

SAT

PRACTICE BOOK
WITH SOLUTIONS

BOOK

2

PROBLEM SOLVING AND DATA ANALYSIS

Contains hundred of engaging solving and analysis to train your mind.
Tons of questions to boost your understanding.

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$$y = kx$$

$$2 = m$$

$$\frac{7a + a}{4a}$$

$$\frac{2y +}{8}$$

$$230$$

$$4a$$

$$7x$$

PREFACE

"The struggle is real." That is how I describe my many years of teaching Mathematics! From finding reference materials that contain almost everything I need to preparing students for international assessments like SAT, PSAT, CIE and IB have been quite a huge challenge because textbooks and other resources vary accordingly.

This practice book contains more exercises with solutions based on blended SAT Math curriculum. I have compiled as many questions as possible with corresponding solution for each type. SAT and PSAT exam preparation exercises are the central components and main focus of this workbook. I want users of this book to have an all-in-one go-to material where they can find everything they need to enhance their Math skills and eventually earn mastery of the topics.

Preparing students for SAT was my inspiration on why I came up with designing this practice book. My objective is to be able to help students achieve 600 points and above. This book is special as it contains questions with handwritten solutions.

This practice book is a product of my many years of teaching experience, and it took me a year to finally complete it. I am sure this will be a big help for students. Though this has a simple structure, I still suggest that students first review the topics from different resources, then take hold of this book and solve all practice questions to attain the target score.

Arif Yetik, MA

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1

If $\frac{a}{b} = 3$, what is the value of $\frac{3b}{a}$?

- A) 1
- B) 3
- C) 6
- D) 9

2

If $y = k \cdot x$, where k is constant, and $y=20$ when $x=5$, what is the value of y when $x=7$?

- A) 4
- B) 16
- C) 24
- D) 28

3

If $\frac{x-y}{x} = \frac{2}{5}$, which of the following must be also true?

- A) $\frac{x+y}{y} = \frac{8}{3}$
- B) $\frac{x}{y} = \frac{3}{5}$
- C) $\frac{y}{x} = \frac{5}{2}$
- D) $\frac{x-y}{y} = \frac{1}{3}$

4

If $\frac{m+2}{m-2} = 4$, what is the value of m ?

- A) 2
- B) 3
- C) $\frac{10}{3}$
- D) $\frac{11}{3}$

5

If a is the average (arithmetic mean) of $3t$ and 11 , b is the average of $4t$ and 18 , and c is average $5t$ and 31 , what is the average of a , b , and c in terms of t ?

- A) $t + 6$
- B) $2t + 10$
- C) $6t + 30$
- D) $12t + 60$

6

If $\frac{2m}{n} = \frac{1}{3}$, what is the value of $\frac{n}{m}$?

- A) $\frac{1}{6}$
- B) 6
- C) $\frac{2}{3}$
- D) $\frac{3}{2}$

7

If $x - y = 9$ and $\frac{y}{2} = 3$, what is the value of x ?

- A) 12
- B) 14
- C) 15
- D) 18

8

If $a = \frac{3}{4}b$ and $b = 16$, what is the value of $2a - 20$?

- A) 4
- B) 10
- C) 12
- D) 24

9

Horsepower and watts are units of measure of power. They are directly proportional such that 3 horsepower is equal to 2,237.1 watts. How much power, in watts, is equal to 5 horsepower?

- A) 745.7 watts
- B) 2,982.8 watts
- C) 3,728.5 watts
- D) 3,738.5 watts

10

If $\frac{c-d}{d} = \frac{3}{5}$, which of the following must be true?

- A) $\frac{c}{d} = \frac{5}{8}$
- B) $\frac{c+d}{d} = \frac{3}{8}$
- C) $\frac{c-d}{c+d} = \frac{8}{3}$
- D) $\frac{d}{c+d} = \frac{5}{13}$

11

Nick walks 20 meters in 9.5 seconds. If he walks at this same rate, which of the following is closest to the distance he will walk in 3 minutes?

- A) 37.9 meters
- B) 253 meters
- C) 379 meters
- D) 3,790 meters

12

If $\frac{a-2}{3} = k$ and $k = 4$, what is the value of a ?

- A) 10
- B) 14
- C) 15
- D) 16

13

A major snowstorm is expected to hit a Erzurum city, in Turkey, at 10 AM. The storm is expected to last 15 hours with snow falling at constant rate of 2 inches per hour. The Erzurum city currently has 14 inches of snow on the ground. How much total snow is the Erzurum city expected to have at 7 PM?

- A) 14 inches
- B) 21 inches
- C) 32 inches
- D) 36 inches

14

Two investors are to share profits of \$21,000 in the ratio of 5:2. What is the amount of the smaller share?

- A) \$3,000
- B) \$6,000
- C) \$15,000
- D) \$18,000

15

Of every 240 chickens hatched at a farm, 96 will be kept as egg hens and 144 will be sold at market. At this rate, how many chickens will be sold if 600 chickens are hatched?

- A) 200
- B) 240
- C) 330
- D) 360

16

The ratio of a to b to c to d to e is 1 to 2 to 3 to 4 to 5. If $c=3,600$, what is the value of e ?

- A) 1,200
- B) 2,400
- C) 4,800
- D) 6,000

1

x	y
1	3
3	27

Given the ordered pairs in the table above, which of the following could be true?

- A) y varies inversely as x
- B) y varies directly as x
- C) y varies inversely as the square of x
- D) y varies directly as the square of x

2

x	y
1	2
3	54

The variables x and y are related by an equation of the form $y = Ax^m$ where A and m are both positive real numbers. What is the value of y when $x = 5$?

- A) 64
- B) 125
- C) 128
- D) 250

3

If m varies inversely as n and $m = 6$ when $n = 8$, which of the following is another solution for m and n ?

- A) $m = 8$ and $n = 12$
- B) $m = 8$ and $n = 8$
- C) $m = 4$ and $n = 12$
- D) $m = 3$ and $n = 24$

4

If y varies inversely as the square of x , then when x is multiplied by 3, y will be

- A) divided by 9
- B) divided by 3
- C) multiplied by 9
- D) multiplied by 3

5

Let $f(x, y) = Ax^3y^2$ where A is a constant. If $f(m, n) = 10$, what is the value of $f(2m, 3n)$?

- A) 120
- B) 240
- C) 360
- D) 720

6

If y varies inversely as x and the graph of their relation in the xy -plane passes through the point $(5, 6)$, what is the value of y when $x = 4$?

- A) 6
- B) 7.5
- C) 15
- D) 30

7

If b varies inversely as the square of a , and $b = 8$ when $a = 2$, then what is the value of b when $a = 3$?

- A) 9
- B) 8
- C) $\frac{27}{8}$
- D) $\frac{32}{9}$

8

A marathon offers \$ 6,000 in prize money to the top three finishers. If the first, second, and third place prizes are distributed in the ratio of 5:3:2, how much money, in dollars, does the first-place finisher receive?

- A) \$ 4,500
- B) \$ 3,000
- C) \$ 1,800
- D) \$ 1,200

9

If a train travels at a constant rate of 48 miles per hour, how many minutes will it take to travel 120 miles?

- A) 96 minutes
- B) 120 minutes
- C) 150 minutes
- D) 180 minutes

10

If the ratio of a to b is 3 to 2, and ratio a to c is 5 to 3, what is the ratio of b to c ?

- A) 15 to 9
- B) 15 to 10
- C) 10 to 9
- D) 10 to 6

11

A paint mixture consists of a 3:2:11 ratio blue, violet, and white, respectively. How many ounces of white are needed to make 512 ounces of this mixture?

- A) 352
- B) 96
- C) 64
- D) 32

12

If a printer can print 4 pages in 15 seconds, how many pages can it print in 4 minutes?

- A) 64
- B) 32
- C) 16
- D) 15

13

If $\frac{2a}{b} = \frac{1}{2}$ and $\frac{c}{2b} = \frac{5}{8}$, what is $\frac{c}{2a}$?

- A) $\frac{3}{5}$
- B) $\frac{5}{2}$
- C) $\frac{5}{3}$
- D) $\frac{5}{4}$

14

Chloe can edit 750 words per minute and Faye can edit 450 words per minute. If each page of text contains 800 words, how many pages can they edit working together, in 24 minutes?

- A) 24
- B) 32
- C) 36
- D) 48

15

If a \$7,500 contribution is divided among charities X , Y , and Z in ratio of 7:5:3, respectively, how many much more, in dollars, does charity X receive than charity Z ?

- A) \$500
- B) \$1,500
- C) \$1,800
- D) \$2,000

16

A hare runs at a constant rate of x miles per hour, and tortoise runs at a constant rate of y miles per hour, where $0 < x < y$. How many more hours will it take the tortoise to finish a race of z miles than hare?

- A) $\frac{xy + yz}{xz}$
- B) $\frac{y - x}{z}$
- C) $\frac{xz - yz}{xy}$
- D) $\frac{x + y}{z}$

1

The fraction $\frac{m}{12}$ is equal to 0.75. What is the value of m ?

- A) 3
- B) 6
- C) 8
- D) 9

2

x	y
1	5
3	45

The variables x and y are related by an equation of the form $y = Ax^m$ where A and m are both positive real numbers. What is the value of y when $x = 8$?

- A) 320
- B) 256
- C) 128
- D) 64

3

If x varies inversely as y and $x = 9$ when $y = 16$, which of the following is another solution for m and n ?

- A) $x = 8$ and $y = 24$
- B) $x = 9$ and $y = 18$
- C) $x = 12$ and $y = 12$
- D) $x = 16$ and $y = 8$

4

On a school international trip, there must be 2 chaperones for every 26 students. How many chaperones need to be on a trip if 173 students are on the trip?

- A) 11
- B) 12
- C) 13
- D) 14

5

Mike's printer can print 5 pieces of paper in 18 seconds. How long will it take to print 140 pieces of paper?

- A) 7 minutes 50 seconds
- B) 8 minutes 24 seconds
- C) 8 minutes 48 seconds
- D) 9 minutes 18 seconds

6

Emmanuel is driving home for spring break, a 435-mile trip. He travels an average of 60 miles per hour for the first 210 miles, and then he travels an average of 45 miles per hour for the last 225 miles. What is Jim's average velocity for the entire trip?

- A) 50.2 miles per hour
- B) 51.2 miles per hour
- C) 54.2 miles per hour
- D) 57.2 miles per hour

7

On a certain map, 10 miles is represented by 1.2 centimeters. What is the distance on the map that represents 60 miles?

- A) 6.4 centimeters
- B) 7.0 centimeters
- C) 7.2 centimeters
- D) 8.0 centimeters

8

2 gallons of paint are needed for a wall that is 130 square feet. How many gallons of paint must be purchased at the store for 780 square feet of wall space?

- A) 6 gallons
- B) 9 gallons
- C) 10 gallons
- D) 12 gallons

9

Store A, Store B, and Store C sell basketball balls. The ratio of the number of basketball balls sold of A to B is $\frac{5}{4}$. The ratio of the number of basketball balls sold of B to C is $\frac{7}{3}$. If Store C sold 24 basketball balls, how many soccer balls did Store A sell?

- A) 70
- B) 56
- C) 48
- D) 24

10

Company A, Company B, and Company C are three internet providers in a certain area of the country. The ratio of subscribers of A to B to C is 3:4:6. If there are a total of 65,000 subscriptions, how many of the 65,000 use Company B and Company C?

- A) 50,000
- B) 45,000
- C) 40,000
- D) 35,000

11

An airplane traveled at a speed of 600 miles per hour for 75 minutes. How far did the airplane travel?

- A) 700 miles
- B) 750 miles
- C) 800 miles
- D) 900 miles

12

A car tire rotates 4,700 times every 5 miles. How many times will the car tire rotate in 60 miles?

- A) 42,600 rotations
- B) 52,400 rotations
- C) 56,400 rotations
- D) 58,200 rotations

13

If Adrian gains 18 pounds, then the ratio of Adrian's weight to Todd's weight would be $\frac{5}{8}$.

If Todd weighs 160 pounds, what was Adrian's initial weight?

- A) 75
- B) 82
- C) 100
- D) 118

14

In a pet store there are 16 dogs and 12 cats. The ratio of dogs to cats is proportional to the ratio of ferrets to rabbits. How many ferrets are there in the store if there are 15 rabbits?

- A) 14
- B) 18
- C) 20
- D) 24

15

At the present time the ratio of a father's age to his son's age is 2:1. Ten years ago, the ratio of father's age to son's age was 8:3. What is the present age of father?

- A) 40
- B) 45
- C) 50
- D) 60

16

The ratio of the width to the length of a rectangle is $\frac{3}{5}$, and the perimeter is 96 cm. What is value of the length of this rectangle?

- A) 18
- B) 24
- C) 27
- D) 30

1

If x varies inversely as y and $x = 6$ when $y = 15$, what is the value of y when $x = 2$?

- A) 5
- B) 30
- C) 45
- D) 90

2

The sides of a triangle are proportional to 3, 4 and 6. If the perimeter of this triangle is 78 cm, then what is the length of the shortest side?

- A) 6
- B) 12
- C) 15
- D) 18

3

If y varies inversely as square x and $x = 4$ when $y = 5$, what is the value of y when $x = 2$?

- A) 12
- B) 15
- C) 16
- D) 20

4

If y varies directly as square x and $x = 2$ when $y = 20$, what is the value of x when $y = 80$?

- A) 4
- B) 12
- C) 16
- D) 20

5

Let $f(x,y) = k \cdot x^2y$ where k is a constant. If $f(a,b) = 8$, what is the value of $f(a,3b)$?

- A) 12
- B) 24
- C) 36
- D) 72

6

If x varies inversely as square root of y and the graph of their relation in the xy - *plane* passes through the point $(6,9)$, what is the value of y when $x = 2$?

- A) 243
- B) 81
- C) 27
- D) 9

7

a , b , and c are proportional to 5, 12 and 13. If $b+c-a=9$, then what is the value of a ?

- A) 2.25
- B) 4.5
- C) 7.5
- D) 9

8

The ratio of a mother's age to her son's age is 4:1. 8 years from now their ages will be in the ratio 3:1. What is the mother's present age?

- A) 40
- B) 45
- C) 48
- D) 64

9

The resistance R in an electric circuit varies directly with the voltage. If $R = 20$ when $V = 120$, what is the value of R when $V = 300$?

- A) 30
- B) 40
- C) 50
- D) 60

10

a , b , and c are proportional to 4, 3 and 2. If $a^2 + b^2 + c^2 = 116$, then what is the value of $a + b + c$?

- A) 9
- B) 15
- C) 18
- D) 21

11

A cake mixture consists of a 1:3:2:7 cacao, sugar, egg, and flour, respectively. How many ounces of egg are needed to make 390 ounces of this cake?

- A) 30
- B) 60
- C) 90
- D) 210

12

If a xerox machine can scan 3 pages in 10 seconds, how many pages can it scan in 3 minutes?

- A) 36
- B) 45
- C) 51
- D) 54

13

If $\frac{a}{b} = \frac{2}{5}$, what is $\frac{3a-b}{2a+b}$?

- A) $\frac{1}{2}$
- B) $\frac{1}{5}$
- C) $\frac{2}{7}$
- D) $\frac{1}{9}$

14

If $\frac{x+y}{y} = \frac{5}{2}$, what is $\frac{3x-y}{x+2y}$?

- A) $\frac{1}{7}$
- B) $\frac{5}{7}$
- C) 1
- D) $\frac{9}{7}$

15

a , b , and c are proportional to 2, 3 and 4. If $3a-b+c=21$, then what is the value of b ?

- A) 3
- B) 9
- C) 12
- D) 14

16

The ratio of two numbers is 5:6 if 12 subtracted from each number, the ratio of the resulting number is 3:4. what is the value of biggest number?

- A) 36
- B) 30
- C) 24
- D) 12

1

If $x = 3y - 2$, what is the value of y in terms of x ?

- A) $2x - 3$
- B) $3x + 2$
- C) $\frac{x+2}{3}$
- D) $\frac{x+3}{2}$

2

If $x = \frac{2y-z}{5}$, what is the value of y in terms of x and z ?

- A) $5x + z$
- B) $5x + 2z$
- C) $\frac{5x-z}{2}$
- D) $\frac{5x+z}{2}$

3

If $a = \frac{3b-2}{4c}$, what is the value of c in terms of a and b ?

- A) $\frac{3b-2}{a}$
- B) $\frac{3b-2}{4a}$
- C) $\frac{3b+2}{2a}$
- D) $\frac{3b+2}{4a}$

4

If $a = \frac{2b+c-1}{3c}$, what is the value of c in terms of a and b ?

- A) $\frac{2b-1}{3a-1}$
- B) $\frac{2b-1}{3a+1}$
- C) $\frac{2b+1}{3a-1}$
- D) $\frac{2b+1}{3a+1}$

5

A mason uses the formula $n = d\sqrt{7h}$ to estimate the number of bricks, n , needed to build a wall that is d feet long and h feet high. What is the value of h in terms of d and n ?

- A) $\frac{d^2}{7n^2}$
- B) $\frac{7n^2}{7d^2}$
- C) $\frac{n}{7d}$
- D) $\frac{n^2}{7d^2}$

6

A carpenter lays b bricks per hour for h hours and then $2b$ bricks for $3h$ hours. In terms of b and h , how many bricks did he lay in total?

- A) $5bh$
- B) $7bh$
- C) $3h + 4b$
- D) $4h + 3b$

7

If x pears cost c dollars, which of the following expressions gives the cost of 13 pears, in dollars?

- A) $13cx$
- B) $\frac{c}{13x}$
- C) $\frac{13c}{x}$
- D) $\frac{cx}{13}$

8

There are x grade levels with y students in each grade level in an international school. If school buys p pilot pens to be distributed equally among the students, which of the following gives the number of drawing pens each student receives?

- A) $\frac{xy}{p}$
- B) $\frac{p}{xy}$
- C) $\frac{yp}{x}$
- D) $\frac{xp}{y}$

9

Eric buys d dollars' worth of groceries each week and spends a *one-fifths* of those dollars on snacks. In terms of d , how many weeks will it take Eric to spend a total of \$75 just on snacks?

- A) $\frac{15}{d}$
- B) $\frac{375}{d}$
- C) $\frac{d}{15}$
- D) $\frac{d}{375}$

10

A 8 inches by 12.5 inches piece of cardboard costs \$2.5. If the costs of cardboard is proportional to its area, what is the cost of a piece of cardboard that is 15 inches by 40 inches?

- A) \$9
- B) \$10
- C) \$12.5
- D) \$15

11

A rolling ball covers a distance of 2,700 feet in 3 minutes. What is the ball's average speed, in inches per seconds? (12 inches = 1 foot)

- A) 1
- B) 1.25
- C) 1.5
- D) 2

12

Jack drives 180 miles at rate of 45 mph, and then another 120 miles at rate of 60 mph. What was his average speed, in miles per hour?

- A) 50
- B) 51.5
- C) 52.5
- D) 55

13

The ratio of the width to the length of a rectangle is $\frac{3}{5}$, and the perimeter is 64 cm. What is area of this rectangle?

- A) 160
- B) 180
- C) 240
- D) 300

14

If y varies directly as x and the graph of their relation in the xy - *plane* passes through the point $(-3, 6)$, what is the value of y when $x = 4$?

- A) -8
- B) -4
- C) 4
- D) 8

15

Sue and Joe are brothers. Three years ago, the ratio of their ages was $3 : 2$. Three years from now their ages will be in the ratio $9 : 7$. How old Taren now?

- A) 9
- B) 12
- C) 15
- D) 18

16

The arithmetic mean of five integers is 45. Which of the following number must be added in order to make the arithmetic mean equal to 52?

- A) 75
- B) 82
- C) 85
- D) 87

1

1 decagram = 10 grams

1,000 milligrams = 1 grams

A clinic stores one type of medicine in 5-decagram containers. Based on the information given above, how many 1-milligram doses are there in one 5-decagram container?

- A) 50,000
- B) 5,000
- C) 500
- D) 0.005

2

Eric bought a camera at a store that gave a 25 percent discount off its original price. The total amount he paid to the cashier was t dollars, including an 8 percent sales tax on the discounted price. Which of the following represents the original price of the camera in terms of t ?

- A) $\frac{t}{0.75}$
- B) $\frac{t}{0.81}$
- C) $(0.75)t$
- D) $(0.75)(0.08)t$

3

Yana is a farmer working the production of apples by two types of apple trees. She noticed that Type A trees produced 25 percent more apples than Type B trees did. Based on Yana's observation, if the Type A trees produced 40,000 apples, how many apples did the Type B trees produce?

- A) 36,000
- B) 34,000
- C) 32,000
- D) 30,000

4

The dancer earns \$135 at a performance where 9 people attend. The dancer uses 41% of the money earned to pay the costs involved in putting on each performance. The rest of the money earned is the dancer's profit. What is the profit the dancer makes at a performance where 9 people attend?

- A) \$55.35
- B) \$64.38
- C) \$79.65
- D) \$96.8

5

At San Juan High School, approximately 4 percent of juniors and 3 percent of seniors were received first honors last school year. If there were 1482 juniors and 972 seniors enrolled at San Juan High School last year, which of the following is closest to the total number of juniors and seniors at San Juan High School last year who were received first honors?

- A) 96
- B) 88
- C) 59
- D) 29

6

1 kilometer = 1,000 meters

1 meter = 100 centimeters

Based on the above information, how many centimeters are in 2.5 kilometers?

- A) 250,000
- B) 25,000
- C) 250
- D) 0.025

7

A rectangle was altered by increasing its length by 20% and decreasing its width by x percent. If these alterations decreased the area of the rectangle by 4%, what is the value of x ?

- A) 8
- B) 12
- C) 15
- D) 20

8

If a 1-pound cake is sliced in half and each half is sliced into eighths, what is the weight, in ounces, of each of the slices? (1 pound = 16 ounces)

- A) 1
- B) 2
- C) 4
- D) 8

9

Josie surveyed a random sample of the juniors of high school to determine whether the Fieldtrip should be held in September or October. Of the 60 students surveyed, 40% preferred September. So, how many students in the entire 150 juniors would be expected to prefer having the Fieldtrip in October?

- A) 24
- B) 36
- C) 60
- D) 90

10

The density of an object is equal to the mass of the object divided by the volume of the object. What is the volume, in milliliters, of an object with a mass of 15 grams and a density of 2.5 grams per milliliter?

- A) 5
- B) 6
- C) 30
- D) 37.5

11

How many cubic feet are there in a room measuring $5m \times 10m \times 2m$? ($1 \text{ m}^3 = 35.314 \text{ ft}^3$)

- A) 35.3
- B) 353.1
- C) 3,531.4
- D) 35,314.6

12

A man makes a 27.0 km trip in 16 minutes. If he trips 48 minutes then how far was the trip in miles? (1 mile = 1,609 meters)

- A) 16.8
- B) 32.16
- C) 48.48
- D) 50.33

13

The density of an object is equal to the mass of the object divided by the volume of the object. What is the mass, in grams, of an object with a volume of 48 milliliters and a density of 1.25 grams per milliliter?

- A) 18.6
- B) 28
- C) 38.4
- D) 60

14

Myra begins a new walking program with 800 m on the first day. Each day, she will increase her walk by 200 m. How many kilometers will she walk on day 8 of her program?

- A) 7.8
- B) 8.6
- C) 9.8
- D) 12

15

If the population of town Y is 60% greater than the population of town X, and the population of town Z is 20% greater than the population of town X, then what percent greater is the population of town Y than the population of town Z?

- A) 16.6%
- B) 25%
- C) 33.3%
- D) 40%

16

If x is 300% less than 22, what is the value of $|x|$?

- A) 33
- B) 22
- C) 14
- D) 11

1

How many liters of a 30% saltwater solution must be added to 8 liters of a 15% saltwater solution to obtain a 20% saltwater solution?

- A) 4
- B) 5
- C) 6
- D) 8

2

A dormitory's monthly water bill was \$67.30. Due to a rate increase, its monthly bill is now \$73.36. To the nearest tenth of a percent, by what percent did the amount of the dormitory's water bill increase?

- A) 8.1%
- B) 8.5%
- C) 9.0%
- D) 9.6%

3

An educational foundation is forming a committee to discuss plans for the renovation of high school and elementary school. Of those invited to join the committee, 20% are parents of students, 35% are teachers from the current schools, 25% are school and foundation administrators, and the remaining 8 individuals are students. How many teachers were invited to join the committee?

- A) 8
- B) 10
- C) 12
- D) 14

4

If the length of a rectangle is decreased by 20% but its width is increased by 30%, by what percent does its area increase?

- A) 4%
- B) 84%
- C) 96%
- D) 104%

5

A room 6 m by 5 m is 4 m high. Allowing 8 m² for door and windows, how many gallons of paint walls and ceiling if a gallon of paint can cover about 16 m² of surface?

- A) 6
- B) 7
- C) 16
- D) 17

6

A shipping company medium size package requires 60 centimeters of tape to be closed securely. What is the maximum number of packages of this type that can be secured with 48 meters of tape? (1 meter = 100 cm)

- A) 40
- B) 80
- C) 120
- D) 160

7

A salesman receives a basic salary of \$ 600 and a commission of 4% on all sales. Find his total sales in a month when he received \$ 800?

- A) \$3,200
- B) \$3,600
- C) \$4,500
- D) \$5,000

8

Jacob spent 12% of his 10-hour workday in department meetings. How many minutes of his workday did he spend in meetings?

- A) 1.2
- B) 8.8
- C) 72
- D) 96

9

A customer paid \$72.8 for a jacket after a 12 percent sales tax was added. What was the price of the jacket before the sales tax was added?

- A) 62
- B) 64
- C) 65
- D) 68

10

A metal bar weighs 8.5 ounces. 92% of the bar is silver. How many ounces of silver are in the bar? (round to the nearest thousandth)

- A) 7.82
- B) 7.42
- C) 6.32
- D) 4.57

11

Ruben bought an electric drill at 85% of the regular price. He paid \$120.48 for the drill. What was the regular price? (Round to the nearest cent)

- A) \$148.64
- B) \$141.74
- C) \$132.28
- D) \$129.96

12

The planet Venus travels 422,500,000 miles in its orbit around the Sun. If it takes 0.61 years for Venus to complete its orbit, which of the following is closest to the average speed of Venus, in miles per hour, in its orbit around the Sun?

- A) 79,066
- B) 126,077
- C) 163,128
- D) 306,680

Questions 13-14 refer to the following information.

Product	Price	Amount
L-Galactose	\$480	500 mg
L-Erythrose	\$165	100 mg
D-Threose	\$66	50 mg

A company produces chemicals to be used by pharmaceutical manufactures.

13

How much more will 250 mg of L-Erythrose 250 mg of costs than D-Threose?

- A) 330
- B) 165
- C) 82.5
- D) 80

14

A customer orders 4 g of L-Galactose and L-Erythrose. If the total price of the order is \$4,702.5, how much L-Galactose, in grams, did customer order?

- A) 1.25
- B) 2.50
- C) 2.65
- D) 2.75

15

A public school has 1,200 students. 480 of these students are girls. What percentage of these students are boys?

- A) 40 %
- B) 48 %
- C) 60 %
- D) 64 %

Questions 1-3 refer to the following information.

A survey was conducted annually among randomly chosen from city families to determine the number of cars owned per household. The table below shows the survey results.

	1 car	2 cars	3+cars	Total
1980	170	45	5	220
1990	185	66	16	267
2000	150	128	95	373
2010	135	180	144	459
Total	640	419	260	1319

1

What percent of households surveyed in 1980 had exactly 3 cars and more?

- A) 1.8%
- B) 2.3%
- C) 5.0%
- D) 20.0%

2

What percent of households surveyed in 2000 had exactly 2 cars?

- A) 11%
- B) 25%
- C) 34%
- D) 36%

3

What percent of households surveyed in 2010 had exactly 1 car?

- A) 27%
- B) 29%
- C) 32%
- D) 35%

4

25% of 300 is equal to 20% of

- A) 75
- B) 250
- C) 350
- D) 375

5

	Red Marbles	Yellow Marbles
Bag 1	4	5
Bag 2	5	9
Bag 3	6	8
Bag 4	7	15

In the bags above, which bag has the greatest percentage of red marbles?

- A) Bag 1
- B) Bag 2
- C) Bag 3
- D) Bag 4

6

A store has a stock of 60 laptops and 84 tablets. During a week, the store sells 20% of laptops and 25% of tablets. What percent of total stock of laptops was sold during this week?

- A) 8.3%
- B) 16.6%
- C) 18%
- D) 20%

7

1 kilometer = 1,000 meters

1 meter = 100 centimeters

Based on the above information, how many centimeters are in 0.5 kilometers?

- A) 500,000
- B) 50,000
- C) 500
- D) 0.05

8

In 2004, snow accumulation in Calgary was 20% higher than it was in 2003. In 2005, snow accumulation for Calgary was 15% higher than it was in 2004. The snow accumulation in 2005 was what percent higher than it was in 2003?

- A) 29%
- B) 32%
- C) 35%
- D) 38%

9

A jacket has marked retail price \$60 but is on sale at a 25% discount. If a customer has a coupon for 12% off of the sale price, and if the sales tax is 8%, what is the final price of this jacket, including all discount and tax?

- A) \$36
- B) \$39.6
- C) \$42.77
- D) \$45

10

If a population of bacteria increases from 100 to 220, what is the percent increase in this population?

- A) 90%
- B) 100%
- C) 120%
- D) 220%

11

What number is 25% less than 80?

- A) 20
- B) 60
- C) 75
- D) 80

12

If the price of a stock declined by 30% decreased in one year and increased by 70% the next year, by what percent did the price increase over the two-year period?

- A) 9%
- B) 15%
- C) 19%
- D) 119%

13

If the length of a rectangle is decreased by 10% but its width is increased by 30%, by what percent does its area increase?

- A) 17%
- B) 51%
- C) 91%
- D) 117%

1

What number is 30% greater than the sum of 40 and 80?

- A) 136
- B) 144
- C) 156
- D) 168

2

The sum of three numbers is 216. If the greatest of these numbers is 40% more than the sum of the other two, what is the value of the greatest of these numbers?

- A) 90
- B) 96
- C) 116
- D) 126

3

The original price of an item was marked down by 25% for a week-long sale. Since the item was not sold in the first week, it was marked down an additional p percent. If the total mark down from the original price was then 34%, what is the value of p ?

- A) 9
- B) 12
- C) 15
- D) 16

4

The cost of grapes at a grocery store is normally \$6.99 per kilogram. There was a sale on grapes for 60% off the normal price. What is the sale price of the grapes to the nearest cent?

- A) \$4.20
- B) \$3.29
- C) \$3.20
- D) \$2.80

5

If a percent of 75 is 9, then a percent of what number is 15?

- A) 75
- B) 90
- C) 125
- D) 150

6

The percent decrease from 15 to 9 is equal to the percent increase from 25 to x . What is the value of x ?

- A) 35
- B) 36
- C) 40
- D) 45

7

Scientists discovered "jelly-like" fish living in one of the deepest places on earth, almost 26,246 feet below the ocean surface. Approximately how many kilometers below the sea's surface is that place? (1 meter \approx 3.28ft)

- A) 6
- B) 7
- C) 8
- D) 9

8

A laptop was on sale for 35% off its original price. If the sale price of the laptop was \$844.35, what was the original price of the book? (Assume there is no sales tax.)

- A) \$1,259
- B) \$1,299
- C) \$1,349
- D) \$1,399

9

In 2015 the populations of City A and City B were equal. From 2005 to 2015, the population of City A increased by 21% and the population of City B decreased by 9%. If the population of City A was 246,589 in 2005, what was the population of City B in 2005?

- A) 279,781
- B) 298,373
- C) 327,882
- D) 337,883

10

In a 21-game season a certain basketball player scores at least 15 points in 50% of the first 8 games, 40% of the next 7 games, and 20% in the last 6 games. In what percent of all 21 games did this player score less than 15 points?

- A) 52%
- B) 62%
- C) 64%
- D) 66%

11

If the price of car goes up by 3%, which is \$12,000, what is the new price of the car?

- A) \$11,640
- B) \$12,000
- C) \$12,300
- D) \$12,360

12

If 80% of the students in a classroom passed math exam and five students failed, then how students passed math exam?

- A) 20
- B) 24
- C) 25
- D) 30

13

If the width of a rectangle is 75% of its length. If the area of rectangle is 108 cm^2 then what is the perimeter of rectangle?

- A) 14
- B) 21
- C) 28
- D) 42

14

A rectangular field has length 10m longer than width. If the area of this field $2,000 \text{ m}^2$ then, what is the length of wire fence that we will put around the field?

- A) 90
- B) 120
- C) 180
- D) 240

15

Derick wants to buy everyone in his family a notebook for Christmas. Derick has 12 members in his family, and each notebook costs \$9.00 plus a sales tax of 12%. How much money will Derick spend on his Christmas gifts?

- A) \$108
- B) \$120.96
- C) \$124
- D) \$128

16

Tyrone added 60 liters of a 40% alcohol solution to 20 liters of 20% alcohol solution. What is the alcohol concentration of the new solution?

- A) 35%
- B) 38%
- C) 40%
- D) 45%

1

		Subjects			Total
		Biology	Chemistry	Physics	
Gender	Female	49	53	68	170
	Male	41	69	50	160
	Total	90	122	118	330

A group of science school students responded to a survey that asked which science subjects they were currently enrolled. The survey data were as shown in the table above. Which of the following categories accounts for approximately 15% of all the survey respondents?

- A) Females taking Biology
- B) Males taking Physics
- C) Females taking Chemistry
- D) Males taking Biology

Questions 2 and 3 refer to the following information.

Lengths of Fish (in inches)						
5	5	6	6	6	7	7
8	8	9	9	9	9	10
11	11	12	13	13	14	21

The table above lists the lengths of a random sample of 21 tilapia fish.

2

What is the mean the table shown above?

- A) 9
- B) 9.48
- C) 10
- D) 21

3

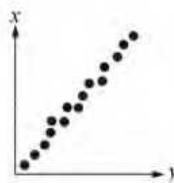
The outlier measurement of 21 inches is an error. Of the mean, median, and range of the values listed, which will change the most if the 21-inch measurement is removed from the data?

- A) Range
- B) Mean
- C) Median
- D) Mode

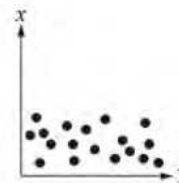
4

Which of the following graphs best shows a strong positive association between x and y ?

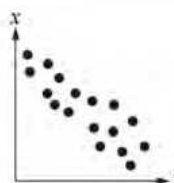
(A)



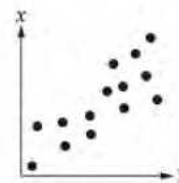
(C)



(B)

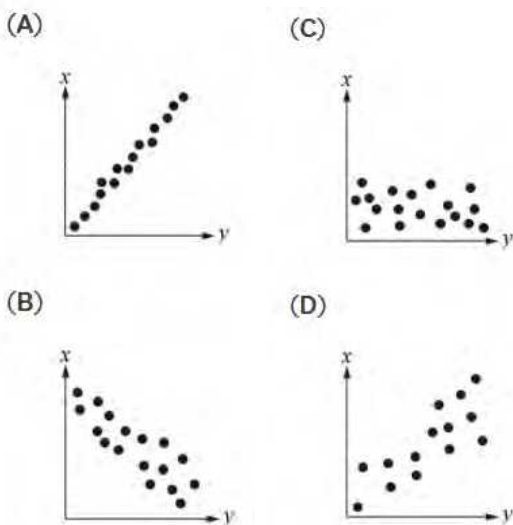


(D)



5

Which of the following graphs best shows a weak positive association between x and y ?

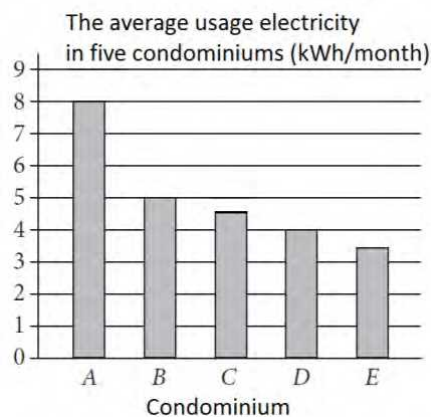


6

If the average of 5, 8, m , and 15 is 13, what is the value of m ?

- A) 19
- B) 21
- C) 24
- D) 52

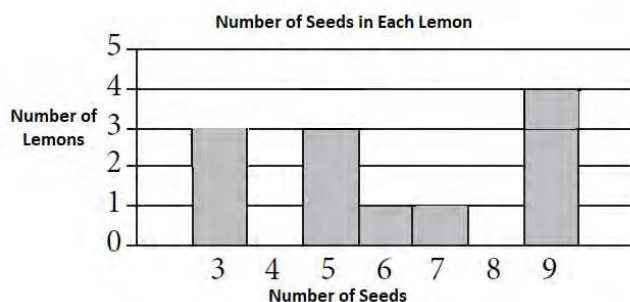
7



The average usage electricity in five condominiums graph above. If the total number of average usage electricity in five condominiums is 36,900 kWh, what is an appropriate label for the vertical axis on the graph?

- A) Number of average usage electricity (in tens of thousands)
- B) Number of average usage electricity (in thousands)
- C) Number of average usage electricity (in hundreds)
- D) Number of average usage electricity (in ten)

8



Based on the histogram above, which is the average number of seeds per lemon?

- A) 5.6
- B) 6.0
- C) 6.08
- D) 6.48

Questions 9 and 10 refer to the following information.



9

What does the c - *intercept* represent in the graph?

- A) The decrease in cost to renting bowling game per hour
- B) The total number of bowling games
- C) The total number of hours the boat is rented
- D) The initial cost of renting bowling game

10

Which of the following shows the relationship between h and c ?

- A) $c = 5h - 3$
- B) $c = \frac{3}{4}h + 5$
- C) $c = 3h + 5$
- D) $c = \frac{4}{3}h + 5$

11

The table below shows 45 students' favorite type of movie in an international school. If the table was shown as a pie chart, what angle would be needed to show Horror movie?

Favourite genre of film	Frequency
Comedy	12
Romance	10
Action	7
Horror	9
Drama	7
Total	45

- A) 48°
- B) 60°
- C) 72°
- D) 75°

Questions 1, 2 and 3 refer to the following information.

Annual Budgets for Different Programs in X city

Program	Year			
	2014	2015	2016	2017
Agriculture and resources	\$ 164,235	\$ 175,900	\$ 170,803	\$ 160,064
Education	\$ 875,450	\$ 845,300	\$ 899,750	\$1,065,800
Public Safety	\$ 264,904	\$ 288,708	\$ 306,106	\$ 301,900
Health	\$ 480,645	\$ 497,403	\$ 490,801	\$ 499,785
General government	\$ 3,099,050	\$2,963,463	\$3,067,890	\$3,127,898

The table above lists the annual budget, in thousands of dollars

1

Which of the following best approximates the average rate of change in the annual budget for Education in X city from 2014 to 2017?

- A) \$ 45,000,000 per year
- B) \$ 48,000,000 per year
- C) \$ 49,000,000 per year
- D) \$ 52,000,000 per year

2

Which of the following best approximates the average rate of change in the annual budget for General government in X from 2014 to 2017?

- A) \$ 7,200,000 per year
- B) \$ 9,200,000 per year
- C) \$ 14,400,000 per year
- D) \$ 28,800,000 per year

3

Of the following, which program's ratio of its 2014 budget to 2017 budget is closest to the Education program's ratio of its budget 2014 budget to its 2017 budget?

- A) General government
- B) Public safety
- C) Health
- D) Agriculture and resources

Questions 4 and 5 refer to the following information.

Planet	Acceleration due to gravity, "g" [m/s ²]
Mercury	3.59
Venus	8.87
Earth	9.81
Moon	1.62
Mars	3.77
Jupiter	25.95
Saturn	11.08
Uranus	10.67
Neptune	14.07
Pluto	0.42

The chart above shows approximations of the acceleration due to gravity in meters per second squared in our solar system.

4

What is the weight in newtons, of an object on Mars with a mass of 80 kilograms?

- A) 21.2
- B) 168.8
- C) 301.6
- D) 311.2

5

An object on earth has a weight of 196.2 newtons. On which planet would the same object have an approximate weight of 8.4 newtons?

- A) Mars
- B) Mercury
- C) Neptune
- D) Pluto

Questions 6 and 7 refer to the following information.

A sociologist asked each student how many siblings he or she has from primary and secondary private schools. The results are shown in the table below.

Number of siblings	Primary	Secondary
0	21	31
1	25	38
2	21	33
3	16	28
4 and more	13	26

6

What is the median number of siblings for primary school students surveyed?

- A) 0
- B) 1
- C) 2
- D) 3

7

What is the median number of siblings for secondary school students surveyed?

- A) 0
- B) 1
- C) 2
- D) 3

8

Of the following, approximately what is the probability of three siblings in both school?

- A) 17%
- B) 21%
- C) 22%
- D) 25%

9

Results on the IGCSE Exam of High School

	Passed	Failed
<i>Took review class</i>	11	7
<i>Did not take review class</i>	8	24

The table above summarizes the results of 50 high school students who took the IGCSE exam. If one of the surveyed students who passed the exam is chosen at random for an interview, what is the probability that the person chosen did not take the review class for IGCSE exam?

- A) 11/19
- B) 8/19
- C) 11/50
- D) 8/50

10

Gender	Age		Total
	Secondary 1	Secondary 2	
<i>Male</i>	22	27	49
<i>Female</i>	25	24	49
<i>Total</i>	47	51	98

The table above shows distribution of secondary school students and gender for an international high school. If one student will be selected for a competition at random, what is the probability that the student will be either a male from secondary 1 or female from secondary 2?

- A) $1/2$
- B) $23/49$
- C) $26/49$
- D) $29/49$

11

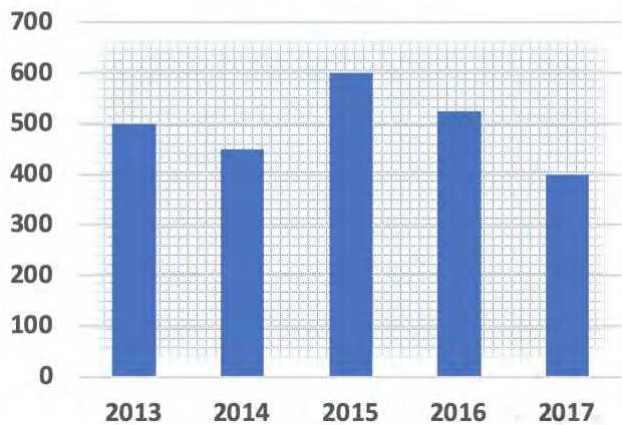
1, 3, X , X , 8, $2X$, 13, 15

If the mean of data shown above is 8, what could be value of X ?

- A) 5
- B) 6
- C) 7
- D) 12

Questions 1, and 2 refer to the following information.

**Hazelnut production in Turkey
(thousand tons)**



The graph above shows the hazelnut production in Turkey from 2013 to 2017.

1

What is the total production for all five years?

- A) 2,375 thousand tons
- B) 2,475 thousand tons
- C) 2,500 thousand tons
- D) 2,575 thousand tons

2

How many percentages of hazelnut did decrease from 2015 to 2016?

- A) 12.5%
- B) 14%
- C) 15%
- D) 18%

3

**Number of Registered Voters in Country X in 2016, in
Thousands**

Region	Age				Total
	18 to 30	31 to 45	46 to 60	60 and older	
Region I	686	2,629	2,967	541	6,823
Region II	1,327	5,871	6,209	1,206	14,613
Region III	899	3,012	3,450	487	7,848
Region IV	598	2,247	2,798	516	6,159
Total	3,510	13,759	15,424	2,750	35,443

Based on the table, if a registered voter who was 18 to 45 years old in 2016 is chosen at random, which of the following is closest to the probability that the registered voter was from the Region II?

- A) 0.35
- B) 0.40
- C) 0.42
- D) 0.51

4

The population of Western honey bee is estimated over the 16 weeks, as shown in the table.

Weeks	Population
0	256
4	512
8	1,024
12	2,048
16	4,096

Which of the following best describes the relationship between time and the estimated population of Western honey bee during the sixteen weeks?

- A) Increasing linear
- B) Decreasing linear
- C) Exponential growth
- D) Exponential decay

5

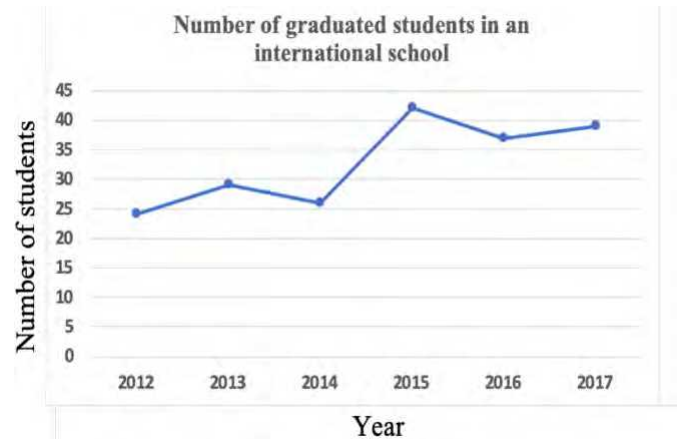
The table below gives the distribution of high temperatures in degrees Celsius (°C) for Manila and Baguio over the same 14 days in April.

Temperature Celsius	Manila Frequency	Baguio Frequency
16 C to 20 C	0	2
21 C to 24 C	0	5
25 C to 28 C	2	6
29 C to 31 C	5	1
32 C and above	7	0

Which of the following is true about the data shown for these 14 days?

- A) The standard deviation of temperatures in Baguio is larger.
- B) The standard deviation of temperatures in Manila is larger.
- C) The standard deviation of temperatures in Manila is the same as that of Baguio
- D) The standard deviation of temperatures in these cities cannot be calculated with the data provided

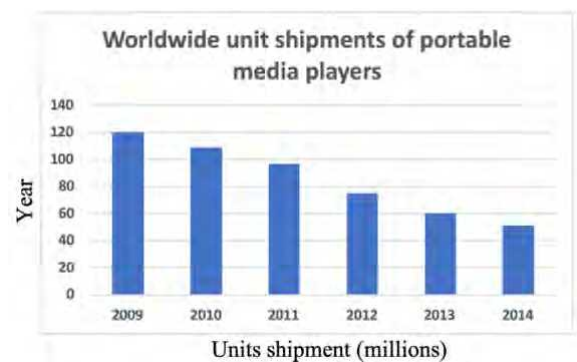
6



According to the line graph above, between which two consecutive years was there the greatest change in the number of graduated students?

- A) 2012–2013
- B) 2013–2014
- C) 2014–2015
- D) 2016–2017

7



According to graph above, the number of portable media players sold in 2010 is what fraction of the number sold in 2013?

- A) 3
- B) 2
- C) $\frac{11}{6}$
- D) $\frac{11}{7}$

Questions 8-10 refer to the following information.

Tree Species	Growth Factor
Red Maple	4.5
Silver Maple	3.0
Sugar Maple	5.0
River Birch	3.5
White Birch	5.0
Shagbark Hickory	7.5
Green Ash	4.0
Black Walnut	4.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species.

8

According to the information in the table, what is the approximate age of Green Ash tree with a diameter of 5.5 inches?

- A) 10 years
- B) 11 years
- C) 20 years
- D) 22 years

9

If a sugar maple tree and a black walnut tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in feet, of their diameters 15 years from now?

(1 foot = 12 inches)

- A) 0.35
- B) 0.63
- C) 1.3
- D) 1.6

10

According to the information in the table, what is the approximate age of River Birch tree with a diameter of 1 foot and 4 inches? (1 foot = 12 inches)

- A) 16 years
- B) 48 years
- C) 54 years
- D) 56 years

1

Where Do Students Get Most of College Admission Information?

Sources	Percent of Survey
College Counselor	61%
Adviser	14%
Internet	13%
Magazines/brochures	8%
TV and Other	4%

The table above shows a summary of 450 responses to a survey question. Based on the table, how many of those surveyed get most of their College admission information from either College Counselor or the Internet?

- A) 74
- B) 148
- C) 333
- D) 378

2

The members of a school council wanted to assess the opinions of all students about cancellation of Mediterranean Food Festival in upcoming school events. The school council surveyed a sample of 156 students who are studying in high school. The survey showed that the majority of students were in favor of not cancellation of program. Which of the following is true about the school council's survey?

- A) It shows that the majority of students are in favor of the Mediterranean Food Festival.
- B) The survey sample should have included more students who are not studying in school.
- C) The survey sample should have consisted all of parents.
- D) The survey sample is unbiased because elementary school students are not included.

Questions 3-5 refer to the following information.

Turkish Ice Cream and Topping Selections

		Flavor	
		Vanilla	Ube
Topping	Hot Fudge	13	8
	Nuts	8	7

The table above shows the flavors of Turkish ice cream and the toppings chosen by the people at store. Each person chose one flavor of ice cream and one topping.

3

Of the people who chose Ube ice cream, what fraction chose hot fudge as a topping?

- A) $\frac{2}{9}$
- B) $\frac{7}{15}$
- C) $\frac{8}{15}$
- D) $\frac{8}{21}$

4

Of the people who chose Vanilla ice cream, what fraction chose nuts as a topping?

- A) $\frac{2}{9}$
- B) $\frac{7}{15}$
- C) $\frac{8}{15}$
- D) $\frac{8}{21}$

5

If one person will be selected at random, what is the probability that the person will be chosen Ube ice cream with nuts as topping?

- A) $\frac{7}{36}$
- B) $\frac{7}{15}$
- C) $\frac{15}{36}$
- D) $\frac{7}{8}$

6

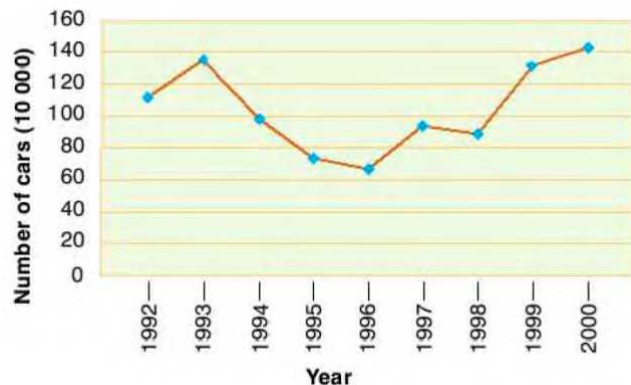
Lengths (inches)

Mathew	1.8	2.1	3.4	2.4	2.8
Marxia	1.5	x	3.2	4.1	2.9

Mathew and Marxia bought five finger bananas, and the lengths of the finger bananas are shown in the table above. The mean of the lengths of the finger bananas Marxia collected is 0.3 inch greater than the mean of the finger bananas Mathew collected. What is the value of x ?

- A) 1.5
- B) 2.3
- C) 2.5
- D) 2.9

7



The graph shown above is the number of cars produced by a car company between 1992 and 2000.

According to the line graph above, between which two consecutive years was there the greatest change in the number of produced cars?

- A) 1992–1993
- B) 1996–1997
- C) 1998–1999
- D) 1999–2000

Questions 8-10 refer to the following information.

The bar graph below compares different causes of death in the United States for the year 1999.



8

Of the following, what was the most common cause of death?

- A) Alcohol
- B) AIDS
- C) Suicide
- D) Smoking

9

Of the following, what is the ratio of number of deaths caused by alcohol to the number of deaths caused by suicide?

- A) $10/27$
- B) $81/111$
- C) $111/81$
- D) $27/10$

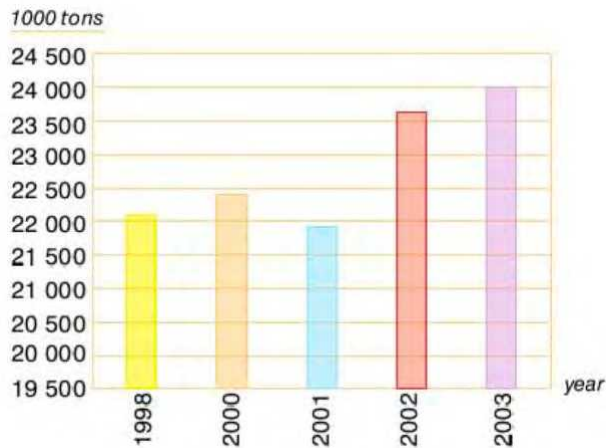
10

On average, approximately how many people died per day in 1999? (consider that 1 year=365 days)

- A) 1,732 per year
- B) 17,320 per year
- C) 173,200 per year
- D) 632,000 per year

1

The bar graph below shows the vegetable production (measured in thousands of tons) in country X between 1998 and 2003.



Of the following, approximately what is the total production from 1998 to 2003?

- A) 110,000 tons
- B) 112,000 tons
- C) 114,000 tons
- D) 118,000 tons

2

The causes of 1,440 fires in a city are listed below.

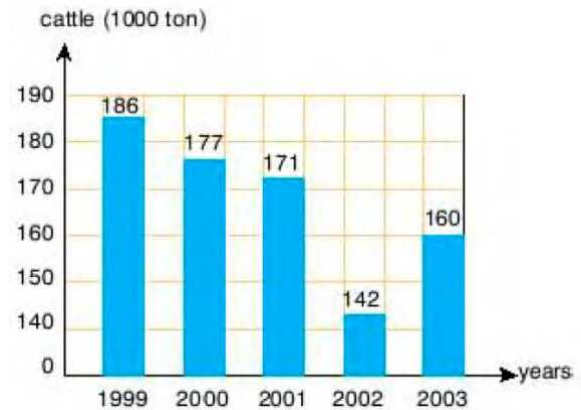
Cause	Number
Electrical	367
Cooking	268
Children	98
Naked flames	120
Cigarette	188
Arson	210
Unknown	189

Of the following, what is the percentage of fires caused by electrical?

- A) 13.1%
- B) 14.5%
- C) 18.6%
- D) 25.4%

3

The bar graph shows the number of cattle (measured in thousands of ton) in Country X in between 1999 and 2003.



Of the following, approximately what is the average number of cattle between 1999 to 2002?

- A) 154.7 tons
- B) 164.7 tons
- C) 169.0 tons
- D) 837.0 tons

4

In a fast food restaurant, the following orders are taken. What is the mode of given data?

pizza, hot dog, chips, pizza, chips, chips, pizza, sandwich, hot dog, pizza, chips, sandwich, chips

- A) pizza
- B) chips
- C) hot dog
- D) sandwich

5

The following temperatures were recorded in a week.

10° C, 7° C, 9° C, 11° C, 13° C, 11° C, 14° C

What is the median of the given data?

- A) 9° C
- B) 10.7° C
- C) 11° C
- D) 12° C

Questions 6-8 refer to the following information.

Number of visitors to a restaurant on each day of a month

18	21	24	24	28	27
20	31	37	42	33	39
27	24	32	38	43	41
29	27	34	37	41	43
21	24	28	35	36	39

The data shown above is the number of visitors to a restaurant on each day of the month.

6

Of the following, what is the mean?

- A) 24
- B) 29.8
- C) 30.4
- D) 31.3

7

Of the following, what is the median?

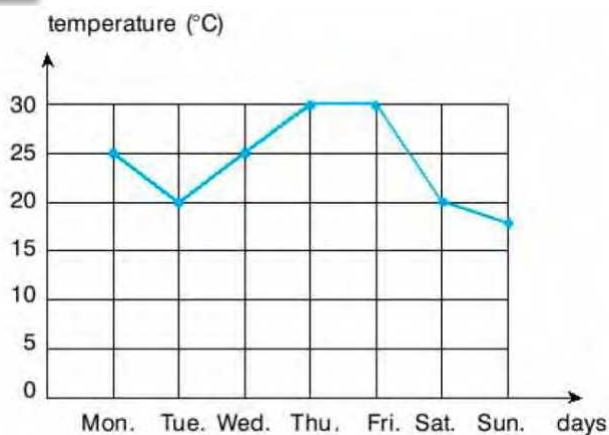
- A) 29
- B) 30.5
- C) 33
- D) 34

8

Of the following, what is the mode?

- A) 24
- B) 27
- C) 37
- D) 39

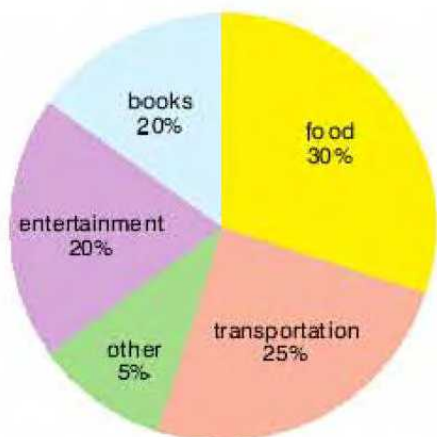
9



The line graph above shows the average daily temperature in a city for each day of a week in August. What is the average temperature of the week?

- A) 17°C
- B) 19°C
- C) 20°C
- D) 24°C

10



A high school student receives \$30 pocket money a week. The circle graph above shows how student spends his pocket money. How much does student spend on transportation?

- A) \$4
- B) \$6
- C) \$7.5
- D) \$9

Questions 11-12 refer to the following information.

15	22	19	8	14
12	25	20	10	9
24	21	15	12	28
26	19	11	14	6

11

What is the mean of data set is shown above?

- A) 14
- B) 15.75
- C) 16.50
- D) 17.25

12

What is the median of data set is shown above?

- A) 15
- B) 17
- C) 19
- D) 20

Questions 1-3 refer to the following information.

Number of Contestants by Score and Day

Days/Points	5	4	3	2	1	0	Total
Day 1	3	2	5	1	3	2	16
Day 2	1	3	4	3	3	2	16
Day 3	3	2	5	4	1	1	16
Total	12	11	17	10	8	5	48

The same 16 contestants, on each of 3 days, answered 5 questions in order to win a gold medal. Each contestant received 1 point for each correct answer. The number of contestants receiving a given score on each day is shown in the table above.

1

Of the following, approximately What is the mean score of the contestants on Day 2?

- A) 2.4
- B) 2.6
- C) 2.8
- D) 2.9

2

Of the following, approximately What is the median score of the contestants on Day 3?

- A) 2.5
- B) 3.0
- C) 3.5
- D) 3.6

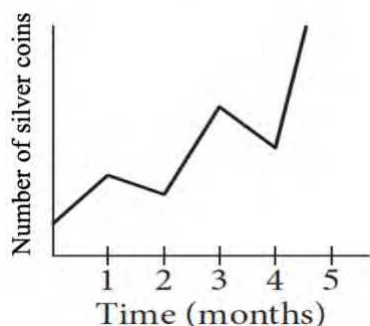
3

Of the following, approximately What is the mean score of the contestants in end of program?

- A) 2.55
- B) 3.66
- C) 3.75
- D) 3.81

4

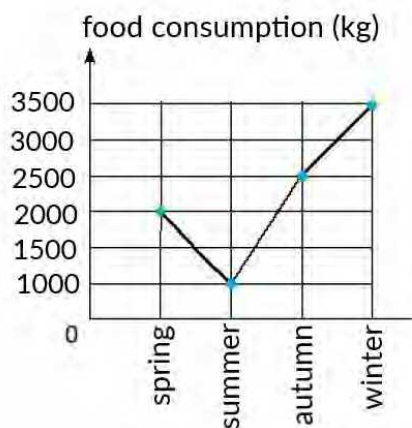
Sarah collects silver coins and she tracks the number of silver coins in her collection on the graph below.



On what interval did the number of silver coins increase the fastest?

- A) Between 1 and 2 months
- B) Between 2 and 3 months
- C) Between 3 and 4 months
- D) Between 4 and 5 months

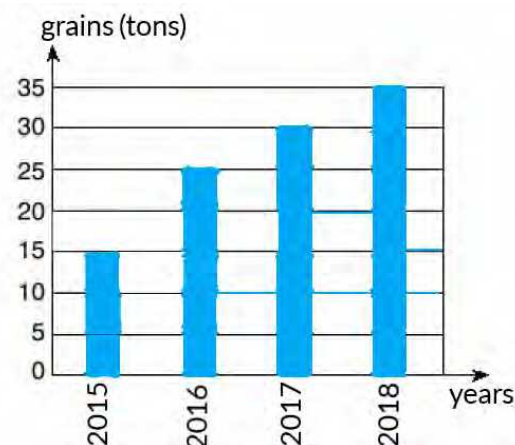
5



The line graph above is shown the food consumption of the animals on a farm for each season of a year. What is the total food consumption for the year?

- A) 7,500 kg
- B) 8,000 kg
- C) 9,000 kg
- D) 9,500 kg

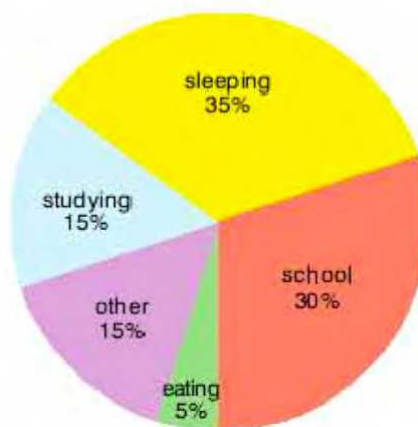
6



The bar graph above shows the amount of grains produced by a farm between 2015 and 2018. What is the percentage increase in the production from 2016 to 2018?

- A) 25 %
- B) 30 %
- C) 35 %
- D) 40 %

7



The circle graph above shows how a high school student spends the twenty-four hours of a typical day. How many hours does the student spend at school?

- A) 3.6 hours
- B) 7.2 hours
- C) 8 hours
- D) 9 hours

Questions 8 and 9 refer to the following information.

The following data shows the monthly cost in USD of Sean's electricity bill for first nine months of 2019.

\$33, \$27, \$24, \$42, \$16, \$28, \$30, \$43, \$36

8

Of the following, what is the mean of this data?

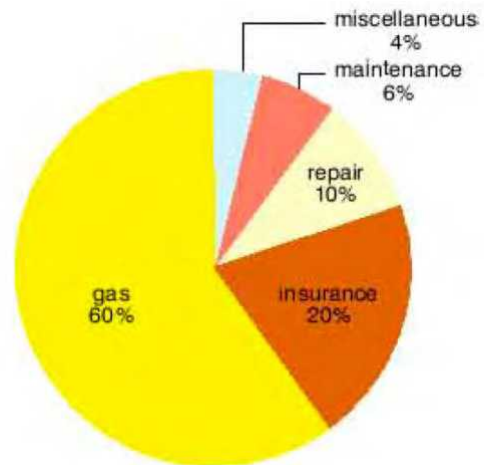
- A) \$29
- B) \$30
- C) \$31
- D) \$31.9

9

Of the following, what is the median of this data?

- A) \$29
- B) \$30
- C) \$31
- D) \$31.5

10



The circle graph above shows the annual operating expenses for a school bus. The total expenses were \$6,400. How much was spent on repair for the school bus?

- A) \$ 256
- B) \$ 384
- C) \$ 640
- D) \$ 1,280

1

The arithmetic mean of a , b , and c is 42. The arithmetic mean of a , b , c , and d is 48. What is the value of d ?

- A) 18
- B) 32
- C) 66
- D) 84

2

The arithmetic mean of twelve number is 19. The mean of different set of five number is 13. What is the mean of combined the two sets of numbers?

- A) 16.34
- B) 17.24
- C) 18.04
- D) 19.36

3

The arithmetic mean of two number m and n is 112, and m is three times n . what is value of m ?

- A) 28
- B) 56
- C) 112
- D) 168

4

2, 7, 6, 10, 8, 12, 16, 14, 15

What is the difference between the mean and the median of given date set shown above?

- A) 0
- B) 1
- C) 2
- D) 3

Questions 5 and 6 refer to the following information.

Customer Purchases at a Gas Station

	Food purchased	Food not purchased	Total
Diesel purchased	56	32	88
Diesel not purchased	23	19	42
Total	79	51	130

On Sunday, a local gas station had 130 customers. The table above summarizes whether or not the customers on Sunday purchased diesel, a food, both, or neither.

5

What is the probability that a gas station customer selected at random on that day did not purchase food?

- A) $32/52$
- B) $19/42$
- C) $32/88$
- D) $51/130$

6

What is the probability that a gas station customer selected at random on that day purchase diesel?

- A) $32/88$
- B) $56/88$
- C) $88/130$
- D) $79/88$

7

The weights, in kilograms, for 20 cows in a barn were reported, and the mean, median, range, and standard deviation for the data were found. The cow with the highest reported weight was found to actually weigh 16 kg more than its reported weight. What value remains unchanged if the found values are reported using the corrected weight?

- A) Mean
- B) Median
- C) Range
- D) Standard deviation

8

Blood Type				
Rhesus Factor	A	B	AB	O
+	27	11	x	32
-	9	3	2	1

Human blood can be classified into four common blood types—A, B, AB, and O. It is also characterized by the presence (+) or absence (–) of the rhesus factor. The table above shows the distribution of blood type and rhesus factor for a group of people. If one of these people who is rhesus negative (–) is chosen at random, the probability that the person has blood type B is $\frac{1}{31}$. What is the value of x ?

- A) 6
- B) 8
- C) 11
- D) 13

Questions 9 and 10 refer to the following information.

International Tourist Arrival in millions

Rank ↕	Destination ↕	International tourist arrivals (2018) ^[1] ↕	International tourist arrivals (2017) ^[1] ↕
1	 France	89.4 million	86.9 million
2	 Spain	82.8 million	81.9 million
3	 United States	79.6 million	76.9 million
4	 China	62.9 million	60.7 million
5	 Italy	62.1 million	58.2 million
6	 Turkey	45.8 million	37.6 million
7	 Mexico	41.4 million	39.3 million
8	 Germany	38.9 million	37.5 million
9	 Thailand	38.3 million	35.5 million

The table above shows the number of international tourist arrivals, rounded to the nearest tenth of a million, to the top nine tourist destinations in both 2017 and 2018

9

Based on the information given in the table, how much greater, in millions, was the median number of international tourist arrivals to the top nine tourist destinations in 2018 than the median number in 2017, to the nearest tenth of a million?

- A) 3.6 million
- B) 3.9 million
- C) 4.1 million
- D) 4.5 million

10

The number of international tourist arrivals in Turkey in 2017 was 9% greater than in 2016. The number of international tourist arrivals in Turkey was m million more in 2017 than in 2016. What is the value of m to the nearest integer?

- A) 3
- B) 4
- C) 5
- D) 6

1

Data A	1	2	2	4	5	6
Data B	1	2	3	4	6	6

The table above shows two lists of numbers. Which of the following is a true statement comparing data A and data B?

- A) The means are different, and the standard deviations are the same.
- B) The means are the different, and the standard deviations are the different.
- C) The means are the same, and the standard deviations are the same.
- D) The means are the same, and the standard deviations are different.

2

Survey Results	
Answer	Percent
Always	27.20%
Often	20.40%
Sometimes	18.60%
Rarely	12.30%
Never	21.50%

The table above shows the results of a survey. Based on the table, which of the following is closest to the probability that a participant answered “Often” given that participant did not answer “Never”?

- A) 0.26
- B) 0.28
- C) 0.31
- D) 0.33

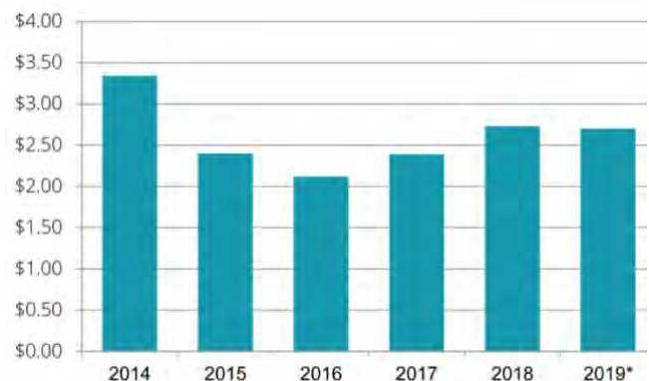
3

The maximum value of a data set consisting of 18 positive integers is 77. A new data set consisting of 19 positive integers is created by including 86 in the original data set. Which of the following measures must be nine greater for the new data set than for the original data set?

- A) The mean
- B) The median
- C) The range
- D) The standard deviation

4

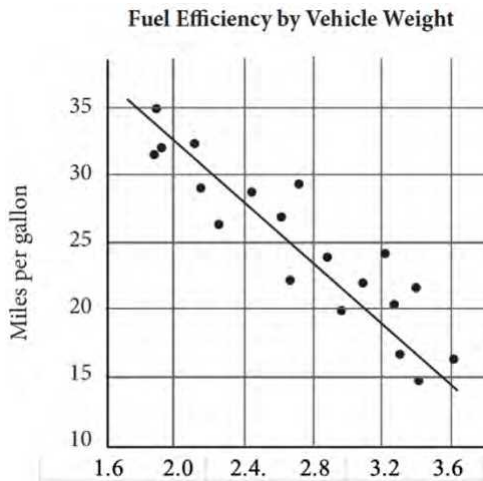
Yearly U.S national average price of gasoline



The figure above shows the average annual gas price in U.S from 2014 to 2019. Based on the graph shown, which of the following conclusions valid?

- A) The price more than doubled between 2016 and 2018.
- B) The drop-in price from 2014 to 2016 was more than \$1.00 per gallon.
- C) A gallon of gas cost more in 2017 than in 2018.
- D) The overall change in price was greater between 2017 and 2019 than it was between 2014 and 2016.

5



The scatterplot above shows the fuel efficiency, in miles per gallon, of a variety of vehicles weighing between 1.6 and 3.6 tons. Based on the line of best fit to the data represented, which of the following is the closest to the expected miles per gallon of a vehicle that weighs 2.4 tons?

- A) 21
- B) 25
- C) 27
- D) 29

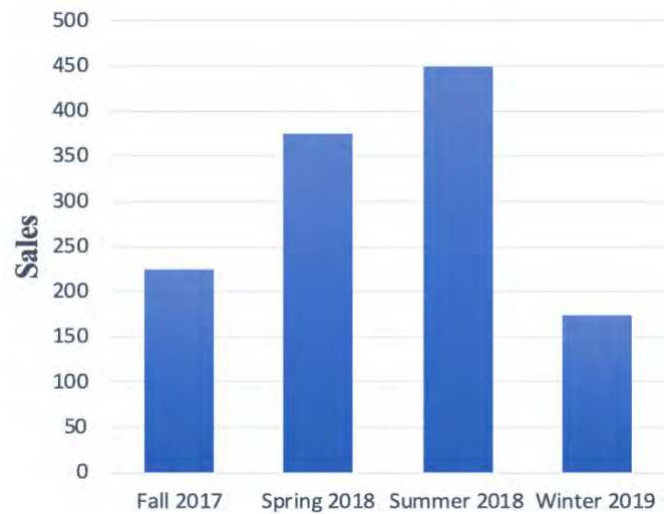
6



The chart above shows the number of fans in attendance for basketball games. If the total number of fans for all five games was 143,759, what is an appropriate label for the vertical axis?

- A) Fans in attendance (in hundreds)
- B) Fans in attendance (in thousands)
- C) Fans in attendance (in tens of thousands)
- D) Fans in attendance (in millions)

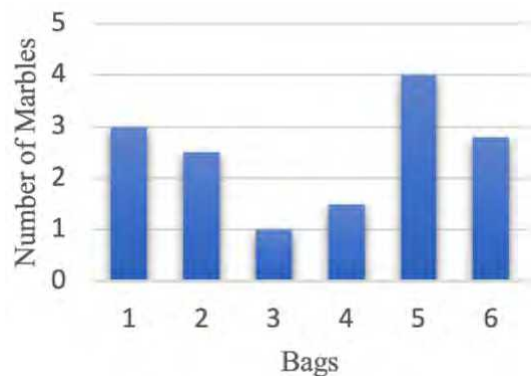
7



The graph above shows a sale in department store. Based on the given data, what was the approximate percent increase from fall 2017 to summer 2018?

- A) 75%
- B) 100%
- C) 125%
- D) 150%

8



The graph above shows the distribution of number of the marbles in the six bags. Which of the following is the closest to the average number of marbles for the six bags represented?

- A) Bag 1
- B) Bag 2
- C) Bag 4
- D) Bag 6

1

While out of a run, three joggers with an average age of 46 are joined by a group of four more joggers with an average age of t . If the average of the group of seven joggers is 39, which of the following must be true about average age of the group of four joggers?

- A) $t = 30$
- B) $t < 30$
- C) $30 < t < 33$
- D) $33 < t < 36$

2

During Business class, Ms. Flor administers 4 quizzes. Each student receives a score between 0 and 100 inclusive. If a student in Ms. Flor's class has an average score of 81 on the first three quizzes, what is lowest score the student can score on the fourth quiz and still be able to pass class with passing score of 75?

- A) 54
- B) 57
- C) 70
- D) 75

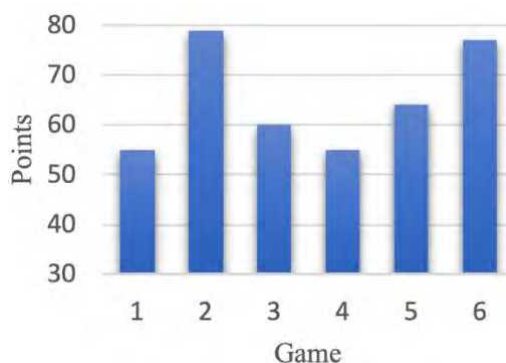
3

In summer classes, the median age of the high school students is 14. If there are 19 students in summer classes, which of the following must be true?

- I. If there is 12-year-old student, there is also a 16-year-old.
- II. The mode of summer classes students' age is 14.
- III. At least one of students is 14-year-old.

- A) III only
- B) I and II only
- C) I and III only
- D) I, II, and III

4



The Xavier high school basketball team has played six games for the first quarter of season. The graph shows the team's total points for each game. Based on the graph information, which of the following must be true?

- I. The mean is greater than mode.
- II. The median is greater than range.
- III. The mode is greater than mean

- A) I only
- B) I and II only
- C) II and III only
- D) I, II, and III

5

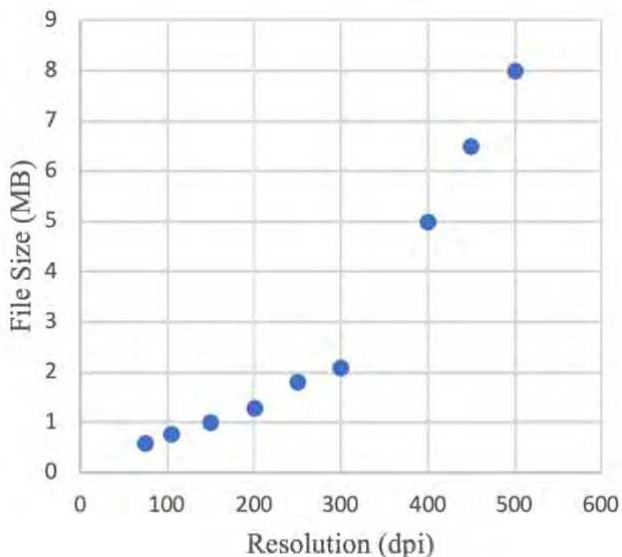
Bernice	Jade	Rose	Liza	John	Joe	Apple
5' 8"	5' 5"	5' 10"	x	5' 11"	6' 3"	5' 3"

Based on the table, if x is the median height for staff, which of the following could be Liza's height?

- A) 5' 65"
- B) 5' 75"
- C) 5' 9"
- D) 5' 10.5"

Questions 6-8 refer to the following information.

The scatterplot graph below shows document scan resolution and file size.



6

What type of function does scatterplot closely resemble?

- A) Logarithmic
- B) Linear
- C) Exponential
- D) Moving Average

7

What is the best estimate for file size based on 200 dpi?

- A) 0.9 MB
- B) 1.0 MB
- C) 1.1 MB
- D) 1.3 MB

8

What is the mean of data is given in the scatterplot?

- A) 2.45
- B) 3.00
- C) 3.25
- D) 3.45

9

Stuffed Animal	Price
Bear	\$ 9.25
Dinosaur	\$ 13.60
Panda	\$ 9.75
Rabbit	\$ 7.50
Monkey	\$ 8.75

Rose bought one of each of the five stuffed animals in the above list. What is the difference between mean and median price for the five stuffed animals?

- A) \$0.52
- B) \$4.25
- C) \$9.25
- D) \$9.75

Questions 10-12 refer to the following information.

Imelda goes bird watching for 21 days. The number of birds he sees each day are:

11, 5, 13, 16, 10, 12, 17, 9, 11, 14, 20, 10, 10, 7, 9, 13, 7, 10, 6, 13, 8

10

What is the mean of data set is shown above?

- A) 10
- B) 11
- C) 12.50
- D) 13

11

What is the median of data set is shown above?

- A) 9
- B) 10
- C) 11
- D) 12

12

What is the difference of median and mode of data set is shown above?

- A) 0
- B) 1
- C) 1.5
- D) 3

1

The mean score of 10 players in a basketball game was 9.1 points. If the highest individual score is removed, the mean score of the remaining 9 players is 7. What was the highest score?

- A) 19
- B) 23
- C) 26
- D) 28

2

The average (arithmetic mean) of a set of eleven numbers is 64. If one of the numbers is discarded, the average of the remaining numbers is 61. What is the value of the number that was discarded?

- A) 91
- B) 93
- C) 94
- D) 99

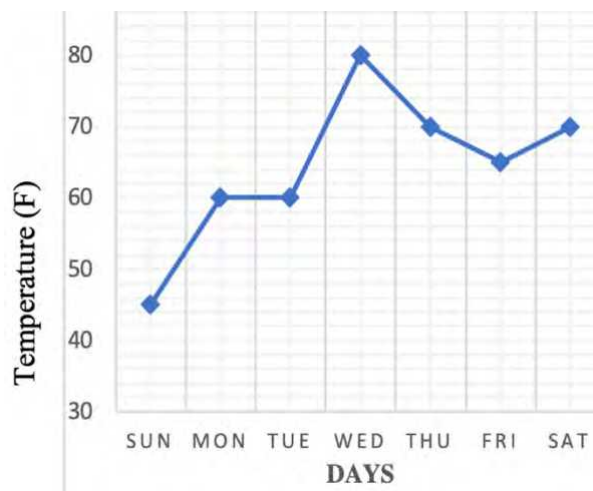
3

The lowest value in an arithmetic sequence is x and the highest value is y . If each value of sequence is increased by k , then which of the following must be true for the revised arithmetic sequence?

- I. The range is k .
- II. The median remains unchanged.
- III. The mean increased by k .

- A) I only
- B) III only
- C) I and III only
- D) II and III only

4



The graph above shows the average daily temperature during a particular week in May in a certain city. Which statement best describes the temperature data in the graph above?

- A) median $>$ mean
- B) median $<$ mean
- C) median = mode
- D) mean = mode

5

In a set of x data values, k represents the median. If each number in the set is decreased by 5, which of the following expressions represents the median of the revised set of the data values?

- A) k
 B) $k - 5$
 C) $k - \frac{x}{5}$
 D) $\frac{x - k}{5}$

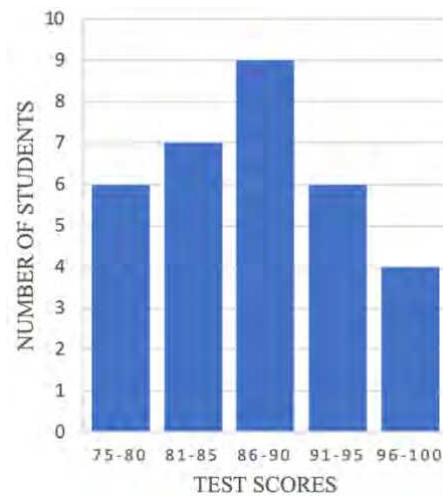
6

Roll	Frequency
1	6
2	4
3	5
4	4
5	5
6	6

A six-sided die was rolled 30 times and the results encoded above table. What is the difference between the mean of the rolls and the median of the rolls?

- A) 0.5
 B) 0.4
 C) 0.3
 D) 0

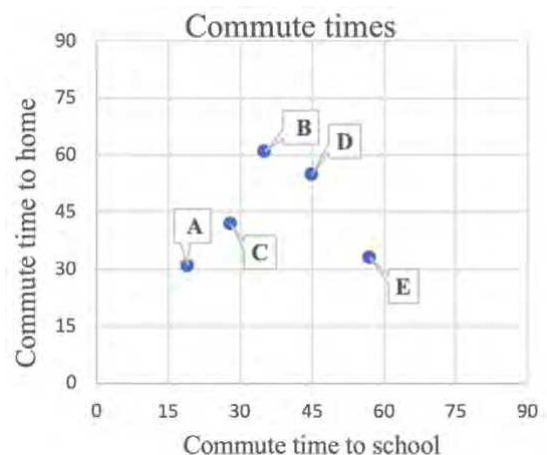
7



The graph above shows the students' test score in Math class in a certain high school. Which five-point interval contains the median?

- A) 75 - 80
 B) 81 - 85
 C) 86 - 90
 D) 91 - 95

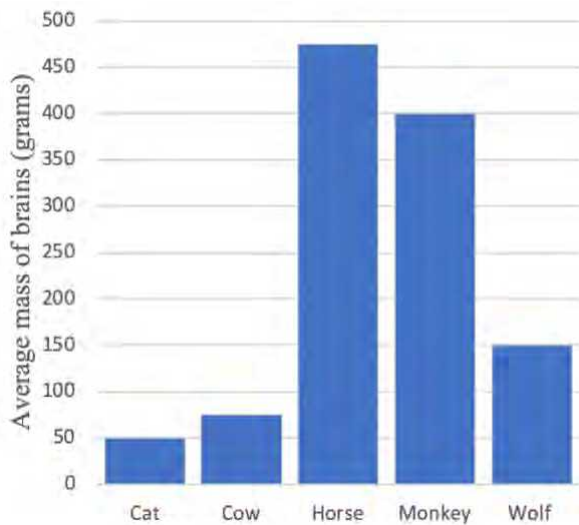
8



In the shown graph above, A, B, C, D, and E are represented of the five students' commute time to school and commute time to home. Whose spent greatest time for commuting?

- A) E
 B) D
 C) C
 D) B

9



According to the graph above, the average mass of a cat's brain is what fraction of the average mass of a horse's brain?

- A) $\frac{2}{11}$
- B) $\frac{2}{15}$
- C) $\frac{2}{17}$
- D) $\frac{2}{19}$

Questions 10 and 11 refer to the following information

Spin	Frequency
1	4
2	3
3	0
4	2
5	5
6	1
7	6
8	4
9	3
10	2

The spinner for a board game has 10 sectors, number 1 through 10. It is spun 30 times and results summarized in the table above.

10

Of the following, what is the mean value of these 30 spins?

- A) 4.66
- B) 4.99
- C) 5.33
- D) 5.66

11

Of the following, what is the median value of these 30 spins?

- A) 6.5
- B) 7.0
- C) 7.5
- D) 10

Questions 1-3 refer to the following information.

2016 Summer Olympic Medal Table

Rank	Country	Gold	Silver	Bronze	Total
1	USA	46	37	38	121
2	Great Britain	27	23	17	67
3	China	26	18	26	70
4	Russia	19	17	20	56
5	Germany	17	10	15	42
Total		135	105	116	356

The table above shows distribution of medals awarded at the 2016 Brazil Summer Olympics.

1

If an Olympic medalist is to be chosen at random from one of the countries in the table, which country gives the highest probability of selecting a Bronze medalist?

- A) USA
- B) Great Britain
- C) China
- D) Russia

2

If an Olympic medalist is to be chosen at random from one of the countries in the table, which country gives the highest probability of selecting a Silver medalist?

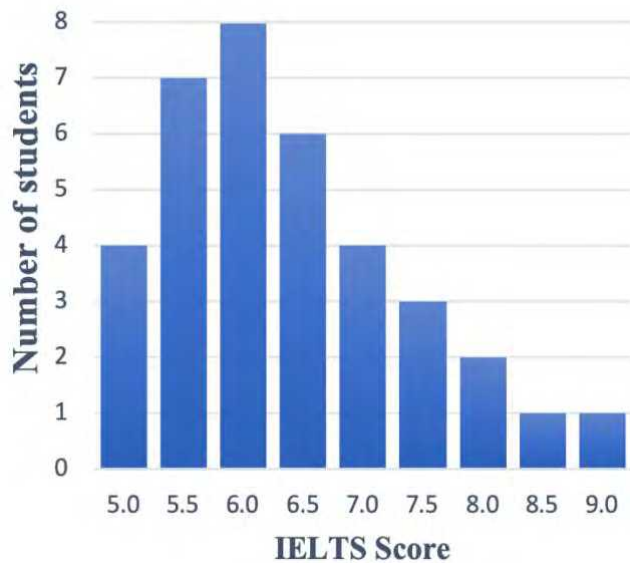
- A) USA
- B) Great Britain
- C) China
- D) Russia

3

If an Olympic medalist is to be chosen at random from one of the countries in the table, which country gives the highest probability of selecting a Gold medalist?

- A) Great Britain
- B) USA
- C) China
- D) Russia

Questions 4-6 refer to the following information



The graph above shows distribution of IELTS score of 36 students.

4

What percentage of these students received 7.0 or more?

- A) 25.2%
- B) 26.7%
- C) 29.5%
- D) 30.5%

5

What is the median number of IELTS score these students received?

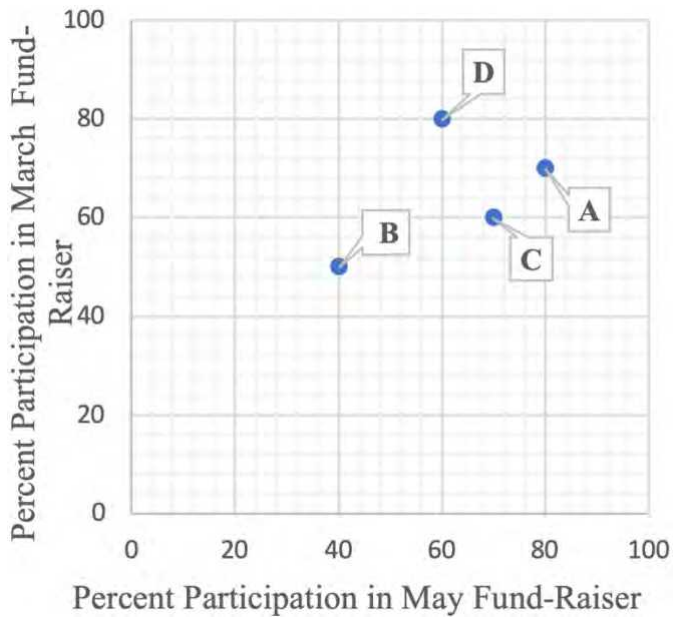
- A) 5.5
- B) 6.0
- C) 6.5
- D) 7.0

6

What is the mean number of IELTS score these students received?

- A) 5.75
- B) 6.25
- C) 6.38
- D) 6.75

Questions 7 and 8 refer to the following information



The graph above shows for different classes at San Juan Elementary schools participated in two fund-raisers last year in March and May.

7

Which class had greatest change in percentage in participation from March fund-raiser to the May fund-raiser?

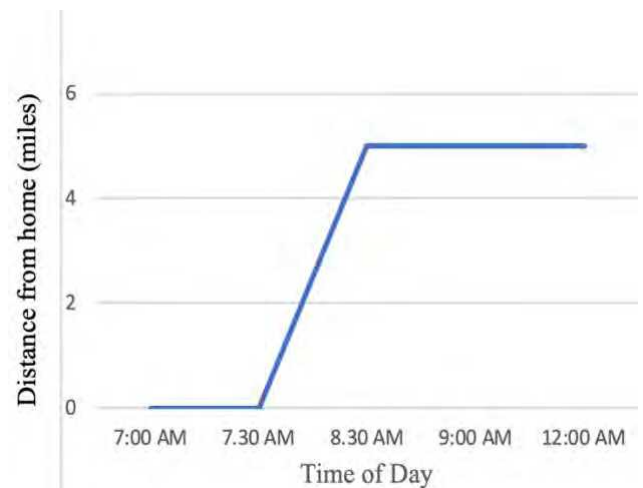
- A) Class A
- B) Class B
- C) Class C
- D) Class D

8

If there were 40 students each in Class A and D, and 30 students each in Class B and Class C. How many students participated in the March fund-raiser?

- A) 33
- B) 60
- C) 93
- D) 97

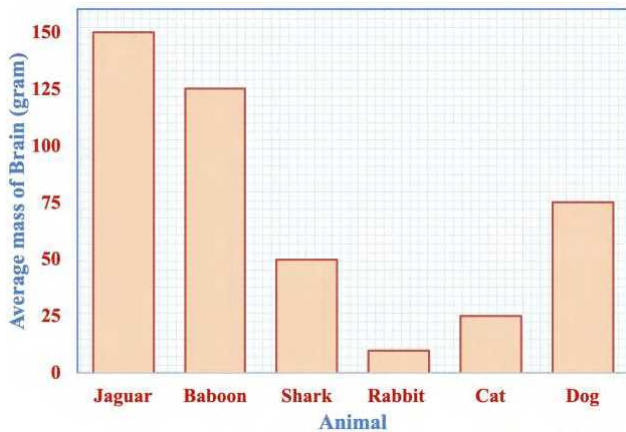
9



The graph above shows the distance of Ariel's car from his home over a period of time on a particular day. Which of the situations below best fits the given information?

- A) Ariel leaves home, drives to restaurant for breakfast and returns home.
- B) Ariel leaves home, drives to work and remains there
- C) Ariel leaves work, drives restaurant for lunch and drives back work.
- D) Ariel is at supermarket, takes groceries home, and then drives back to work.

1



According to graph above, which of the following is true?

- A) Average mass of brain is proportional to animals' sizes.
- B) Jaguar is the smartest animal.
- C) Total mass of brain of dog and shark equals to mass of brain of baboon.
- D) Jaguar is two times faster as much as dog.

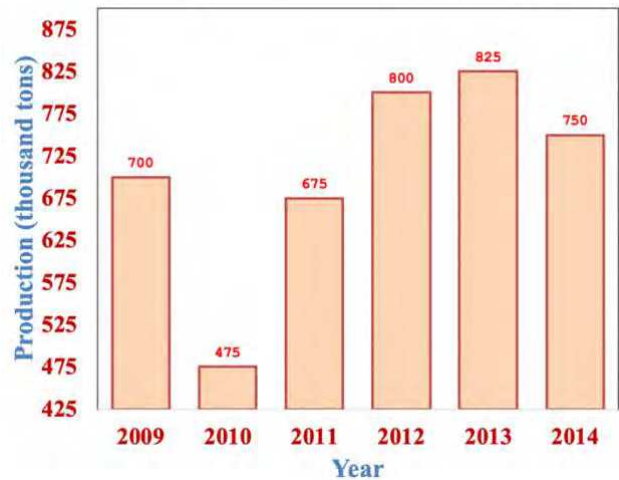
2

According to graph above, the average baboon brain is what fraction of average mass of a dog's brain?

- A) 3
- B) 2
- C) $5/3$
- D) 1

3

Annual Apricot Production In Turkey



According to graph above, which of the following is true?

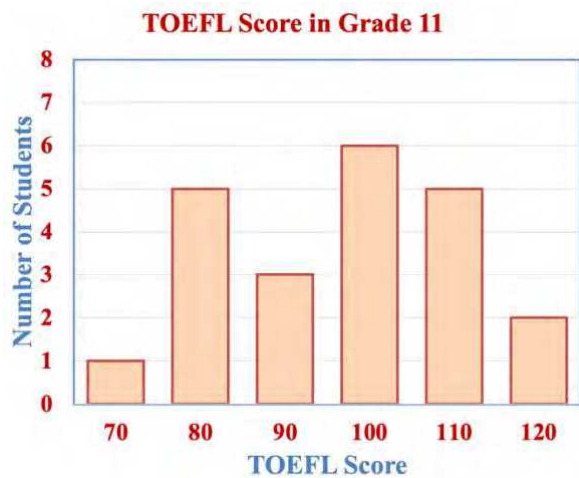
- A) Annual apricot production's percentage increase was the highest from 2011 to 2012.
- B) Production of apricot was affected by insects in 2010.
- C) Farmers were not worked hard in 2014.
- D) Annual apricot production's percentage increase was the highest from 2010 to 2011.

4

According to graph above, approximately what is the average of annual apricot production from 2009 to 2014?

- A) 704
- B) 725
- C) 750
- D) 755

Questions 5-7 refer to the following information



The graph above shows distribution of TOEFL score of 27 students.

5

What percentage of these students received 110 or more?

- A) 23.2%
- B) 24.7%
- C) 25.9%
- D) 28.5%

6

What is the median number of TOEFL score these students received?

- A) 90
- B) 95
- C) 97.5
- D) 100

7

What is the mean number of TOEFL score these students received?

- A) 75.75
- B) 78.89
- C) 82.50
- D) 84.25

Questions 8-10 refer to the following information

	Years of Experience				Total
	1	2	3	4+	
Carpenter	1,463	1,983	1,563	1,702	6,711
Mason	2,156	2,007	2,381	2,279	8,823
Plumber	759	803	512	699	2,773
Painter	1,045	790	1,451	1,802	5,088
Total	5,423	5,583	5,907	6,482	23,395

The table above shows the number of workers in City X with at least one year of experience in four different construction related occupations.

8

If a painter in City X is chosen random, which of the following is closest to the probability that the painter has at least two years of experience?

- A) 59.2%
- B) 63.9%
- C) 79.4%
- D) 81.5%

9

If a carpenter in City X is chosen random, which of the following is closest to the probability that the carpenter has at least four years of experience?

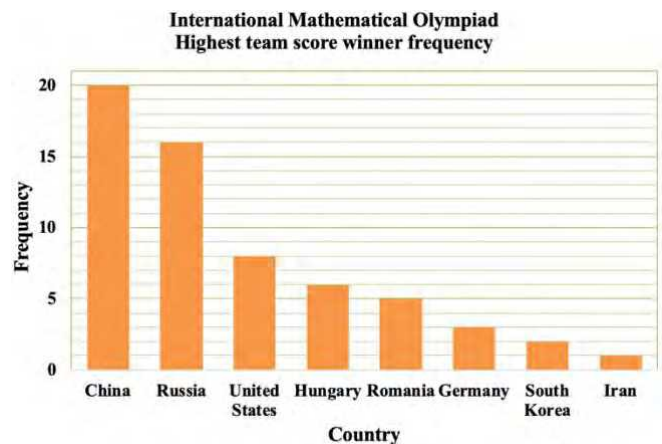
- A) 7.2%
- B) 25.3%
- C) 49%
- D) 52.5%

10

If a worker with at least three years of experience in City X is chosen random from those included in the table, which of the following is closest to the probability that the person is Mason?

- A) 25.1%
- B) 29.7%
- C) 37.6%
- D) 71.2%

Questions 11-12 refer to the following information



The table above shows 61 students from eight nations have achieved the highest team score in the IMO.

11

Based on the graph, what fraction of IMO highest team score winner was from Germany?

- A) $\frac{4}{61}$
- B) $\frac{3}{61}$
- C) $\frac{61}{4}$
- D) $\frac{61}{3}$

12

Based on the graph, what fraction of IMO highest team score winner was from Russia and Iran?

- A) $\frac{17}{61}$
- B) $\frac{16}{61}$
- C) $\frac{61}{17}$
- D) $\frac{61}{16}$

Questions 13-14 refer to the following information

	Human caused fires	Lightning caused fires	Total
Mediterranean Region	63		
Aegean Region		29	
Total	97		201

The incomplete table above shows the number of wildfires that occurred in two regions of Turkey in between 2015 and 2018.

13

Based on the table, what fraction of all wildfires in Aegean region were lightning caused?

- A) $\frac{63}{201}$
- B) $\frac{104}{201}$
- C) $\frac{63}{104}$
- D) $\frac{29}{63}$

14

Based on the table, what fraction of all wildfires in Aegean and Mediterranean regions were human caused?

- A) $\frac{97}{201}$
- B) $\frac{104}{201}$
- C) $\frac{63}{138}$
- D) $\frac{34}{63}$

Questions 15-16 refer to the following information

	Covid -19 Test Negative	Covid -19 Test Positive	Total
Female	343	67	410
Male	480	70	550
Total	823	137	960

The table above shows the results of Covid-19 test in a certain city.

15

Based on the table, if a person is chosen random, which of the following is closest to the probability that person is male with positive COVID – 19 tests?

- A) 0.072
- B) 0.127
- C) 0.50
- D) 0.878

16

Based on the table, if a female is chosen random, which of the following is closest to the probability that person is female with negative COVID – 19 tests?

- A) 0.069
- B) 0.134
- C) 0.357
- D) 0.836

Questions 1 and 2 refer to the following information.

Rose opened a saving bank account that earns 4% interest compounded annually. Her initial deposit was £ 200, and she uses the expression $200 \cdot (x)^t$ to find the value of the account after t years.

1

What is the value of x in the expression?

- A) 1.02
- B) 1.04
- C) 202
- D) 204

2

Rose's friend Amber found an account that earns 3% interest compounded annually. Amber made an initial deposit of £ 200 into this account at the same time Rose made a deposit of £ 200 into her account. After 5 years, how much more money will Rose's initial deposit have earned than Amber's initial deposit? (Round your answer to the nearest cent)

- A) £ 11.5
- B) £ 17.5
- C) £ 22;4
- D) £ 35.8

3

In planning maintenance for a city's infrastructure, city hall civil engineers estimate that, starting from the present, the population of the city will decrease by 8 percent every 15 years. If the present population of the city is 32,000, which of the following expressions represents the engineer's estimate of the population of the city t years from now?

- A) $32,000(0.08)^{15t}$
- B) $32,000(0.08)^{\frac{t}{15}}$
- C) $32,000(0.92)^{15t}$
- D) $32,000(0.92)^{\frac{t}{15}}$

Questions 4 and 5 refer to the following information.

The stock price of one share in ice cream company is worth \$2,400 today. A stock analyst believes that the stock will lose 16 percent of its value each week for the next three months. The analyst uses the equation $I = 2,400 \cdot x^t$ to model the value, I , of the stock after t months.

4

What value should the analyst use for x ?

- A) 0.84
- B) 3
- C) 16
- D) 84

5

What does the analyst believe the value of the stock will be at the end of three months to the nearest dollar?

- A) \$ 2,016
- B) \$ 1,422.5
- C) \$ 843.1
- D) \$ 419.8

6

$$1,200 \left(1 + \frac{r}{1,200} \right)^{12}$$

The expression above gives the amount of money, in GBP, generated in a year by a £ 1,200 deposit in a saving bank account that pays an annual interest rate of $r\%$, compounded monthly. Which of the following expressions shows how much additional money is generated at an interest rate of 7% than at an interest rate of 4%?

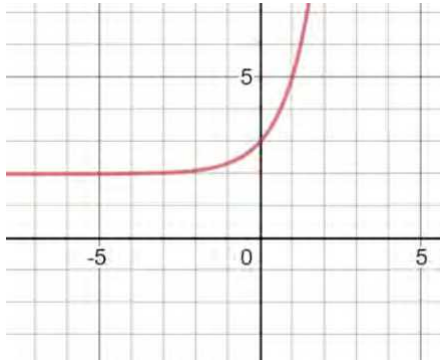
- A) $1,200 \left(1 + \frac{7-4}{1,200} \right)^{12}$
- B) $1,200 \left(1 + \frac{7}{1,200} \right)^4$
- C) $1,200 \left(1 + \frac{7}{1,200} \right)^{12} - 1,200 \left(1 + \frac{4}{1,200} \right)^{12}$
- D) $1,200 \left(1 + \frac{4}{1,200} \right)^7$

7

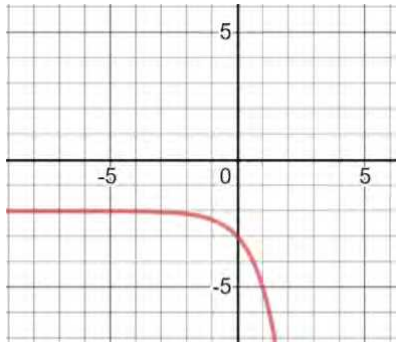
$$f(x) = 3^x + 2$$

The function f is defined by the equation above. Which of the following is the graph of $y = -f(x)$ in the xy -plane?

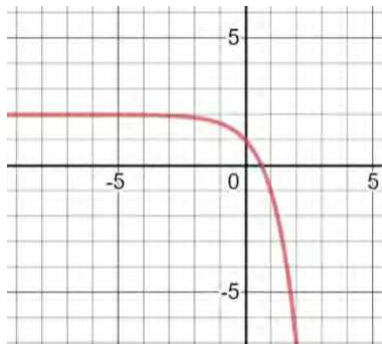
A)



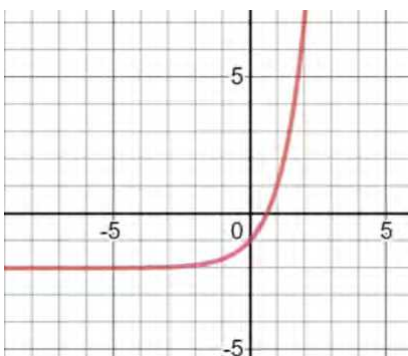
B)



C)



D)



8

The Asia's population has grown at an average rate of 1.9 percent per year since 1960. There were approximately 3.2 billion people in the world in 1990. Which of the following functions represents the Asia's population P , in billions of people, t years since 1990?

- A) $P(t) = 1.09t + 3.2$
 B) $P(t) = 1.019t + 3.2$
 C) $P(t) = 3.2 \cdot (1.019)^t$
 D) $P(t) = t \cdot (1.019)^{3.2}$

9

$$P = 1,650 \cdot (1.03)^t$$

The equation above models the number of people, P , of a club t years after the club opens. Which equation models the number of people of the club q quarter years after the club opens?

- A) $P = 1,650 \cdot (1.03)^{\frac{q}{4}}$
 B) $P = 1,650 \cdot (1.03)^q$
 C) $P = 1,650 \cdot (1.03)^{\frac{q}{4}}$
 D) $P = 1,650 \cdot (1.03)^{4q}$

10

A bacteria population, B , can be modeled by the equation $B = B_0 \cdot (10)^t$, where B_0 is the bacteria population at the beginning of the experiment, t is the time in hours since the beginning of the experiment. Which of the following gives the B , if the $B_0 = 2$ and $t = 8$?

- A) 200,000
- B) 2,000,000
- C) 20,000,000
- D) 200,000,000

11

Kate's mother put \$1,000 into a bank account for her when she was born. The account gained interest at a rate of 4% per year, compounded annually. Assuming no more money was deposited and none was withdrawn, how much money will be in the account when Kate turns 18?

- A) \$1,325.6
- B) \$1,525.4
- C) \$1,800.9
- D) \$2,025.8

12

Iron 55 is a radioactive element used in science experiment. It has a half-life of about 2.75 years. Suppose a laboratory has 100 grams of iron 55. If scientists don't use it, how much will still be iron 55 in 11 years?

- A) 50
- B) 25
- C) 12.5
- D) 6.125

13

Jacob's father put \$3,600 into a bank account for him when he was born. The account gained interest at a rate of 6.6% per year, compounded annually. Assuming no more money was deposited and none was withdrawn, how much money will be in the account when Jacob turns 18?

- A) \$11,113.7
- B) \$11,248.8
- C) \$11,374.5
- D) \$11,674.6

1

If the initial population of rabbits was 15 and grew to 24 after the second year, which of the following function best models the population of rabbits R with respect to the number of years t if the population growth of rabbits is considered to be exponential?

- A) $R = 5t + 15$
- B) $R = 15(10)^t$
- C) $R = 5t^2 + 15$
- D) $R = 15(1.26)^t$

2

If the initial population of rabbits was 115 and grew to 138 after a year, which of the following function best models the population of rabbits P with respect to the number of years t if the population growth of rabbits is considered to be linear?

- A) $P = 25t + 115$
- B) $P = 15t^2 + 5t + 115$
- C) $P = 115(1.2)^t$
- D) $P = 115(1.25)^t$

3

The population of trees in a forest has been decreasing by 7% every 3 years. The population at the beginning of 2017 was estimated to be 12,000. If F represents the population of trees t years after 2017, which of the following equations gives the population of trees over time?

- A) $F = 12,000(0.93)^{\frac{t}{3}}$
- B) $F = 12,000(0.93)^t$
- C) $F = 12,000(0.93)^{3t}$
- D) $F = 12,000(0.07)^{\frac{t}{3}}$

4

Nina owes Bernice some money and decides to pay her back in the following way. Bernice receives 5 dollars the first day, 10 dollars the second day, 50 dollars the third day, 250 dollars the fourth day. Which of the following best describes the relationship between time and the total amount of money Bernice received from Nina over of these four days?

- A) Exponential decay
- B) Exponential growth
- C) Increasing linear
- D) Decreasing linear

5

Jimmy has a large of PC games. He decides to trade in three of his PC games for one new PC games each month at a PC store. Which of the following best describes the relationship between time and total number of PC games?

- A) Exponential decay
- B) Exponential growth
- C) Increasing linear
- D) Decreasing linear

6

A biologist counts 64 cells in a petri dish and each of them splits into two new cells every hour.

He uses the function $P(t) = cr^t$ to calculate the total number of cells after t hours. Which of the following shows the correct values to c and r ?

- A) $c = 64, r = 2$
- B) $c = 64, r = 1$
- C) $c = 64, r = 0.5$
- D) $c = 32, r = 2$

7

Rose modeled the growth of a tree population by estimating the number of the trees' pollen grains per square feet that were deposited each. She estimated there were 4,200 pollen grains per square feet the first year the grains were deposited, with a 1.5% annual increase in the number of grains per square feet thereafter. Which of the following functions models $M(t)$, the number of pollen grains per square centimeter t years after the first year the grains were deposited?

- A) $M(t) = 4,200^{1.015t}$
- B) $M(t) = 4,200(0.985)^t$
- C) $M(t) = 4,200(1.015)^t$
- D) $M(t) = 4,200^t$

8

A scientist feeds two pet rabbits in the zoo. Due to the short gestation period of rabbits, and the rabbit population doubles each month. If $P(t)$ represents the rabbit population after t years, then which of the following equations best models the rabbit population in this zoo over time?

- A) $P(t) = 2 \times 2^{t+1}$
- B) $P(t) = 2 \times 2^t$
- C) $P(t) = 2 \times 2^{12t}$
- D) $P(t) = 2 \times 2^{\frac{t}{12}}$

9

In 2012, the population of pink salmon in a pond was 123. In 2014, it was 9,963. What model of $y = a \times b^x$ could be used for this exponential growth?

- A) $y = 123 \times (81)^x$
- B) $y = 123 \cdot (9)^x$
- C) $y = 3 \times (123)^x$
- D) $y = 123 \times (9,963)^x$

10

If Benne has \$20,000 deposited in the bank, and receives a 2 % interest annually, how much did she receive from bank after three years with her capitals?

- A) \$20,400
- B) \$20,808
- C) \$21,224
- D) \$22,256

11

The population of Hometown 2011 was estimated to be 32,000 people with an annual rate of increase of 4%. Which of the following is approximately population of Hometown after 5 years?

- A) 38,932
- B) 38,995
- C) 39,934
- D) 39,943

12

Cobalt 60 is a radioactive element used in science experiment. It has a half-life of about 5.4 years. Suppose a laboratory has 150 grams of cobalt 60. If scientists don't use it, how much will still be cobalt 60 in 27 years?

- A) 37.5
- B) 18.75
- C) 9.37
- D) 4.69

1

During a sun flower population study, researchers determine that the equation $R = 1800 \times (1.17)^5$ describes the population R of sun flowers 5 years after their introduction into a new field. Which of the following gives the values I , the initial population of sun flowers, and r , the annual percent increase in this population??

- A) $I = 1800$, $r = 117$
- B) $I = 1800$, $r = 17$
- C) $I = 1800$, $r = 5$
- D) $I = 117$, $r = 5$

Questions 2 and 3 refer to the following information.

$$P(x) = 420 \times (1.08)^t$$

The formula above shows the relationship between the population, P , of a certain bacterium in a tube as a function of $P(x)$, t , the number of weeks that have passed since the bacteria were first introduced in the tube.

2

By what percent should we expect the bacteria population to increase between the start of the week 2 and the week 3?

- A) 420%
- B) 108%
- C) 8%
- D) 1.08%

3

What is the meaning of the number 420 in the formula?

- A) The population of the bacteria increases by 420 per week
- B) The tube initially contained 420 bacteria.
- C) The population of the bacteria increases by 420% each week.
- D) The population of the bacteria increases after a week.

4

$$F(x) = 1,000 \times (1 + y)^t$$

An analyst wants to use the formula above to estimate the value, in dollars, of a \$1,000 initial investment in a mutual fund after t quarters have passed. If a \$1,000 initial investment in this fund is increased to \$1,050.21 after 3 quarters, what should be value of y ?

- A) 0.108
- B) 0.151
- C) 0.168
- D) 16.8

Questions 5 and 6 refer to the following information.

$$I = \frac{V}{(1+r)^t}$$

The formula above indicates the initial investment, I , that must be made in an account with an annual interest rate of r to ensure a future value of V after period of t years.

5

To the nearest dollar, what initial investment should be made in an account that earns 12% annually ($r = 12$) in order to ensure a future value of \$736 in four years?

- A) \$436
- B) \$448
- C) \$458
- D) \$468

6

What value of r , to the nearest thousandth, would ensure that the value of an investment would increase by 44% in two years?

- A) 12
- B) 13
- C) 15
- D) 18

7

A total of \$1600 is deposited in two savings accounts for one year, part at 6% and the remainder at 8%. If \$116 was earned in interest, how much was deposited at 8%?

- A) \$600
- B) \$800
- C) \$1,000
- D) \$1,100

8

A town has a population growth rate of 10% per year. The population in 2016 was 6,000. What was the population in 2018?

- A) 6,750
- B) 6,960
- C) 7,160
- D) 7,260

9

In 2013, the population of rabbit in a farm was 32. In 2018, it was 243. What model of $y = a \times b^x$ could be used for this exponential growth?

- A) $y = 32 \times (1.5)^x$
- B) $y = 32 \times (3)^x$
- C) $y = 243 \times (32)^x$
- D) $y = 32 \times (0.243)^x$

10

If Jenny has \$4,800 deposited in the bank, and receives a 4 % interest annually, how much did she receive from bank after four years with her capitals?

- A) \$4,903.5
- B) \$4,915.3
- C) \$5,603.5
- D) \$5,615.3

11

The population of Hometown 2011 was estimated to be 80,000 people with an annual rate of increase of 6%. Which of the following is approximately population of Hometown after 10 years?

- A) 142,358
- B) 143,268
- C) 148,263
- D) 152,264

$$X^2 + px + q = 0$$

$$X_{1/2} = -\frac{1}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$



$$X = 6 - 2y$$

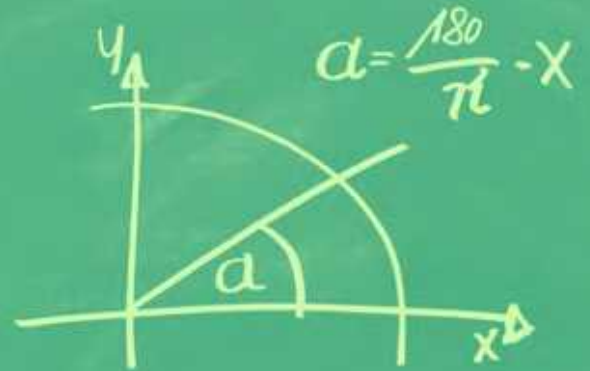
$$X + a = b$$

$$f(x) = \tan x$$

$$f(x) = \sin x$$

SOLUTIONS

$$X_{1/2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



$$X^2 + px + q = 0$$

$$X_{1/2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$



$$X = 6 - 2y$$

$$X + a = b$$

$$f(x) = \tan x$$

1

If $\frac{a}{b} = 3$, what is the value of $\frac{3b}{a}$?

- A) 1
- B) 3
- C) 6
- D) 9

Solution:

$$\frac{a}{b} = 3 \Rightarrow a = 3b$$

$$\frac{3b}{a} \Rightarrow \frac{3b}{3b} = \boxed{1}$$

2

If $y = k \cdot x$, where k is constant, and $y=20$ when $x=5$, what is the value of y when $x=7$?

- A) 4
- B) 16
- C) 24
- D) 28

Solution:

$$y = k \cdot x$$

$$20 = k \cdot 5 \Rightarrow k = 4$$

$$y = 4x$$

$$x = 7 \Rightarrow y = 4 \cdot 7$$

$$\boxed{y = 28}$$

3

If $\frac{x-y}{x} = \frac{2}{5}$, which of the following must be also true?

Solution:

$$\text{A) } \frac{x+y}{y} = \frac{8}{3} \Rightarrow \frac{5+3}{3} = \frac{8}{3} \quad \checkmark$$

$$\text{B) } \frac{x}{y} = \frac{3}{5} \Rightarrow \frac{5}{3} \quad \times$$

$$\text{C) } \frac{y}{x} = \frac{5}{2} \Rightarrow \frac{3}{5} \quad \times$$

$$\text{D) } \frac{x-y}{y} = \frac{1}{3} \Rightarrow \frac{5-3}{3} = \frac{2}{3} \quad \times$$

$$\left. \begin{aligned} \frac{x-y}{x} &= \frac{2}{5} \\ x=5 &\Rightarrow 5-y=2 \\ y &= 3 \end{aligned} \right\}$$

4

If $\frac{m+2}{m-2} = 4$, what is the value of m ?

- A) 2
- B) 3
- C) $\frac{10}{3}$
- D) $\frac{11}{3}$

Solution:

$$\frac{m+2}{m-2} = 4$$

$$m+2 = 4(m-2)$$

$$m+2 = 4m-8$$

$$10 = 3m$$

$$\boxed{m = \frac{10}{3}}$$

5

If a is the average (arithmetic mean) of $3t$ and 11 , b is the average of $4t$ and 18 , and c is average $5t$ and 31 , what is the average of a , b , and c in terms of t ?

- A) $t + 6$
 B) $2t + 10$
 C) $6t + 30$
 D) $12t + 60$

Solution:

$$a = \frac{3t+11}{2}; \quad b = \frac{4t+18}{2}; \quad c = \frac{5t+31}{2}$$

$$\frac{a+b+c}{3} = \frac{\frac{3t+11}{2} + \frac{4t+18}{2} + \frac{5t+31}{2}}{3}$$

$$= \frac{\frac{12t+60}{2}}{3} = \frac{12t+60}{6} = \boxed{2t+10}$$

6

If $\frac{2m}{n} = \frac{1}{3}$, what is the value of $\frac{n}{m}$?

- A) $\frac{1}{6}$
 B) 6
 C) $\frac{2}{3}$
 D) $\frac{3}{2}$

Solution:

$$\frac{2m}{n} = \frac{1}{3}$$

$$n = 6m$$

$$\frac{n}{m} = \frac{6m}{m}$$

$$= \boxed{6}$$

7

If $x - y = 9$ and $\frac{y}{2} = 3$, what is the value of x ?

- A) 12
 B) 14
 C) 15
 D) 18

Solution:

$$\frac{y}{2} = 3 \Rightarrow y = 6$$

$$x - y = 9$$

$$x - 6 = 9$$

$$\boxed{x = 15}$$

8

If $a = \frac{3}{4}b$ and $b = 16$, what is the value of $2a - 20$?

- A) 4
 B) 10
 C) 12
 D) 24

Solution:

$$b = 16$$

$$a = \frac{3}{4}b$$

$$a = \frac{3}{4} \cdot 16$$

$$a = 12 \rightarrow 2a - 20 = 2 \cdot 12 - 20$$

$$= 24 - 20$$

$$= \boxed{4}$$

9

Horsepower and watts are units of measure of power. They are directly proportional such that 3 horsepower is equal to 2,237.1 watts. How much power, in watts, is equal to 5 horsepower?

- A) 745.7 watts
 B) 2,982.8 watts
 C) 3,728.5 watts
 D) 3,738.5 watts

Solution:

$$\begin{aligned} 3 \text{ hp} &= 2,237.1 \text{ w} \\ 5 \text{ hp} &= ? \text{ w} \\ &= \frac{(5)(2,237.1)}{3} \\ &= \boxed{3,728.5 \text{ w}} \end{aligned}$$

10

If $\frac{c-d}{d} = \frac{3}{5}$, which of the following must be true?

- A) $\frac{c}{d} = \frac{5}{8} \Rightarrow \frac{8}{5} \times$
 B) $\frac{c+d}{d} = \frac{3}{8} \Rightarrow \frac{8+5}{5} = \frac{13}{5} \times$
 C) $\frac{c-d}{c+d} = \frac{8}{3} \Rightarrow \frac{8-5}{8+5} = \frac{3}{13} \times$
 D) $\frac{d}{c+d} = \frac{5}{13} \Rightarrow \frac{5}{8+5} = \frac{5}{13} \checkmark$

Solution:

$$\frac{c-d}{d} = \frac{3}{5}$$

$$d = 5$$

$$c - 5 = 3$$

$$c = 8$$

11

Nick walks 20 meters in 9.5 seconds. If he walks at this same rate, which of the following is closest to the distance he will walk in 3 minutes?

- A) 37.9 meters
 B) 253 meters
 C) 379 meters
 D) 3,790 meters

Solution:

$$\begin{aligned} 3 \text{ minutes} &\rightarrow 180 \text{ seconds} \\ 9.5 \text{ seconds} &= 20 \text{ meters} \\ 180 \text{ seconds} &= ? \text{ meters} \\ &= \frac{20 \cdot 180}{9.5} = 378.9 \text{ meters} \end{aligned}$$

12

If $\frac{a-2}{3} = k$ and $k = 4$, what is the value of a ?

- A) 10
 B) 14
 C) 15
 D) 16

Solution:

$$\frac{a-2}{3} = k$$

$$k = 4$$

$$\frac{a-2}{3} = 4$$

$$a-2 = 12$$

$$a = 14$$

13

A major snowstorm is expected to hit a Erzurum city, in Turkey, at 10 AM. The storm is expected to last 15 hours with snow falling at constant rate of 2 inches per hour. The Erzurum city currently has 14 inches of snow on the ground. How much total snow is the Erzurum city expected to have at 7 PM?

- A) 14 inches
B) 21 inches
C) 32 inches
D) 36 inches

Solution:

10 AM → 7 PM
 $\underbrace{\hspace{2cm}}$
 9 hours

per hour 2 inches, so after

9 hours $\rightarrow 9 \cdot 2 = 18$ inches snow

Current $\rightarrow 14$ inches

after 9 hours $\rightarrow 18$ inches

at 7 PM = 32 inches

14

Two investors are to share profits of \$21,000 in the ratio of 5:2. What is the amount of the smaller share?

- A) \$3,000
B) \$6,000
C) \$15,000
D) \$18,000

Solution:

5 : 2

5k : 2k

5k + 2k = 21,000

7k = 21,000

k = 3,000

smaller share 2k

= 2 · 3000

= \$ 6 000

15

Of every 240 chickens hatched at a farm, 96 will be kept as egg hens and 144 will be sold at market. At this rate, how many chickens will be sold if 600 chickens are hatched?

- A) 200
B) 240
C) 330
D) 360

Solution:

240 chickens hatched = 144 sold

600 chickens hatched = ?

$$= \frac{600 \cdot 144}{240}$$

$$= 360 \text{ will be sold}$$

16

The ratio of a to b to c to d to e is 1 to 2 to 3 to 4 to 5. If $c=3,600$, what is the value of e ?

- A) 1,200
B) 2,400
C) 4,800
D) 6,000

Solution:

$a : b : c : d : e = 1 : 2 : 3 : 4 : 5$

$a = k$

$b = 2k$

$c = 3k$

$d = 4k$

$e = 5k$

$c = 3600$

$3k = 3,600$

$k = 1,200$

$e = 5 \cdot k = 5 \cdot 1200$

$e = 6,000$

1

x	y
1	3
3	27

Given the ordered pairs in the table above, which of the following could be true?

- A) y varies inversely as x
- B) y varies directly as x
- C) y varies inversely as the square of x
- D) y varies directly as the square of x

Solution:

$$\left. \begin{array}{l} x=1; y=3 \\ x=3; y=27 \end{array} \right\} \begin{array}{l} y=kx^2 \\ k=1 \end{array}$$

2

x	y
1	2
3	54

The variables x and y are related by an equation of the form $y = Ax^m$ where A and m are both positive real numbers. What is the value of y when $x = 5$?

- A) 64
- B) 125
- C) 128
- D) 250

Solution:

$$\begin{aligned} y &= Ax^m \\ x &= 1; y = 2 \\ 2 &= A \cdot 1^m \Rightarrow A = 2 \\ x &= 3; y = 54 \\ 54 &= 2 \cdot 3^m \Rightarrow 27 = 3^m \Rightarrow m = 3 \\ y &= 2 \cdot x^3 \\ x &= 5 \Rightarrow y = 2 \cdot 5^3 \\ y &= 250 \end{aligned}$$

3

If m varies inversely as n and $m = 6$ when $n = 8$, which of the following is another solution for m and n ?

- A) $m = 8$ and $n = 12 \Rightarrow 8 \cdot 12 = 96 \neq k$
- B) $m = 8$ and $n = 8 \Rightarrow 8 \cdot 8 = 64 \neq k$
- C) $m = 4$ and $n = 12 \Rightarrow 4 \cdot 12 = 48 = k$ ✓
- D) $m = 3$ and $n = 24 \Rightarrow 3 \cdot 24 = 72 \neq k$

Solution:

$$\begin{aligned} m \cdot n &= k \\ 6 \cdot 8 &= k \Rightarrow k = 48 \end{aligned}$$

4

If y varies inversely as the square of x , then when x is multiplied by 3, y will be

- A) divided by 9
- B) divided by 3
- C) multiplied by 9
- D) multiplied by 3

Solution:

$$\begin{aligned} y \cdot x^2 &= k \\ y \cdot x^2 &= y_2 (3x)^2 \\ y x^2 &= y_2 9x^2 \\ y_2 &= \frac{y}{9} \end{aligned}$$

5

Let $f(x, y) = Ax^3y^2$ where A is a constant. If $f(m, n) = 10$, what is the value of $f(2m, 3n)$?

- A) 120
B) 240
C) 360
D) 720

Solution:

$$\begin{aligned} f(m, n) &= 10 \\ A \cdot m^3 \cdot n^2 &= 10 \end{aligned} \quad \left. \vphantom{\begin{aligned} f(m, n) &= 10 \\ A \cdot m^3 \cdot n^2 &= 10 \end{aligned}} \right\}$$

$$\begin{aligned} f(2m, 3n) &= A(2m)^3 \cdot (3n)^2 \\ &= A \cdot 2^3 m^3 \cdot 3^2 \cdot n^2 \\ &= 8 \cdot 9 \cdot A \cdot m^3 n^2 \\ &= 72 \cdot 10 \\ f(2m, 3n) &= 720 \end{aligned}$$

6

If y varies inversely as x and the graph of their relation in the xy -plane passes through the point $(5, 6)$, what is the value of y when $x = 4$?

- A) 6
B) 7.5
C) 15
D) 30

Solution:

$$\begin{aligned} x \cdot y &= k \Rightarrow \text{passes through } (5, 6) \\ x &= 5; \quad y = 6 \\ k &= 5 \cdot 6 \Rightarrow k = 30 \\ x \cdot y &= 30 \\ x = 4 &\Rightarrow 4 \cdot y = 30 \\ &\quad \boxed{y = 7.5} \end{aligned}$$

7

If b varies inversely as the square of a , and $b = 8$ when $a = 2$, then what is the value of b when $a = 3$?

- A) 9
B) 8
C) $\frac{27}{8}$
D) $\frac{32}{9}$

Solution:

$$\begin{aligned} k &= b \cdot a^2 \\ k &= 8 \cdot 2^2 \Rightarrow k = 32 \\ 32 &= b a^2 \\ a = 3 &\Rightarrow 32 = b \cdot 3^2 \\ &\quad \boxed{b = \frac{32}{9}} \end{aligned}$$

8

A marathon offers \$6,000 in prize money to the top three finishers. If the first, second, and third place prizes are distributed in the ratio of 5:3:2, how much money, in dollars, does the first-place finisher receive?

- A) \$4,500
B) \$3,000
C) \$1,800
D) \$1,200

Solution:

$$\begin{aligned} 5:3:2 &\Rightarrow 5k; 3k; 2k \\ 5k + 3k + 2k &= 6,000 \\ 10k &= 6,000 \\ k &= 600 \\ 5k &\Rightarrow \text{first place} \\ 5 \cdot 600 &= \boxed{\$3,000} \end{aligned}$$

9

If a train travels at a constant rate of 48 miles per hour, how many minutes will it take to travel 120 miles?

- A) 96 minutes
 B) 120 minutes
 C) 150 minutes
 D) 180 minutes

Solution:

48 miles \searrow 60 minutes
 120 miles \swarrow ?

$$\frac{120 \cdot 60}{48} \Rightarrow \boxed{150 \text{ minutes}}$$

10

If the ratio of a to b is 3 to 2, and ratio a to c is 5 to 3, what is the ratio of b to c ?

- A) 15 to 9
 B) 15 to 10
 C) 10 to 9
 D) 10 to 6

Solution:

$$a : b = 3 : 2$$

$$a : c = 5 : 3$$

$$\left. \begin{array}{l} \frac{a}{b} = \frac{3}{2} \\ \frac{a}{c} = \frac{5}{3} \end{array} \right\} \begin{array}{l} \frac{a}{b} = \frac{3 \cdot 5}{2 \cdot 5} = \frac{15}{10} \\ \frac{a}{c} = \frac{5 \cdot 3}{3 \cdot 3} = \frac{15}{9} \end{array}$$

$$a = 15; \quad b = 10; \quad c = 9$$

$$\frac{b}{c} = \frac{10}{9}$$

$$\boxed{b : c = 10 : 9}$$

11

A paint mixture consists of a 3:2:11 ratio blue, violet, and white, respectively. How many ounces of white are needed to make 512 ounces of this mixture?

- A) 352
 B) 96
 C) 64
 D) 32

Solution:

$$3 : 2 : 11 = \text{blue} : \text{violet} : \text{white}$$

$$3k \quad 2k \quad 11k$$

$$3k + 2k + 11k = 512$$

$$16k = 512$$

$$k = 32$$

$$\text{white} = k \cdot 11 = \boxed{352 \text{ ounces}}$$

12

If a printer can print 4 pages in 15 seconds, how many pages can it print in 4 minutes?

- A) 64
 B) 32
 C) 16
 D) 15

Solution:

4 pages \searrow 15 seconds
 ? pages \swarrow 240 seconds (4 mins)

$$= \frac{4 \cdot 240}{15} = 64 \text{ pages}$$

13

If $\frac{2a}{b} = \frac{1}{2}$ and $\frac{c}{2b} = \frac{5}{8}$, what is $\frac{c}{2a}$?

- A) $\frac{3}{5}$
 B) $\frac{5}{2}$
 C) $\frac{5}{3}$
 D) $\frac{5}{4}$

Solution:

$$\left. \begin{array}{l} \frac{2a}{b} = \frac{1}{2} \\ \frac{c}{2b} = \frac{5}{8} \Rightarrow \frac{c}{b} = \frac{5}{4} \end{array} \right\} \begin{array}{l} \frac{a}{b} = \frac{1}{4} \\ \frac{c}{b} = \frac{5}{4} \end{array}$$

$a = 1 ; b = 4 ; c = 5$

$$\frac{c}{2a} = \frac{5}{2(1)} = \frac{5}{2}$$

14

Chloe can edit 750 words per minute and Faye can edit 450 words per minute. If each page of text contains 800 words, how many pages can they edit working together, in 24 minutes?

- A) 24
 B) 32
 C) 36
 D) 48

Solution:

$$\text{Chloe} \rightarrow \frac{750 \cdot 24}{800} = 22.5$$

$$\text{Faye} \rightarrow \frac{450 \cdot 24}{800} = 13.5$$

$$22.5 + 13.5 = 36 \text{ pages}$$

15

If a \$7,500 contribution is divided among charities X, Y, and Z in ratio of 7:5:3, respectively, how many much more, in dollars, does charity X receive than charity Z?

- A) \$500
 B) \$1,500
 C) \$1,800
 D) \$2,000

Solution:

$$7:5:3 = x : y : z$$

$$\begin{array}{ccc} 7k & 5k & 3k \end{array}$$

$$7k + 5k + 3k = 7500$$

$$15k = 7500$$

$$k = 500$$

$$x = 7 \cdot 500 \Rightarrow \$3,500$$

$$z = 3 \cdot 500 \Rightarrow \$1,500$$

$$x \text{ receives } \$2,000 \text{ more than } z$$

16

A hare runs at a constant rate of x miles per hour, and tortoise runs at a constant rate of y miles per hour, where $0 < x < y$. How many more hours will it take the tortoise to finish a race of z miles than hare?

- A) $\frac{xy + yz}{xz}$
 B) $\frac{y - x}{z}$
 C) $\frac{xz - yz}{xy}$
 D) $\frac{x + y}{z}$

Solution:

Hare $\rightarrow x$ mph Tortoise $\rightarrow y$ mph

$$\left. \begin{array}{l} x \text{ miles} \xrightarrow{1 \text{ hour}} \\ z \text{ miles} \xrightarrow{?} \end{array} \right\} \left. \begin{array}{l} y \text{ miles} \xrightarrow{1 \text{ hour}} \\ z \text{ miles} \xrightarrow{?} \end{array} \right\}$$

$$\frac{z}{x} \text{ hours} \qquad \frac{z}{y} \text{ hours}$$

$$\frac{z}{y} - \frac{z}{x} = \frac{zx - zy}{xy}$$

1

The fraction $\frac{m}{12}$ is equal to 0.75. What is the value of m ?

- A) 3
B) 6
C) 8
D) 9

Solution:

$$\frac{m}{12} = 0.75$$

$$m = (12)(0.75)$$

$$m = 9$$

2

x	y
1	5
3	45

The variables x and y are related by an equation of the form $y = Ax^m$ where A and m are both positive real numbers. What is the value of y when $x = 8$?

- A) 320
B) 256
C) 128
D) 64

Solution:

$$y = Ax^m$$

$$x = 1; y = 5 \Rightarrow 5 = A \cdot 1^m \Rightarrow A = 5$$

$$x = 3; y = 45 \Rightarrow 45 = 5 \cdot 3^m \Rightarrow m = 2$$

$$y = 5x^2$$

$$x = 8 \Rightarrow y = 5 \cdot 8^2$$

$$y = 320$$

3

If x varies inversely as y and $x = 9$ when $y = 16$, which of the following is another solution for m and n ?

- A) $x = 8$ and $y = 24 \Rightarrow 8 \cdot 24 = 192$ ✗
B) $x = 9$ and $y = 18 \Rightarrow 9 \cdot 18 = 162$ ✗
C) $x = 12$ and $y = 12 \Rightarrow 12 \cdot 12 = 144$ ✓
D) $x = 16$ and $y = 8 \Rightarrow 16 \cdot 8 = 128$ ✗

Solution:

$$x \cdot y = k$$

$$9 \cdot 16 = k \Rightarrow k = 144$$

4

On a school international trip, there must be 2 chaperones for every 26 students. How many chaperones need to be on a trip if 173 students are on the trip?

- A) 11
B) 12
C) 13
D) 14

Solution:

26 students \swarrow 2 chaperones
173 students \searrow ?

$$= \frac{173}{26}$$

$$= 13.3$$

so 13 chaperones are needed

5

Mike's printer can print 5 pieces of paper in 18 seconds. How long will it take to print 140 pieces of paper?

- A) 7 minutes 50 seconds
- B) 8 minutes 24 seconds
- C) 8 minutes 48 seconds
- D) 9 minutes 18 seconds

Solution.

$$\begin{array}{l} 5 \text{ papers} \quad \swarrow \quad \searrow \quad 18 \text{ seconds} \\ 140 \text{ papers} \quad \swarrow \quad \searrow \quad ? \end{array}$$

$$\begin{aligned} &= \frac{140 \cdot 18}{5} \\ &= 504 \text{ seconds} \end{aligned}$$

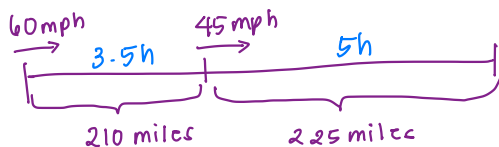
$$\boxed{8 \text{ mins } 24 \text{ seconds}}$$

6

Emmanuel is driving home for spring break, a 435-mile trip. He travels an average of 60 miles per hour for the first 210 miles, and then he travels an average of 45 miles per hour for the last 225 miles. What is Jim's average velocity for the entire trip?

- A) 50.2 miles per hour
- B) 51.2 miles per hour
- C) 54.2 miles per hour
- D) 57.2 miles per hour

Solution:



$$\text{Average rate} = \frac{435 \text{ miles}}{8.5 \text{ hours}}$$

$$= 51.17 \approx \boxed{51.2 \text{ mph}}$$

7

On a certain map, 10 miles is represented by 1.2 centimeters. What is the distance on the map that represents 60 miles?

- A) 6.4 centimeters
- B) 7.0 centimeters
- C) 7.2 centimeters
- D) 8.0 centimeters

Solution.

$$\begin{array}{l} 10 \text{ miles} \quad \swarrow \quad \searrow \quad 1.2 \text{ cm} \\ 60 \text{ miles} \quad \swarrow \quad \searrow \quad ? \end{array}$$

$$\frac{(60)(1.2)}{10} = \boxed{7.2 \text{ cm}}$$

8

2 gallons of paint are needed for a wall that is 130 square feet. How many gallons of paint must be purchased at the store for 780 square feet of wall space?

- A) 6 gallons
- B) 9 gallons
- C) 10 gallons
- D) 12 gallons

Solution:

$$\begin{array}{l} 2 \text{ gallons} \quad \swarrow \quad \searrow \quad 130 \text{ sqf} \\ ? \quad \swarrow \quad \searrow \quad 780 \text{ sqf} \end{array}$$

$$= \frac{2 \cdot 780}{130} = \boxed{12 \text{ gallons}}$$

9

Store A, Store B, and Store C sell basketball balls. The ratio of the number of basketball balls sold of A to B is $\frac{5}{4}$. The ratio of the number of basketball balls sold of B to C is $\frac{7}{3}$. If Store C sold 24 basketball balls, how many soccer balls did Store A sell?

- A) 70
B) 56
C) 48
D) 24

Solution:

$$\frac{A}{B} = \frac{5}{4}$$

$$\frac{B}{C} = \frac{7}{3} \Rightarrow \frac{B}{24} = \frac{7}{3} \Rightarrow B = 56$$

$$C = 24$$

$$\frac{A}{56} = \frac{5}{4} \Rightarrow A = 70$$

10

Company A, Company B, and Company C are three internet providers in a certain area of the country. The ratio of subscribers of A to B to C is 3:4:6. If there are a total of 65,000 subscriptions, how many of the 65,000 use Company B and Company C?

- A) 50,000
B) 45,000
C) 40,000
D) 35,000

Solution:

$$A = 3k ; B = 4k ; C = 6k$$

$$3k + 4k + 6k = 65,000$$

$$13k = 65,000$$

$$k = 5,000$$

$$B + C = 4k + 6k = 10k = 10 \cdot 5,000 = 50,000$$

11

An airplane traveled at a speed of 600 miles per hour for 75 minutes. How far did the airplane travel?

- A) 700 miles
B) 750 miles
C) 800 miles
D) 900 miles

Solution:

$$75 \text{ minutes} = 1.25 \text{ hours}$$

$$\begin{array}{l} 600 \text{ miles} \quad \nearrow \quad 1 \text{ hour} \\ \quad \quad \quad \quad \quad \searrow \quad 1.25 \text{ hours} \\ \quad \quad \quad \quad \quad ? \end{array}$$

$$= (600)(1.25)$$

$$= 750 \text{ miles}$$

12

A car tire rotates 4,700 times every 5 miles. How many times will the car tire rotate in 60 miles?

- A) 42,600 rotations
B) 52,400 rotations
C) 56,400 rotations
D) 58,200 rotations

Solution:

$$\begin{array}{l} 4,700 \text{ rotations} \quad \nearrow \quad \text{for 5 miles} \\ \quad \quad \quad \quad \quad \searrow \quad \text{for 60 miles} \\ \quad \quad \quad \quad \quad ? \end{array}$$

$$= \frac{60 \cdot 4,700}{5}$$

$$= 56,400 \text{ rotations}$$

13

If Adrian gains 18 pounds, then the ratio of Adrian's weight to Todd's weight would be $\frac{5}{8}$.

If Todd weighs 160 pounds, what was Adrian's initial weight?

- A) 75
 B) 82
 C) 100
 D) 118

Solution:

Adrians = x ; Todd = 160

$$\frac{x+18}{160} = \frac{5}{8}$$

$$x+18 = 100$$

$$x = 82 \text{ pounds}$$

14

In a pet store there are 16 dogs and 12 cats. The ratio of dogs to cats is proportional to the ratio of ferrets to rabbits. How many ferrets are there in the store if there are 15 rabbits?

- A) 14
 B) 18
 C) 20
 D) 24

Solution:

$$\frac{\text{Dogs}}{\text{Cats}} = \frac{16}{12} = \frac{4}{3}$$

$$\frac{\text{Ferrets}}{\text{Rabbits}} = \frac{4}{3} \Rightarrow \frac{\text{Ferrets}}{15} = \frac{4}{3}$$

$$\text{Ferrets} = 20$$

15

At the present time the ratio of a father's age to his son's age is 2:1. Ten years ago, the ratio of father's age to son's age was 8:3. What is the present age of father?

- A) 40
 B) 45
 C) 50
 D) 60

Solution:

$$\frac{\text{Father}}{\text{son}} = \frac{2}{1} = \frac{x}{y} \Rightarrow x = 2y$$

$$\frac{x-10}{y-10} = \frac{8}{3}$$

$$3x-30 = 8y-80$$

$$3x+50 = 8y \Rightarrow x=2y$$

$$3(2y)+50 = 8y$$

$$50 = 2y$$

$$y = 25 \rightarrow \text{son's age}$$

$$x = 50 \rightarrow \text{father's age}$$

16

The ratio of the width to the length of a rectangle is $\frac{3}{5}$, and the perimeter is 96 cm.

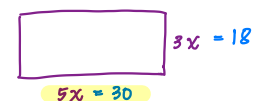
What is value of the length of this rectangle?

- A) 18
 B) 24
 C) 27
 D) 30

Solution:



$$\begin{aligned} P &= 96 \\ 2(3x+5x) &= 96 \\ 8x &= 48 \\ x &= 6 \end{aligned}$$



1

If x varies inversely as y and $x = 6$ when $y = 15$, what is the value of y when $x = 2$?

- A) 5
B) 30
C) 45
D) 90

Solution:

$$xy = k \Rightarrow k = 6 \cdot 15$$

$$k = 90$$

$$x = 2 \Rightarrow 90 = 2y$$

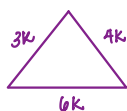
$$y = 45$$

2

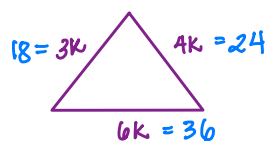
The sides of a triangle are proportional to 3, 4 and 6. If the perimeter of this triangle is 78 cm, then what is the length of the shortest side?

- A) 6
B) 12
C) 15
D) 18

Solution:



$$\left. \begin{aligned} P &= 78 \\ 3k + 4k + 6k &= 78 \\ 13k &= 78 \\ k &= 6 \end{aligned} \right\}$$



3

If y varies inversely as square x and $x = 4$ when $y = 5$, what is the value of y when $x = 2$?

- A) 12
B) 15
C) 16
D) 20

Solution:

$$k = y \cdot x^2$$

$$k = 5 \cdot 4^2$$

$$k = 80$$

$$x = 2; y = ?$$

$$80 = y \cdot 2^2$$

$$y = 20$$

4

If y varies directly as square x and $x = 2$ when $y = 20$, what is the value of x when $y = 80$?

- A) 4
B) 12
C) 16
D) 20

Solution:

$$k = \frac{y}{x^2}$$

$$k = \frac{20}{2^2} = 5 \quad x = ?; y = 80$$

$$5 = \frac{80}{x^2}$$

$$x^2 = 16$$

$$x = 4 \text{ or } x = -4$$

5

Let $f(x,y) = k \cdot x^2 y$ where k is a constant. If $f(a,b) = 8$, what is the value of $f(a,3b)$?

- A) 12
 B) 24
 C) 36
 D) 72

Solution:

$$\left. \begin{array}{l} f(a,b) = 8 \\ k \cdot a^2 \cdot b = 8 \end{array} \right\} \begin{array}{l} f(a,3b) = k \cdot a^2 (3b) \\ = 3 k a^2 b \\ = (3)(8) \\ = \boxed{24} \end{array}$$

6

If x varies inversely as square root of y and the graph of their relation in the xy - plane passes through the point $(6,9)$, what is the value of y when $x = 2$?

- A) 243
 B) 81
 C) 27
 D) 9

Solution:

$$k = x\sqrt{y} \rightarrow (6,9) \text{ passes through}$$

$$k = 6\sqrt{9} = 18$$

$$x = 2 ; y = ?$$

$$18 = 2\sqrt{y}$$

$$9 = \sqrt{y}$$

$$\boxed{y = 81}$$

7

a , b , and c are proportional to 5, 12 and 13. If $b + c - a = 9$, then what is the value of a ?

- A) 2.25
 B) 4.5
 C) 7.5
 D) 9

Solution:

$$a = 5k ; b = 12k ; c = 13k$$

$$b + c - a = 9$$

$$12k + 13k - 5k = 9$$

$$20k = 9$$

$$k = \frac{9}{20}$$

$$a = 5k = 5 \left(\frac{9}{20} \right) = \frac{9}{4} = \boxed{2.25}$$

8

The ratio of a mother's age to her son's age is 4:1. 8 years from now their ages will be in the ratio 3:1. What is the mother's present age?

- A) 40
 B) 45
 C) 48
 D) 64

Solution:

$$\frac{\text{mother's age}}{\text{son's age}} = \frac{x}{y} = \frac{4}{1} \Rightarrow x = 4y$$

$$\frac{x+8}{y+8} = \frac{3}{1} \Rightarrow \begin{array}{l} x+8 = 3y+24 \\ 4y+8 = 3y+24 \end{array}$$

$$y = 16$$

$$\boxed{x = 64}$$

9

The resistance R in an electric circuit varies directly with the voltage. If $R = 20$ when $V = 120$, what is the value of R when $V = 300$?

- A) 30
B) 40
C) 50
D) 60

Solution:

$$k = \frac{R}{V} = \frac{20}{120} = \frac{1}{6}$$

$$V = 300 ; R = ?$$

$$k = \frac{R}{V} = \frac{1}{6}$$

$$\frac{R}{300} = \frac{1}{6} \Rightarrow 6R = 300$$

$$\boxed{R = 50}$$

10

a , b , and c are proportional to 4, 3 and 2. If $a^2 + b^2 + c^2 = 116$, then what is the value of $a + b + c$?

- A) 9
B) 15
C) 18
D) 21

Solution:

$$a = 4k ; b = 3k ; c = 2k$$

$$a^2 + b^2 + c^2 = 116$$

$$(4k)^2 + (3k)^2 + (2k)^2 = 116$$

$$16k^2 + 9k^2 + 4k^2 = 116$$

$$29k^2 = 116$$

$$k^2 = 4$$

$$k = \pm 2$$

$$a + b + c = 4k + 3k + 2k$$

$$= 9k \Rightarrow 9 \cdot 2$$

$$= 18$$

11

A cake mixture consists of a 1:3:2:7 cacao, sugar, egg, and flour, respectively. How many ounces of egg are needed to make 390 ounces of this cake?

- A) 30
B) 60
C) 90
D) 210

Solution:

$$\text{cacao} = k ; \text{sugar} = 3k ;$$

$$\text{egg} = 2k ; \text{flour} = 7k$$

$$k + 3k + 2k + 7k = 390$$

$$13k = 390$$

$$k = 30$$

$$\text{egg} = 2 \cdot 30 = \boxed{60 \text{ ounces}}$$

12

If a xerox machine can scan 3 pages in 10 seconds, how many pages can it scan in 3 minutes?

- A) 36
B) 45
C) 51
D) 54

Solution:

$$\begin{array}{l} 3 \text{ pages} \xrightarrow{\text{in}} 10 \text{ seconds} \\ ? \quad \quad \quad \searrow \quad \quad \quad 180 \text{ seconds (3 mins)} \end{array}$$

$$= \frac{3(180)}{10}$$

$$= \boxed{54 \text{ pages}}$$

13

If $\frac{a}{b} = \frac{2}{5}$, what is $\frac{3a-b}{2a+b}$?

- A) $\frac{1}{2}$
 B) $\frac{1}{5}$
 C) $\frac{2}{7}$
 D) $\frac{1}{9}$

Solution:

$$\frac{a}{b} = \frac{2}{5} \Rightarrow \begin{matrix} a = 2 \\ b = 5 \end{matrix}$$

$$\frac{3a-b}{2a+b} = \frac{3(2)-5}{2(2)+5} = \frac{1}{9}$$

14

If $\frac{x+y}{y} = \frac{5}{2}$, what is $\frac{3x-y}{x+2y}$?

- A) $\frac{1}{7}$
 B) $\frac{5}{7}$
 C) 1
 D) $\frac{9}{7}$

Solution:

$$\frac{x+y}{y} = \frac{5}{2}$$

$$y = 2 \quad ; \quad x + 2 = 5 \Rightarrow x = 3$$

$$\frac{3x-y}{x+2y} = \frac{3(3)-2}{3+2(2)} = \frac{7}{7} = \boxed{1}$$

15

a , b , and c are proportional to 2, 3 and 4. If $3a - b + c = 21$, then what is the value of b ?

- A) 3
 B) 9
 C) 12
 D) 14

Solution:

$$a = 2k \quad ; \quad b = 3k \quad ; \quad c = 4k$$

$$3a - b + c = 21$$

$$3(2k) - 3k + 4k = 21$$

$$7k = 21$$

$$k = 3$$

$$b = 3k \Rightarrow 3 \cdot 3$$

$$\boxed{b = 9}$$

16

The ratio of two numbers is 5:6 if 12 subtracted from each number, the ratio of the resulting number is 3:4. what is the value of biggest number?

- A) 36
 B) 30
 C) 24
 D) 12

Solution:

$$\frac{x}{y} = \frac{5}{6} \quad ; \quad \begin{matrix} x = 5k \\ y = 6k \end{matrix}$$

$$\frac{5k-12}{6k-12} = \frac{3}{4}$$

$$4(5k-12) = 3(6k-12)$$

$$20k - 48 = 18k - 36$$

$$2k = 12$$

$$k = 6$$

$$x = 30 \quad ;$$

$$\boxed{y = 36 \text{ (biggest one)}}$$

1

If $x = 3y - 2$, what is the value of y in terms of x ?

- A) $2x - 3$
 B) $3x + 2$
 C) $\frac{x+2}{3}$
 D) $\frac{x+3}{2}$

Solution:

$$x = 3y - 2$$

$$x + 2 = 3y$$

$$\boxed{\frac{x+2}{3} = y}$$

2

If $x = \frac{2y-z}{5}$, what is the value of y in terms of x and z ?

- A) $5x + z$
 B) $5x + 2z$
 C) $\frac{5x-z}{2}$
 D) $\frac{5x+z}{2}$

Solution:

$$x = \frac{2y-z}{5}$$

$$5x = 2y - z$$

$$5x + z = 2y$$

$$\boxed{\frac{5x+z}{2} = y}$$

3

If $a = \frac{3b-2}{4c}$, what is the value of c in terms of a and b ?

- A) $\frac{3b-2}{a}$
 B) $\frac{3b-2}{4a}$
 C) $\frac{3b+2}{2a}$
 D) $\frac{3b+2}{4a}$

Solution:

$$a = \frac{3b-2}{4c}$$

$$4ac = 3b-2$$

$$\boxed{c = \frac{3b-2}{4a}}$$

4

If $a = \frac{2b+c-1}{3c}$, what is the value of c in terms of a and b ?

- A) $\frac{2b-1}{3a-1}$
 B) $\frac{2b-1}{3a+1}$
 C) $\frac{2b+1}{3a-1}$
 D) $\frac{2b+1}{3a+1}$

Solution:

$$a = \frac{2b+c-1}{3c}$$

$$3ac = 2b+c-1$$

$$3ac - c = 2b-1$$

$$c(3a-1) = 2b-1$$

$$\boxed{c = \frac{2b-1}{3a-1}}$$

5

A mason uses the formula $n = d\sqrt{7h}$ to estimate the number of bricks, n , needed to build a wall that is d feet long and h feet high. What is the value of h in terms of d and n ?

A) $\frac{d^2}{7n^2}$

B) $\frac{7n^2}{7d^2}$

C) $\frac{n}{7d}$

D) $\frac{n^2}{7d^2}$

Solution:

$$(n)^2 = (d\sqrt{7h})^2$$

$$n^2 = d^2 \cdot 7 \cdot h$$

$$h = \frac{n^2}{7d^2}$$

6

A carpenter lays b bricks per hour for h hours and then $2b$ bricks for $3h$ hours. In terms of b and h , how many bricks did he lay in total?

A) $5bh$

B) $7bh$

C) $3h + 4b$

D) $4h + 3b$

Solution:

per hour b bricks
for h hours $\rightarrow b \cdot h$ bricks

$2b$ bricks for $3h$ hours

Total number of bricks

$$bh + 2b(3h) \Rightarrow 7bh$$

7

If x pears cost c dollars, which of the following expressions gives the cost of 13 pears, in dollars?

A) $13cx$

B) $\frac{c}{13x}$

C) $\frac{13c}{x}$

D) $\frac{cx}{13}$

Solution:

x pears c dollars

1 pear $\frac{c}{x}$ dollars

13 pears $\rightarrow 13 \cdot \frac{c}{x}$

$$\frac{13c}{x}$$

8

There are x grade levels with y students in each grade level in an international school. If school buys p pilot pens to be distributed equally among the students, which of the following gives the number of drawing pens each student receives?

A) $\frac{xy}{p}$

B) $\frac{p}{xy}$

C) $\frac{yp}{x}$

D) $\frac{xp}{y}$

Solution:

Number of students xy

p pilotpens $\rightarrow \frac{p}{xy}$
distribution

9

Eric buys d dollars' worth of groceries each week and spends a *one-fifths* of those dollars on snacks. In terms of d , how many weeks will it take Eric to spend a total of \$75 just on snacks?

- A) $\frac{15}{d}$
 B) $\frac{375}{d}$
 C) $\frac{d}{15}$
 D) $\frac{d}{375}$

Solution:

every week $\rightarrow \frac{d}{5}$ \$ for snacks

Assuming $\frac{d}{5} < 75$

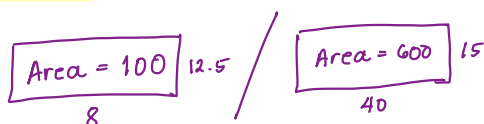
$$\frac{75}{\frac{d}{5}} = \frac{375}{d} \text{ weeks}$$

10

A 8 inches by 12.5 inches piece of cardboard costs \$2.5. If the costs of cardboard is proportional to its area, what is the cost of a piece cardboard that is 15 inches by 40 inches?

- A) \$9
 B) \$10
 C) \$12.5
 D) \$15

Solution:



100 square inches \rightarrow 2.5
 600 square inches \rightarrow ?

$$= \frac{600(2.5)}{100}$$

$$= \$15$$

11

A rolling ball covers a distance of 2,700 feet in 3 minutes. What is the ball's average speed, in inches per seconds? (12 inches = 1 foot)

- A) 1
 B) 1.25
 C) 1.5
 D) 2

Solution:

$$\begin{aligned} 2700 \text{ feet} &= 225 \text{ inches} \\ 3 \text{ min} &= 180 \text{ seconds} \end{aligned}$$

$$\begin{aligned} \text{Rate} &= \frac{225}{180} \\ &= 1.25 \end{aligned}$$

12

Jack drives 180 miles at rate of 45 mph, and then another 120 miles at rate of 60 mph. What was his average speed, in miles per hour?

- A) 50
 B) 51.5
 C) 52.5
 D) 55

Solution:

$$\begin{aligned} 180 \text{ miles} &\rightarrow \text{rate} = 45 \rightarrow 4 \text{ hours} \\ 120 \text{ miles} &\rightarrow \text{rate} = 60 \rightarrow 2 \text{ hours} \end{aligned}$$

$$\begin{aligned} \text{Average speed} &= \frac{\text{Total distance}}{\text{total time}} \\ &= \frac{300}{6} = 50 \end{aligned}$$

13

The ratio of the width to the length of a rectangle is $\frac{3}{5}$, and the perimeter is 64 cm. What is area of this rectangle?

- A) 160
B) 180
C) 240
D) 300

Solution:



$$\begin{aligned} P &= 64 \\ 2(3k + 5k) &= 64 \\ 8k &= 32 \\ k &= 4 \end{aligned}$$

A rectangle with width labeled $3k = 12$ and length labeled $5k = 20$.

$$\begin{aligned} \text{Area} &= 20 \cdot 12 \\ &= \boxed{240} \end{aligned}$$

14

If y varies directly as x and the graph of their relation in the xy - plane passes through the point $(-3, 6)$, what is the value of y when $x = 4$?

- A) -8
B) -4
C) 4
D) 8

Solution:

$$k = \frac{y}{x}; \quad (-3, 6) \text{ passes through}$$

$$k = \frac{6}{-3} \Rightarrow k = -2$$

$$x = 4; \quad y = ?$$

$$-2 = \frac{y}{4}; \quad \boxed{y = -8}$$

15

Sue and Joe are brothers. Three years ago, the ratio of their ages was 3 : 2. Three years from now their ages will be in the ratio 9 : 7. How old Taren now?

- A) 9
B) 12
C) 15
D) 18

Solution:

$$\begin{aligned} \text{Sue} &= x; \quad \text{Joe} = y \\ \frac{x-3}{y-3} &= \frac{3}{2}; \quad \frac{x+3}{y+3} = \frac{9}{7} \\ \Downarrow & \qquad \qquad \qquad \Downarrow \\ 2x-6 &= 3y-3y \qquad 7x+21=9y+27 \\ 2x-6 &= 3y-3y \qquad 7x-9y=6 \\ 2x-3y &= -3 \qquad 7x-9y=6 \\ \hline -3(2x-3y &= -3) \Rightarrow \frac{-6x+9y=9}{7x-9y=6} \\ & \qquad \qquad \qquad \frac{-6x+9y=9}{7x-9y=6} \\ & \qquad \qquad \qquad \boxed{x=15} \end{aligned}$$

16

The arithmetic mean of five integers is 45. Which of the following number must be added in order to make the arithmetic mean equal to 52?

- A) 75
B) 82
C) 85
D) 87

Solution:

$$\begin{aligned} \text{sum of five integer} \\ 5 \cdot 45 &= 225 \\ x &\rightarrow \text{ must be added} \\ 52 &= \frac{225+x}{6} \\ 312 &= 225+x \\ \boxed{x=87} \end{aligned}$$

1

1 decagram = 10 grams
1,000 milligrams = 1 grams

A clinic stores one type of medicine in 5-decagram containers. Based on the information given above, how many 1-milligram doses are there in one 5-decagram container?

- A) 50,000
B) 5,000
C) 500
D) 0.005

Solution:

$$\begin{aligned} 5\text{-decagram} &\rightarrow 50\text{ grams} \\ 50\text{ grams} &\rightarrow 50 \cdot 1000\text{ mg} \\ &= \boxed{50,000\text{ mg}} \end{aligned}$$

2

Eric bought a camera at a store that gave a 25 percent discount off its original price. The total amounts he paid to the cashier was t dollars, including an 8 percent sales tax on the discounted price. Which of the following represents the original price of the camera in terms of t ?

- A) $\frac{t}{0.75}$
B) $\frac{t}{0.81}$
C) $(0.75)t$
D) $(0.75)(0.08)t$

Solution:

Original Price

$$\begin{aligned} 100x &\rightarrow 25\% \text{ off} \rightarrow 75x \\ 75x &\xrightarrow{8\% \text{ tax}} = 75x(1.08) = t \\ x &= \frac{t}{75(1.08)} \\ \text{original price} &= \frac{100 \cdot t}{75(1.08)} = \boxed{\frac{t}{0.81}} \end{aligned}$$

3

Yana is a farmer working the production of apples by two types of apple trees. She noticed that Type A trees produced 25 percent more apples than Type B trees did. Based on Yana's observation, if the Type A trees produced 40,000 apples, how many apples did the Type B trees produce?

- A) 36,000
B) 34,000
C) 32,000
D) 30,000

Solution:

Type A $\rightarrow 125x$ (25% more than B)
Type B $\rightarrow 100x$

$$\begin{aligned} 125x &= 40,000 \\ x &= 320 \Rightarrow \text{Type B} = 100 \cdot 320 \\ &= \boxed{32,000} \end{aligned}$$

4

The dancer earns \$135 at a performance where 9 people attend. The dancer uses 41% of the money earned to pay the costs involved in putting on each performance. The rest of the money earned is the dancer's profit. What is the profit the dancer makes at a performance where 9 people attend?

- A) \$55.35
B) \$64.38
C) \$79.65
D) \$96.8

Solution:

41% \rightarrow cost \Rightarrow 59% \rightarrow profit

$$\$135 \times 0.59 = \boxed{\$79.65}$$

5

At San Juan High School, approximately 4 percent of juniors and 3 percent of seniors were received first honors last school year. If there were 1482 juniors and 972 seniors enrolled at San Juan High School last year, which of the following is closest to the total number of juniors and seniors at San Juan High School last year who were received first honors?

- A) 96
 B) 88
 C) 59
 D) 29

Solution:

$$\begin{array}{l} 4\% \text{ Juniors} \rightarrow 1482 \Rightarrow 59.28 \approx 59 \\ 3\% \text{ Seniors} \rightarrow 972 \Rightarrow 29.16 \approx 29 \\ \hline 88 \end{array}$$

6

1 kilometer = 1,000 meters
 1 meter = 100 centimeters
 Based on the above information, how many centimeters are in 2.5 kilometers?

- A) 250,000
 B) 25,000
 C) 250
 D) 0.025

Solution:

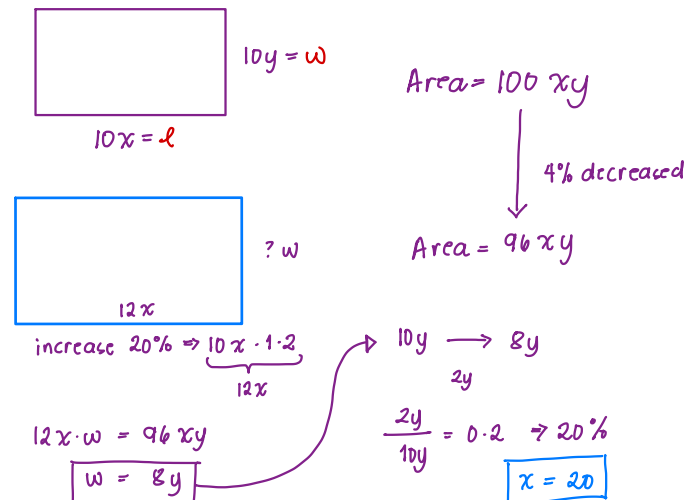
$$\begin{array}{l} 2.5 \text{ km} \Rightarrow 2.5 \times 1000 \text{ m} \\ = 2500 \text{ m} \\ = 2500 \times 100 \text{ cm} \\ = \boxed{250000 \text{ cm}} \end{array}$$

7

A rectangle was altered by increasing its length by 20% and decreasing its width by x percent. If these alterations decreased the area of the rectangle by 4%, what is the value of x ?

- A) 8
 B) 12
 C) 15
 D) 20

Solution:

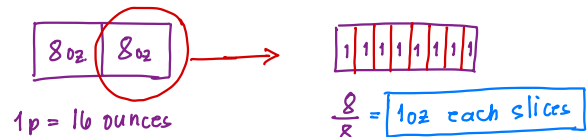


8

If a 1-pound cake is sliced in half and each half is sliced into eighths, what is the weight, in ounces, of each of the slices? (1 pound = 16 ounces)

- A) 1
 B) 2
 C) 4
 D) 8

Solution:



9

Josie surveyed a random sample of the juniors of high school to determine whether the Fieldtrip should be held in September or October. Of the 60 students surveyed, 40% preferred September. So, how many students in the entire 150 juniors would be expected to prefer having the Fieldtrip in October?

- A) 24
B) 36
C) 60
D) 90

Solution:

$$60 \Rightarrow 40\% \Rightarrow 24 \rightarrow \text{September}$$

$$\downarrow$$

$$150 \Rightarrow 60\% \Rightarrow \boxed{90} \rightarrow \text{October}$$

10

The density of an object is equal to the mass of the object divided by the volume of the object. What is the volume, in milliliters, of an object with a mass of 15 grams and a density of 2.5 grams per milliliter?

- A) 5
B) 6
C) 30
D) 37.5

Solution:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$2.5 = \frac{15}{V}$$

$$2.5V = 15$$

$$\boxed{V = 6}$$

11

How many cubic feet are there in a room measuring $5m \times 10m \times 2m$? ($1m^3 = 35.314ft^3$)

- A) 35.3
B) 353.1
C) 3,531.4
D) 35,314.6

Solution:

$$5 \times 10 \times 2 = 100m^3$$

$$1m^3 = 35.3ft^3$$

$$100m^3 = \boxed{3,531.4ft^3}$$

12

A man makes a 27.0 km trip in 16 minutes. If he trips 48 minutes then how far was the trip in miles? (1 mile = 1,609 meters)

- A) 16.8
B) 32.16
C) 48.48
D) 50.33

Solution:

$$\begin{array}{l} 16 \text{ min} \quad 27 \text{ km} \\ 48 \text{ min} \quad \rightarrow 3 \cdot 27 = 81 \text{ km} \end{array}$$

$$\begin{array}{l} 1 \text{ mile} \quad 1609 \text{ m} \\ \hline \end{array}$$

$$81 \text{ km} = \frac{81 \cdot 1000}{1609} = \boxed{50.33 \text{ miles}}$$

13

The density of an object is equal to the mass of the object divided by the volume of the object. What is the mass, in grams, of an object with a volume of 48 milliliters and a density of 1.25 grams per milliliter?

- A) 18.6
B) 28
C) 38.4
D) 60

Solution:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$1.25 = \frac{\text{mass}}{48}$$

$$\text{mass} = (48)(1.25)$$

$$\text{mass} = 60 \text{ grams}$$

14

Myra begins a new walking program with 800 m on the first day. Each day, she will increase her walk by 200 m. How many kilometers will she walk on day 8 of her program?

- A) 7.8
B) 8.6
C) 9.8
D) 12

Solution:

$$\frac{1\text{st}}{800}, \frac{2\text{nd}}{1000}, \frac{3\text{rd}}{1200}, \dots, \frac{8\text{th}}{2200}$$

$$800 + 1000 + 1200 + 1400 + 1600 + 1800 + 2000 + 2200 = 12,000 \text{ m}$$

$$12 \text{ km}$$

15

If the population of town Y is 60% greater than the population of town X, and the population of town Z is 20% greater than the population of town X, then what percent greater is the population of town Y than the population of town Z?

- A) 16.6%
B) 25%
C) 33.3%
D) 40%

Solution:

$$\frac{x}{100p} \rightarrow \frac{y}{160p} \rightarrow \begin{array}{l} 60\% \text{ greater} \\ \text{than } x \end{array} \quad \left| \quad \frac{x}{100p} \rightarrow \frac{z}{120p} \rightarrow \begin{array}{l} 20\% \text{ greater} \\ \text{than } x \end{array}$$

$$\frac{y}{160p} \quad \frac{z}{120p} \Rightarrow y \text{ is } 40\% \text{ more than } z \quad \left| \quad \frac{40p}{160p} = 0.25 \text{ or } 25\%$$

16

If x is 300% less than 22, what is the value of $|x|$?

- A) 33
B) 22
C) 14
D) 11

Solution:

$$x = 300\% \cdot x - 22$$

$$x = 3x - 22$$

$$2x = 22$$

$$x = 11$$

5

A room 6 m by 5 m is 4 m high. Allowing 8 m² for door and windows, how many gallons of paint walls and ceiling if a gallon of paint can cover about 16 m² of surface?

- A) 6
 B) 7
 C) 16
 D) 17

Solution:

$$\begin{aligned} \text{Total area} &= 2(6 \cdot 5 + 5 \cdot 4 + 6 \cdot 4) \\ &= 148 \text{ m}^2 \\ 8 \text{ m}^2 &\rightarrow \text{windows} \\ 30 \text{ m}^2 &\rightarrow \text{doors} \\ 110 \text{ m}^2 &\rightarrow \text{floor area} \\ \frac{110 \text{ m}^2}{16 \text{ m}^2} &= \boxed{7 \text{ gallons}} \end{aligned}$$

6

A shipping company medium size package requires 60 centimeters of tape to be closed securely. What is the maximum number of packages of this type that can be secured with 48 meters of tape? (1 meter = 100 cm)

- A) 40
 B) 80
 C) 120
 D) 160

Solution:

$$48 \text{ m} \rightarrow \frac{(48)(100 \cancel{\text{cm}})}{(60 \cancel{\text{cm}})} = \boxed{80 \text{ package}}$$

7

A salesman receives a basic salary of \$ 600 and a commission of 4% on all sales. Find his total sales in a month when he received \$ 800?

- A) \$3,200
 B) \$3,600
 C) \$4,500
 D) \$5,000

Solution:

$$\begin{aligned} \$800 - \$600 &\Rightarrow \$200 \text{ commissions} \\ 4\% \text{ of sales} &\Rightarrow 200 \\ \text{sales} &= \frac{200}{0.04} \\ &\Rightarrow \boxed{\$5000} \end{aligned}$$

8

Jacob spent 12% of his 10-hour workday in department meetings. How many minutes of his workday did he spend in meetings?

- A) 1.2
 B) 8.8
 C) 72
 D) 96

Solution:

$$\begin{aligned} 12\% \text{ of } 10\text{-hour} \\ (10)(0.12) &= 1.2 \text{ hours spent} \\ &\text{in department meetings} \\ (1.2)(60) &= \boxed{72 \text{ minutes}} \end{aligned}$$

9

A customer paid \$72.8 for a jacket after a 12 percent sales tax was added. What was the price of the jacket before the sales tax was added?

- A) 62
- B) 64
- C) 65
- D) 68

Solution:

Original price 12% tax

$$100x + 12x = 112x$$

$$112x = 72.8$$

$$x = \$6.65$$

$$\text{Original Price} = (100)(0.65)$$

$$\boxed{\$65}$$

10

A metal bar weighs 8.5 ounces. 92% of the bar is silver. How many ounces of silver are in the bar? (round to the nearest thousandth)

- A) 7.82
- B) 7.42
- C) 6.32
- D) 4.57

Solution:

8.5 ounces \rightarrow 92% is silver

$$8.5 (0.92) = \boxed{7.82 \text{ ounces}}$$

11

Ruben bought an electric drill at 85% of the regular price. He paid \$120.48 for the drill. What was the regular price? (Round to the nearest cent)

- A) \$148.64
- B) \$141.74
- C) \$132.28
- D) \$129.96

Solution:

Regular prices 85% off
 $100x \rightarrow 85x = 120.48$

$$x = 1.417$$

$$\text{Regular price} \rightarrow 100 (1.417)$$

$$= \boxed{\$141.74}$$

12

The planet Venus travels 422,500,000 miles in its orbit around the Sun. If it takes 0.61 years for Venus to complete its orbit, which of the following is closest to the average speed of Venus, in miles per hour, in its orbit around the Sun?

- A) 79,066
- B) 126,077
- C) 163,128
- D) 306,680

Solution:

$$\text{Average Rate} = \frac{422,500,000}{(0.61)(365)(24)}$$

$\underbrace{\hspace{1.5cm}}_{\text{year}} \quad \underbrace{\hspace{1.5cm}}_{\text{hour}}$

$$= \boxed{79,066 \text{ mph}}$$

Questions 13-14 refer to the following information.

Product	Price	Amount
L-Galactose	\$480	500 mg
L-Erythrose	\$165	100 mg
D-Threose	\$66	50 mg

A company produces chemicals to be used by pharmaceutical manufactures.

13

How much more will 250 mg of L-Erythrose 250 mg of costs than D-Threose?

- A) 330
- B) 165
- C) 82.5
- D) 80

Solution:

$$\begin{array}{l} 100 \text{ mg L-Erythrose} \rightarrow \$165 \\ 250 \text{ mg L-Erythrose} \rightarrow \$412.5 \end{array}$$

$$\begin{array}{l} 50 \text{ mg D-Threose} \rightarrow \$66 \\ 250 \text{ mg D-Threose} \rightarrow \$330 \end{array}$$

$$\$412.5 - \$330 = \boxed{\$82.50}$$

14

A customer orders 4 g of L-Galactose and L-Erythrose. If the total price of the order is \$4,702.5, how much L-Galactose, in grams, did customer order?

- A) 1.25
- B) 2.50
- C) 2.65
- D) 2.75

Solution:

$$\text{L-Galactose} = x ; \text{L-Erythrose} = y$$

$$4g = 4000 \text{ mg}$$

$$x + y = 4000$$

$$\frac{500x}{480} + \frac{100y}{165} = 4,702.5$$

$$x = 2.75$$

$$y = 1.25$$

15

A public school has 1,200 students. 480 of these students are girls. What percentage of these students are boys?

- A) 40 %
- B) 48 %
- C) 60 %
- D) 64 %

Solution:

$$\begin{array}{l} 1200 \rightarrow 480 \text{ girls} \\ \quad \quad \quad 720 \text{ boys} \end{array}$$

$$\frac{720}{1200} = 0.6 \Rightarrow \boxed{60\%}$$

Questions 1-3 refer to the following information.

A survey was conducted annually among randomly chosen from city families to determine the number of cars owned per household. The table below shows the survey results.

	1 car	2 cars	3+cars	Total
1980	170	45	5	220
1990	185	66	16	267
2000	150	128	95	373
2010	135	180	144	459
Total	640	419	260	1319

1

What percent of households surveyed in 1980 had exactly 3 cars and more?

- A) 1.8%
- B) 2.3%
- C) 5.0%
- D) 20.0%

Solution:

1980 → 5 cars → 3 + cars

$$\frac{5}{220} = 0.0227 \Rightarrow \boxed{2.3\%}$$

2

What percent of households surveyed in 2000 had exactly 2 cars?

- A) 11%
- B) 25%
- C) 34%
- D) 36%

Solution:

Year 2000 → 2 cars → 128

$$\frac{128}{373} = 0.343 \rightarrow 34\%$$

3

What percent of households surveyed in 2010 had exactly 1 car?

- A) 27%
- B) 29%
- C) 32%
- D) 35%

Solution:

Year 2010 → 1 car → 135

$$\frac{135}{459} = 0.294$$

$$\Rightarrow \boxed{29\%}$$

4

25% of 300 is equal to 20% of

- A) 75
- B) 250
- C) 350
- D) 375

Solution:

$$\frac{25}{100} \cdot 300 = \frac{20}{100} \cdot x$$

$$75 = 0.2x \Rightarrow \boxed{x = 375}$$

5

	Red Marbles	Yellow Marbles
Bag 1	4	5
Bag 2	5	9
Bag 3	6	8
Bag 4	7	15

In the bags above, which bag has the greatest percentage of red marbles? Solution:

- A) Bag 1 → $\frac{4}{9} \rightarrow 44\%$
- B) Bag 2 → $\frac{5}{14} \rightarrow 35\%$
- C) Bag 3 → $\frac{6}{14} \rightarrow 42\%$
- D) Bag 4 → $\frac{7}{22} \rightarrow 31\%$

6

A store has a stock of 60 laptops and 84 tablets. During a week, the store sells 20% of laptops and 25% of tablets. What percent of total stock of laptops was sold during this week?

- A) 8.3%
B) 16.6%
C) 18%
D) 20%

Solution:

60 Laptops \rightarrow 20% \rightarrow 12 laptop sold
84 Tablets \rightarrow 25% \rightarrow 21 tablets sold

$$\frac{12}{144} = 0.083 \Rightarrow \boxed{8.3\%}$$

7

1 kilometer = 1,000 meters
1 meter = 100 centimeters
Based on the above information, how many centimeters are in 0.5 kilometers?

- A) 500,000
B) 50,000
C) 500
D) 0.05

Solution:

$$\begin{aligned} 0.5 \text{ km} &= 500 \text{ m} \\ &= 500 \cdot 100 \\ &= \boxed{50,000 \text{ cm}} \end{aligned}$$

8

In 2004, snow accumulation in Calgary was 20% higher than it was in 2003. In 2005, snow accumulation for Calgary was 15% higher than it was in 2004. The snow accumulation in 2005 was what percent higher than it was in 2003?

- A) 29%
B) 32%
C) 35%
D) 38%

Solution:

$$\begin{array}{ccc} 2003 & & 2004 & & 2005 \\ 100x & \xrightarrow[20\% \text{ higher}]{} & 120x & \xrightarrow[15\% \text{ higher}]{} & 138x \\ & \searrow & & \nearrow & \\ & & & & 138x - 100x = 38x \end{array}$$

$$\frac{38x}{100x} = 0.38 \Rightarrow \boxed{38\%}$$

9

A jacket has marked retail price \$60 but is on sale at a 25% discount. If a customer has a coupon for 12% off of the sale price, and if the sales tax is 8%, what is the final price of this jacket, including all discount and tax?

- A) \$36
B) \$39.6
C) \$42.77
D) \$45

Solution:

Retail Price \rightarrow 25% sale \rightarrow 12% coupon \rightarrow 8% tax

$$\$60 \rightarrow 60 \cdot 0.75 \Rightarrow \$45$$

$$45 (0.88) \Rightarrow \$39.6$$

$$\begin{aligned} \text{So, final price } (1.08)(39.6) &= \$42.766 \\ &= \boxed{\$42.77} \end{aligned}$$

10

If a population of bacteria increases from 100 to 220, what is the percent increase in this population?

- A) 90%
- B) 100%
- C) 120%
- D) 220%

Solution:

$$100 \rightarrow 220$$

120 increase
or $\boxed{120\%}$

11

What number is 25% less than 80?

- A) 20
- B) 60
- C) 75
- D) 80

Solution:

$$x \Rightarrow 25\% \text{ less than } 80$$

$$(0.25)(80) = 20$$

$$x = 80 - 20 = \boxed{60}$$

12

If the price of a stock declined by 30% decreased in one year and increased by 70% the next year, by what percent did the price increase over the two-year period?

- A) 9%
- B) 15%
- C) 19%
- D) 119%

Solution:

$$100x \xrightarrow[30\% \text{ decreased}]{} 70x \xrightarrow[70\% \text{ increased}]{} 119x$$

$$119x - 100x = 19x \text{ increased}$$

$$\frac{19x}{100x} = 0.19 \Rightarrow \boxed{19\%}$$

13

If the length of a rectangle is decreased by 10% but its width is increased by 30%, by what percent does its area increase?

- A) 17%
- B) 51%
- C) 91%
- D) 117%

Solution:

$$\begin{array}{l} \boxed{\text{Area} = 100xy} \quad 10y \\ \phantom{\text{Area} = 100xy} \quad 10x \end{array} \quad \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} 117xy - 100xy \\ 17xy \text{ increased} \\ \boxed{17\%} \end{array}$$

$$\begin{array}{l} \boxed{\text{Area} = 117xy} \quad 13y \\ \phantom{\text{Area} = 117xy} \quad 9x \quad \downarrow \text{30\% increased} \\ \phantom{\text{Area} = 117xy} \quad \downarrow \text{10\% decreased} \end{array}$$

1

What number is 30% greater than the sum of 40 and 80?

- A) 136
B) 144
C) 156
D) 168

Solution:

$$40 + 80 = 120$$

30% greater than 120

$$(120)(1.3) = \boxed{156}$$

2

The sum of three numbers is 216. If the greatest of these numbers is 40% more than the sum of the other two, what is the value of the greatest of these numbers?

- A) 90
B) 96
C) 116
D) 126

Solution:

$$\left. \begin{array}{l} \text{Greatest} = \xrightarrow{40\% \text{ more than}} 1.4x \\ \text{Sum of the other two numbers} = x \end{array} \right\}$$

$$\begin{aligned} 1.4x + x &= 216 \\ 2.4x &= 216 \\ x &= 90 \end{aligned}$$

Greatest of these numbers

$$(1.4)(90) = \boxed{126}$$

3

The original price of an item was marked down by 25% for a week-long sale. Since the item was not sold in the first week, it was marked down an additional p percent. If the total mark down from the original price was then 34%, what is the value of p ?

- A) 9
B) 12
C) 15
D) 16

Solution:

$$\begin{array}{l} \text{Original price } 100x \xrightarrow{25\% \text{ off}} 75x \xrightarrow{p\% \text{ off}} 66x \\ \downarrow \\ 75x - 66x = 9x \\ \frac{34}{100}(100x) = 34x \\ 100x - 34x = 66x \\ p = \frac{9x}{75x} = 0.12 \Rightarrow \boxed{12\%} \end{array}$$

4

The cost of grapes at a grocery store is normally \$6.99 per kilogram. There was a sale on grapes for 60% off the normal price. What is the sale price of the grapes to the nearest cent?

- A) \$4.20
B) \$3.29
C) \$3.20
D) \$2.80

Solution:

$$\$6.99 \rightarrow 60\% \text{ off}$$

$$\begin{aligned} &(0.4)(6.99) \\ &= \boxed{\$2.796 \approx 2.80} \end{aligned}$$

5

If a percent of 75 is 9, then a percent of what number is 15?

- A) 75
- B) 90
- C) 125
- D) 150

Solution:

$$a\% \text{ of } 75 = 9$$

$$\frac{a}{100} (75) = 9 \Rightarrow a = 12$$

$$12\% \text{ of } x \text{ is } 15$$

$$\frac{12}{100} x = 15$$

$$x = 125$$

6

The percent decrease from 15 to 9 is equal to the percent increase from 25 to x . What is the value of x ?

- A) 35
- B) 36
- C) 40
- D) 45

Solution:

$$15 \rightarrow 9 = 15 - 9 = 6 \text{ decreases}$$

$$\frac{6}{15} = 0.4 \rightarrow 40\% \text{ decreased}$$

$$25 \text{ increases } 40\% \text{ to } x$$

$$x = 25(1.4) \Rightarrow x = 35$$

7

Scientists discovered "jelly-like" fish living in one of the deepest places on earth, almost 26,246 feet below the ocean surface. Approximately how many kilometers below the sea's surface is that place? (1 meter \approx 3.28ft)

- A) 6
- B) 7
- C) 8
- D) 9

Solution:

$$\frac{26,246}{3.28} = 8,001 \text{ meters}$$

$$\approx 8 \text{ km}$$

8

A laptop was on sale for 35% off its original price. If the sale price of the laptop was \$844.35, what was the original price of the book? (Assume there is no sales tax.)

- A) \$1,259
- B) \$1,299
- C) \$1,349
- D) \$1,399

Solution:

$$\frac{\text{Original price}}{100x} \xrightarrow[35\% \text{ off sale}]{\text{}} 65x = 844.35$$

$$x = 12.99$$

$$\downarrow$$

$$(100)(12.99)$$

$$\boxed{\$1,299}$$

9

In 2015 the populations of City A and City B were equal. From 2005 to 2015, the population of City A increased by 21% and the population of City B decreased by 9%. If the population of City A was 246,589 in 2005, what was the population of City B in 2005?

- A) 279,781
B) 298,373
C) 327,882
D) 337,883

Solution:

$$\frac{100x}{1.21} = 2.64x \xleftarrow[21\%]{\text{increased}} \text{City A} = 100x \text{ (2015)}$$

$$\frac{100x}{0.91} = 109.89x \xleftarrow[9\%]{\text{decreased}} \text{City B} = 100x \text{ (2015)}$$

<u>city A</u>		<u>city B</u>
$82.64x = 246,589$		$(109.89)(2983.83)$
$x = 2983.83$		327.882

10

In a 21-game season a certain basketball player scores at least 15 points in 50% of the first 8 games, 40% of the next 7 games, and 20% in the last 6 games. In what percent of all 21 games did this player score less than 15 points?

- A) 52%
B) 62%
C) 64%
D) 66%

Solution:

at least 15 points in 50% of first 8 games
40% → next 7 games
20% → last 6 games

$$\left. \begin{array}{l} 50\% \text{ of } 8 = 4 \\ 40\% \text{ of } 7 = 2.8 \\ 20\% \text{ of } 6 = 1.2 \end{array} \right\} \begin{array}{l} 8 \text{ games at least} \\ 15 \text{ points} \end{array}$$

$$21 - 8 = 13 \text{ games less than 15 points}$$

$$\frac{13}{21} (100) \cong \boxed{62\%}$$

11

If the price of car goes up by 3%, which is \$12,000, what is the new price of the car?

- A) \$11,640
B) \$12,000
C) \$12,300
D) \$12,360

Solution:

$$\begin{array}{l} \$12,000 (1.03) = \$12,360 \\ \downarrow \\ 3\% \text{ increase} \end{array}$$

12

If 80% of the students in a classroom passed math exam and five students failed, then how students passed math exam?

- A) 20
B) 24
C) 25
D) 30

Solution:

$$\begin{array}{l} 80\% \rightarrow \text{passed} \rightarrow 20\% \text{ failed} \\ \downarrow \\ 5 \text{ students} \\ \downarrow \\ \text{Total} \Rightarrow 25 \end{array}$$

$$25 (0.8) = \boxed{20 \text{ students passed}}$$

13

If the width of a rectangle is 75% of its length. If the area of rectangle is 108 cm^2 then what is the perimeter of rectangle?

- A) 14
B) 21
C) 28
D) 42

Solution:

$$\begin{array}{l} \text{Area} = 108x^2 \\ w = 12x(0.75) \\ w = 9x \\ l = 12x \end{array}$$

$$\begin{array}{l} \text{Area} = 12x(9x) = 108 \\ 108x^2 = 108 \\ x = 1 \end{array}$$

$$l = 12; w = 9$$

$$\begin{array}{l} p = 2(l+w) = 2(12+9) \\ = 42 \text{ cm} \end{array}$$

14

A rectangular field has length 10m longer than width. If the area of this field $2,000 \text{ m}^2$ then, what is the length of wire fence that we will put around the field?

- A) 90
B) 120
C) 180
D) 240

Solution:

$$\begin{array}{l} w = x \\ l = x + 10 \end{array}$$

$$\begin{array}{l} \text{Area} = x(x+10) = 2000 \text{ m}^2 \\ x = 40 \text{ m} \end{array}$$

$$p = 2(40 + 50)$$

$$p = 180 \text{ m}$$

15

Derick wants to buy everyone in his family a notebook for Christmas. Derick has 12 members in his family, and each notebook costs \$9.00 plus a sales tax of 12%. How much money will Derick spend on his Christmas gifts?

- A) \$108
B) \$120.96
C) \$124
D) \$128

Solution:

$$\$9.12 = \$108 \text{ and } 12\% \text{ tax}$$

$$\Rightarrow 1.12(\$108)$$

$$\$120.96$$

16

Tyrone added 60 liters of a 40% alcohol solution to 20 liters of 20% alcohol solution. What is the alcohol concentration of the new solution?

- A) 35%
B) 38%
C) 40%
D) 45%

Solution:

$$\begin{array}{l} 60 \text{ liters} \rightarrow 40\% \text{ of Alcohol} \rightarrow 24 \text{ Alcohol} \\ 20 \text{ liters} \rightarrow 20\% \text{ of Alcohol} \rightarrow 4 \text{ Alcohol} \\ \hline 80 \text{ liters} \qquad \qquad \qquad 28 \text{ Alcohol} \end{array}$$

$$\frac{28}{80} \cdot 100 = 35\%$$

1

		Subjects			Total
		Biology	Chemistry	Physics	
Gender	Female	49	53	68	170
	Male	41	69	50	160
Total		90	122	118	330

A group of science school students responded to a survey that asked which science subjects they were currently enrolled. The survey data were as shown in the table above. Which of the following categories accounts for approximately 15% of all the survey respondents?

- A) Females taking Biology
 B) Males taking Physics
 C) Females taking Chemistry
 D) Males taking Biology

$$15\% \rightarrow (0.15)(330) = 49.5 \rightarrow \text{female taking biology}$$

Questions 2 and 3 refer to the following information.

Lengths of Fish (in inches)						
5	5	6	6	6	7	7
8	8	9	9	9	9	10
11	11	12	13	13	14	21

The table above lists the lengths of a random sample of 21 tilapia fish.

2

What is the mean the table shown above?

- A) 9
 B) 9.48
 C) 10
 D) 21

Solution:

21 tilapia fish

$$\text{Mean} = \frac{\text{Total length of 21 tilapia fish}}{21}$$

$$\text{Mean} = \frac{199}{21} = 9.48$$

3

The outlier measurement of 21 inches is an error. Of the mean, median, and range of the values listed, which will change the most if the 21-inch measurement is removed from the data?

- A) Range
 B) Mean
 C) Median
 D) Mode

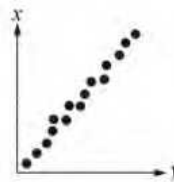
Solution:

$$\text{Range} = \text{maximum value} - \text{minimum value}$$

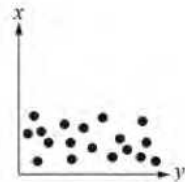
4

Which of the following graphs best shows a strong positive association between x and y ?

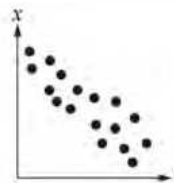
(A)



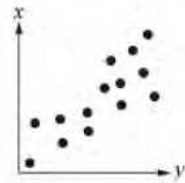
(C)



(B)

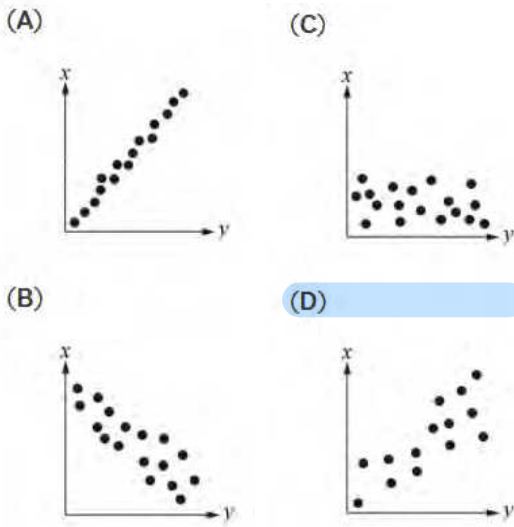


(D)



5

Which of the following graphs best shows a weak positive association between x and y ?



6

If the average of 5, 8, m , and 15 is 13, what is the value of m ?

- A) 19
- B) 21
- C) 24
- D) 52

Solution:

$$\text{Average} = \frac{5+8+m+15}{4}$$

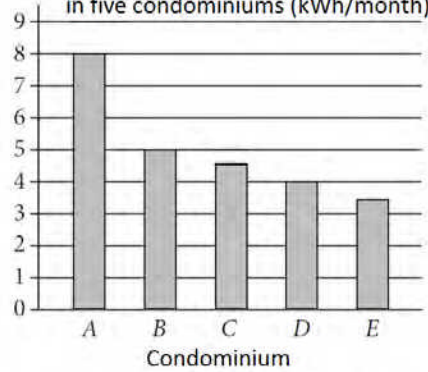
$$13 = \frac{m+28}{4}$$

$$52 = m+28$$

$$m = 24$$

7

The average usage electricity in five condominiums (kWh/month)



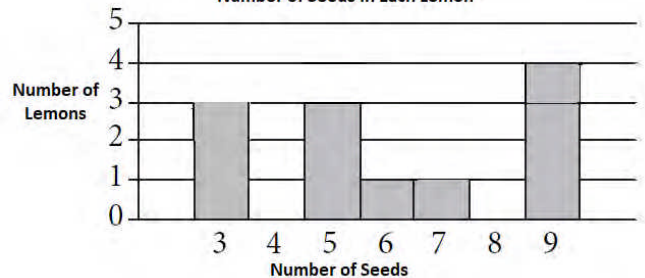
The average usage electricity in five condominiums graph above. If the total number of average usage electricity in five condominiums is 36,900 kWh, what is an appropriate label for the vertical axis on the graph?

- A) Number of average usage electricity (in tens of thousands)
- B) Number of average usage electricity (in thousands)
- C) Number of average usage electricity (in hundreds)
- D) Number of average usage electricity (in ten)

Since average is 36 900 kWh; vertical axis should be in thousand, number of average usage electricity.

8

Number of Seeds in Each Lemon



Based on the histogram above, which is the average number of seeds per lemon?

- A) 5.6
- B) 6.0
- C) 6.08
- D) 6.48

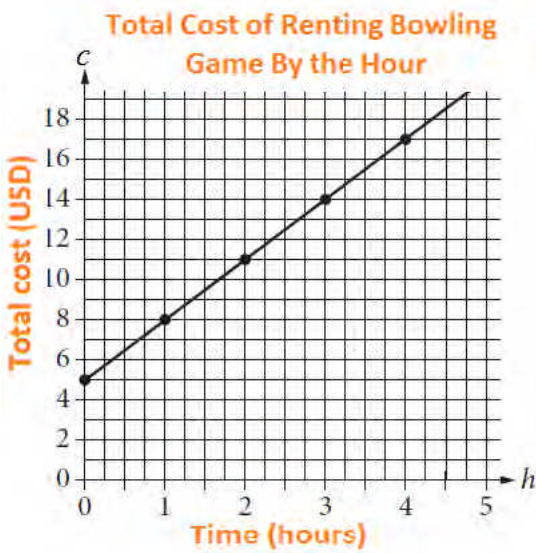
Solution:

3 seeds x 3 lemons → 9
 4 seeds x 2 lemons → 8
 5 seeds x 3 lemons → 15
 6 seeds x 1 lemons → 6
 7 seeds x 1 lemons → 7
 8 seeds x 0 lemons → 0
 9 seeds x 4 lemons → 36
 12 lemons total: 73 seeds

$$\text{Avr} = \frac{\text{total seeds}}{\text{total lemons}}$$

$$\text{Avr} = \frac{73}{12} = 6.08$$

Questions 9 and 10 refer to the following information.



10

Which of the following shows the relationship between h and c ?

A) $c = 5h - 3$

B) $c = \frac{3}{4}h + 5$

C) $c = 3h + 5$

D) $c = \frac{4}{3}h + 5$

Solution:

c-intercept is 5
 slope = $\frac{11-8}{2-1} = \frac{3}{1} = 3$
 (2, 11)
 (1, 8)
 $c = 3h + 5$

9

What does the c -intercept represent in the graph?

- A) The decrease in cost to renting bowling game per hour
- B) The total number of bowling games
- C) The total number of hours the boat is rented
- D) The initial cost of renting bowling game

Solution:

c-intercept is the initial cost of renting

11

The table below shows 45 students' favorite type of movie in an international school. If the table was shown as a pie chart, what angle would be needed to show Horror movie?

Favourite genre of film	Frequency
Comedy	12
Romance	10
Action	7
Horror	9
Drama	7
Total	45

- A) 48°
- B) 60°
- C) 72°
- D) 75°

Solution:

Horror movie = $\frac{9}{45} = \frac{1}{5}$ of pie chart
 $\frac{1}{5} (360^\circ) = 72^\circ$

Questions 1, 2 and 3 refer to the following information.

Annual Budgets for Different Programs in X city

Program	Year			
	2014	2015	2016	2017
Agriculture and resources	\$ 164,235	\$ 175,900	\$ 170,803	\$ 160,064
Education	\$ 875,450	\$ 845,300	\$ 899,750	\$1,065,800
Public Safety	\$ 264,904	\$ 288,708	\$ 306,106	\$ 301,900
Health	\$ 480,645	\$ 497,403	\$ 490,801	\$ 499,785
General government	\$ 3,099,050	\$2,963,463	\$3,067,890	\$3,127,898

The table above lists the annual budget, in thousands of dollars

1

Which of the following best approximates the average rate of change in the annual budget for Education in X city from 2014 to 2017?

- A) \$ 45,000,000 per year
- B) \$ 48,000,000 per year
- C) \$ 49,000,000 per year
- D) \$ 52,000,000 per year

Solution:

$$\begin{array}{r} \text{2017} \\ 1,065,800 \\ - \quad \text{2014} \\ 875,450 \\ \hline 190,350 \\ \div 4 \\ \hline 47.587 \end{array}$$

$$\sim \$ 48,000,000 \text{ per year}$$

2

Which of the following best approximates the average rate of change in the annual budget for General government in X from 2014 to 2017?

- A) \$ 7,200,000 per year
- B) \$ 9,200,000 per year
- C) \$ 14,400,000 per year
- D) \$ 28,800,000 per year

Solution:

$$\begin{array}{r} \text{2017} \\ 3,127,898 \\ - \quad \text{2014} \\ 3,099,050 \end{array}$$

$$= \frac{28,848}{4} = 7.212$$

$$\sim \$ 7,200,000 \text{ per year}$$

3

Of the following, which program's ratio of its 2014 budget to 2017 budget is closest to the Education program's ratio of its budget 2014 budget to its 2017 budget?

- A) General government $\rightarrow 0.99$
- B) Public safety $\rightarrow 0.87$
- C) Health $\rightarrow 0.96$
- D) Agriculture and resources $\rightarrow 1.02$

Solution:

$$\frac{\text{Education 2014}}{\text{Education 2017}} = \frac{875,450}{1,065,800}$$

$$= 0.82$$

Questions 4 and 5 refer to the following information.

Planet	Acceleration due to gravity, "g" [m/s ²]
Mercury	3.59
Venus	8.87
Earth	9.81
Moon	1.62
Mars	3.77
Jupiter	25.95
Saturn	11.08
Uranus	10.67
Neptune	14.07
Pluto	0.42

The chart above shows approximations of the acceleration due to gravity in meters per second squared in our solar system.

4

What is the weight in newtons, of an object on Mars with a mass of 80 kilograms?

- A) 21.2
B) 168.8
C) 301.6
D) 311.2

Solution:

$$\begin{aligned} \text{weight} &= \text{mass} \cdot \text{acceleration} \\ &= 80(3.77) \end{aligned}$$

$$\text{Weight} = 301.6$$

5

An object on earth has a weight of 196.2 newtons. On which planet would the same object have an approximate weight of 8.4 newtons?

- A) Mars
B) Mercury
C) Neptune
D) Pluto

Solution:

$$\begin{aligned} \text{weight} &= m \cdot g \\ 196.2 &= m(9.81) \\ m &= 20 \end{aligned}$$

$$8.4 = 20 \cdot g$$

$$g = \frac{8.4}{20} = 0.42 \rightarrow \text{pluto}$$

Questions 6 and 7 refer to the following information.

A sociologist asked each student how many siblings he or she has from primary and secondary private schools. The results are shown in the table below.

Number of siblings	Primary	Secondary
0	21	31
1	25	38
2	21	33
3	16	28
4 and more	13	26

6

What is the median number of siblings for primary school students surveyed?

- A) 0
B) 1
C) 2
D) 3

Solution:

There are 96 primary students
median is $\frac{48\text{th} + 49\text{th}}{2}$

48th and 49th students have
2 siblings. Therefore the median is 2.

7

What is the median number of siblings for secondary school students surveyed?

- A) 0
B) 1
C) 2
D) 3

Solution:

There are 156 students on secondary school
median is $\frac{78\text{th} + 79\text{th}}{2}$

78th + 79th students have 2 siblings
median is 2

8

Of the following, approximately what is the probability of three siblings in both school?

- A) 17%
B) 21%
C) 22%
D) 25%

Solution:

Total number of students

$$96 + 156 = 252$$

3 siblings $\rightarrow 16 + 28 = 44$

$$p = \frac{44}{252} = \boxed{17\%}$$

9

Results on the IGCSE Exam of High School

	Passed	Failed
Took review class	11	7
Did not take review class	8	24

The table above summarizes the results of 50 high school students who took the IGCSE exam. If one of the surveyed students who passed the exam is chosen at random for an interview, what is the probability that the person chosen did not take the review class for IGCSE exam?

- A) 11/19
B) 8/19
C) 11/50
D) 8/50

Solution:

$P(\text{passed}) \cdot P(\text{no review})$

$$\frac{19}{50} \cdot \frac{8}{19} = \boxed{\frac{8}{50}}$$

10

Gender	Age		Total
	Secondary 1	Secondary 2	
Male	22	27	49
Female	25	24	49
Total	47	51	98

The table above shows distribution of secondary school students and gender for an international high school. If one student will be selected for a competition at random, what is the probability that the student will be either a male from secondary 1 or female from secondary 2?

- A) 1/2
B) 23/49
C) 26/49
D) 29/49

Solution:

male from secondary 1 - 22
female from secondary 2 - 24
46

$$p = \frac{46}{98} = \boxed{\frac{23}{49}}$$

11

1, 3, X, X, 8, 2X, 13, 15

If the mean of data shown above is 8, what could be value of X?

- A) 5
B) 6
C) 7
D) 12

Solution:

$$\text{Mean} = \frac{1 + 3 + X + X + 8 + 2X + 13 + 15}{8}$$

$$8 = \frac{4X + 40}{8}$$

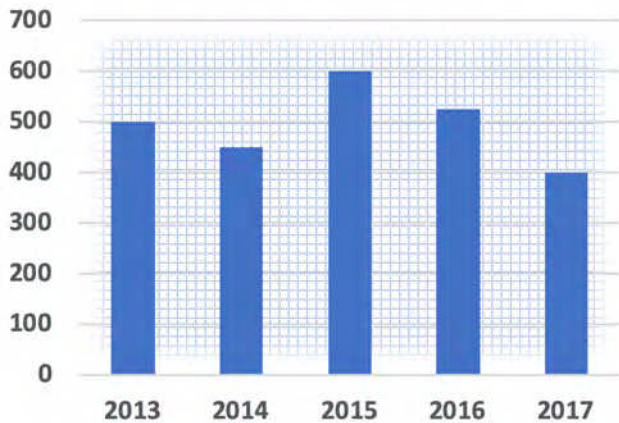
$$64 = 4X + 40$$

$$4X = 24$$

$$\boxed{X = 6}$$

Questions 1, and 2 refer to the following information.

**Hazelnut production in Turkey
(thousand tons)**



The graph above shows the hazelnut production in Turkey from 2013 to 2017.

1

What is the total production for all five years?

- A) 2,375 thousand tons
- B) 2,475 thousand tons
- C) 2,500 thousand tons
- D) 2,575 thousand tons

Solution:

$$\begin{array}{r}
 2013 \rightarrow 500 \\
 2014 \rightarrow 450 \\
 2015 \rightarrow 600 \\
 2016 \rightarrow 525 \\
 2017 \rightarrow + 400 \\
 \hline
 2,475 \text{ thousand tons}
 \end{array}$$

2

How many percentages of hazelnut did decrease from 2015 to 2016?

- A) 12.5%
- B) 14%
- C) 15%
- D) 18%

Solution:

$$\begin{array}{r}
 2015 \rightarrow 600 \\
 2016 \rightarrow -525 \\
 \hline
 75
 \end{array}$$

$$\frac{75}{600} = 0.125$$

$$\approx 12.5\%$$

3

**Number of Registered Voters in Country X in 2016, in
Thousands**

Region	Age				Total
	18 to 30	31 to 45	46 to 60	60 and older	
Region I	686	2,629	2,967	541	6,823
Region II	1,327	5,871	6,209	1,206	14,613
Region III	899	3,012	3,450	487	7,848
Region IV	598	2,247	2,798	516	6,159
Total	3,510	13,759	15,424	2,750	35,443

Based on the table, if a registered voter who was 18 to 45 years old in 2016 is chosen at random, which of the following is closest to the probability that the registered voter was from the Region II?

- A) 0.35
- B) 0.40
- C) 0.42
- D) 0.51

Solution:

18 to 45

$$\begin{array}{r}
 \text{total} = 3510 + 13759 \\
 = 17269
 \end{array}$$

$$\begin{array}{r}
 \text{Region II} = 1327 + 5871 \\
 = 7198
 \end{array}$$

$$P = \frac{7198}{17269} = 0.42$$

4

The population of Western honey bee is estimated over the 16 weeks, as shown in the table.

Weeks	Population
0	256
4	512
8	1,024
12	2,048
16	4,096

Which of the following best describes the relationship between time and the estimated population of Western honey bee during the sixteen weeks?

- A) Increasing linear
B) Decreasing linear
C) Exponential growth
D) Exponential decay

* since it is increasing geometric sequences, it should be exponential growth.

5

The table below gives the distribution of high temperatures in degrees Celsius (°C) for Manila and Baguio over the same 14 days in April.

Temperature Celsius	Manila Frequency	Baguio Frequency
16 C to 20 C	0	2
21 C to 24 C	0	5
25 C to 28 C	2	6
29 C to 31 C	5	1
32 C and above	7	0

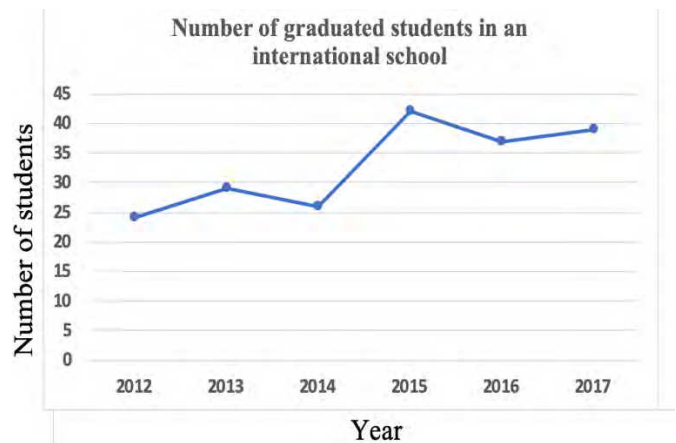
Which of the following is true about the data shown for these 14 days?

- A) The standard deviation of temperatures in Baguio is larger.
B) The standard deviation of temperatures in Manila is larger.
C) The standard deviation of temperatures in Manila is the same as that of Baguio
D) The standard deviation of temperatures in these cities cannot be calculated with the data provided

Manila 7-0, Baguio 6-1
Since Manila has more range, standard deviation is larger.

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6

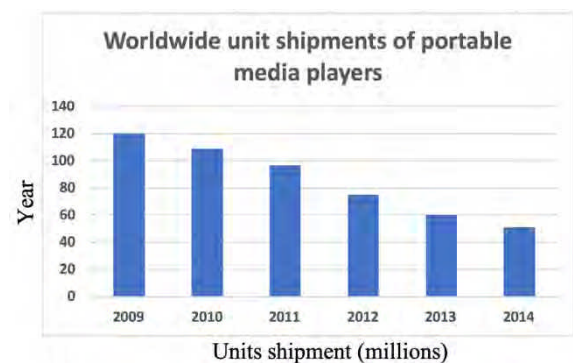


According to the line graph above, between which two consecutive years was there the greatest change in the number of graduated students?

- A) 2012–2013
B) 2013–2014
C) 2014–2015
D) 2016–2017

* Based on graph greatest change is in between 2014–2015

7



According to graph above, the number of portable media players sold in 2010 is what fraction of the number sold in 2013?

- A) 3
B) 2
C) $\frac{11}{6}$
D) $\frac{11}{7}$

Solution:

in 2010 → 110 media players
in 2013 → 60 media players

$$\frac{110}{60} = \frac{11}{6}$$

Questions 8-10 refer to the following information.

Tree Species	Growth Factor
Red Maple	4.5
Silver Maple	3.0
Sugar Maple	5.0
River Birch	3.5
White Birch	5.0
Shagbark Hickory	7.5
Green Ash	4.0
Black Walnut	4.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species.

8

According to the information in the table, what is the approximate age of Green Ash tree with a diameter of 5.5 inches?

- A) 10 years
- B) 11 years
- C) 20 years
- D) 22 years

Solution:

$$\begin{aligned} \text{Green ash} &= \text{diameter} \times \text{growth factor} \\ &= (5.5)(4) \\ &= \boxed{22 \text{ years}} \end{aligned}$$

9

If a sugar maple tree and a black walnut tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in feet, of their diameters 15 years from now? (1 foot = 12 inches)

- A) 0.35
- B) 0.63
- C) 1.3
- D) 1.6

Solution:

$$\begin{aligned} \text{Sugar maple} &\rightarrow 15(5) = 75 \text{ inch} \\ - \text{black walnut} &\rightarrow 15(4.5) = 67.5 \text{ inch} \\ \hline &7.5 \text{ inches is difference} \\ \frac{7.5}{12} &= \boxed{0.63 \text{ feet}} \end{aligned}$$

10

According to the information in the table, what is the approximate age of River Birch tree with a diameter of 1 foot and 4 inches? (1 foot = 12 inches)

- A) 16 years
- B) 48 years
- C) 54 years
- D) 56 years

Solution:

$$\begin{aligned} 1 \text{ foot and } 4 \text{ inches} &= 12 \text{ inches} + 4 \text{ inches} \\ &= 16 \text{ inches} \\ \text{Growth factor of River Birch is } &3.5 \\ \text{Age} &= 16(3.5) \\ &= \boxed{56 \text{ years}} \end{aligned}$$

1

Where Do Students Get Most of College Admission Information?

Sources	Percent of Survey
College Counselor	61%
Adviser	14%
Internet	13%
Magazines/brochures	8%
TV and Other	4%

The table above shows a summary of 450 responses to a survey question. Based on the table, how many of those surveyed get most of their College admission information from either College Counselor or the Internet?

- A) 74
B) 148
C) 333
D) 378

Solution:

College Counselor \rightarrow 61%
Internet \rightarrow 13%
74%

$$74\% \text{ of } 450 \\ = (0.74)(450) \\ = \boxed{333}$$

2

The members of a school council wanted to assess the opinions of all students about cancellation of Mediterranean Food Festival in upcoming school events. The school council surveyed a sample of 156 students who are studying in high school. The survey showed that the majority of students were in favor of not cancellation of program. Which of the following is true about the school council's survey?

- A) It shows that the majority of students are in favor of the Mediterranean Food Festival.
B) The survey sample should have included more students who are not studying in school.
C) The survey sample should have consisted all of parents.
D) The survey sample is unbiased because elementary school students are not included.

Questions 3-5 refer to the following information.

Turkish Ice Cream and Topping Selections

		Flavor	
		Vanilla	Ube
Topping	Hot Fudge	13	8
	Nuts	8	7

The table above shows the flavors of Turkish ice cream and the toppings chosen by the people at store. Each person chose one flavor of ice cream and one topping.

3

Of the people who chose Ube ice cream, what fraction chose hot fudge as a topping?

- A) $\frac{2}{9}$
B) $\frac{7}{15}$
C) $\frac{8}{15}$
D) $\frac{8}{21}$

Solution:

Ube $\left\{ \begin{array}{l} \text{Hot fudge} = 8 \\ \text{Nuts} = 7 \\ \hline \text{total: } 15 \end{array} \right.$

$$\frac{\text{Hotfudge}}{\# \text{ of ube ice cream}} = \frac{\boxed{8}}{\boxed{15}}$$

4

Of the people who chose Vanilla ice cream, what fraction chose nuts as a topping?

- A) $\frac{2}{9}$
 B) $\frac{7}{15}$
 C) $\frac{8}{15}$
 D) $\frac{8}{21}$

Solution:

$$\begin{array}{l} \text{Vanilla} \left\{ \begin{array}{l} \text{hot fudge} = 13 \\ \text{nuts} = 8 \end{array} \right. \\ \hline \text{total} = 21 \\ \hline \frac{\text{nuts}}{\# \text{ of vanilla}} = \frac{8}{21} \end{array}$$

5

If one person will be selected at random, what is the probability that the person will be chosen Ube ice cream with nuts as topping?

- A) $\frac{7}{36}$
 B) $\frac{7}{15}$
 C) $\frac{15}{36}$
 D) $\frac{7}{8}$

Solution:

Ube \rightarrow nuts as topping $\rightarrow 7$

$$\frac{7}{15+21} = \frac{7}{36}$$

6

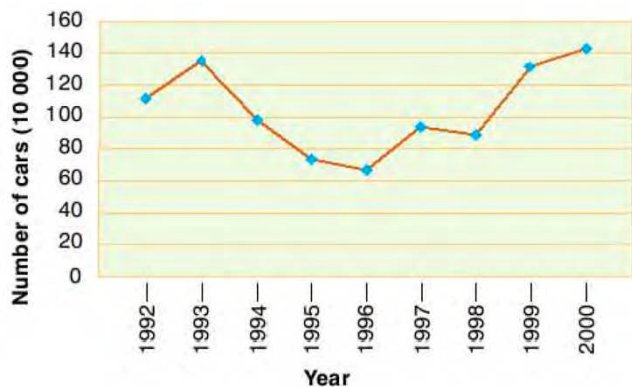
Lengths (inches)

Mathew	1.8	2.1	3.4	2.4	2.8
Marxia	1.5	x	3.2	4.1	2.9

Mathew and Marxia bought five finger bananas, and the lengths of the finger bananas are shown in the table above. The mean of the lengths of the finger bananas Marxia collected is 0.3 inch greater than the mean of the finger bananas Mathew collected. What is the value of x ?

- A) 1.5
 B) 2.3
 C) 2.5
 D) 2.9
- Solution:
 $\text{Mean}_{\text{mathew}} = \frac{1.8+2.1+3.4+2.4+2.8}{5}$
 $\text{Mean}_{\text{mathew}} = 2.5$
 * The mean of marxia is 0.3 inch greater than the mean of mathew; $2.5+0.3 = 2.8$
 $2.8 = \frac{1.5+x+3.2+4.1+2.9}{5} \Rightarrow 14 = x+11.7$
 $x = 2.3$

7



The graph shown above is the number of cars produced by a car company between 1992 and 2000.

According to the line graph above, between which two consecutive years was there the greatest change in the number of produced cars?

- A) 1992–1993 $\rightarrow \sim 20$
 B) 1996–1997 $\rightarrow \sim 25$
 C) 1998–1999 $\rightarrow \sim 40$ (highest)
 D) 1999–2000 $\rightarrow \sim 10$

Questions 8-10 refer to the following information.

The bar graph below compares different causes of death in the United States for the year 1999.



8

Of the following, what was the most common cause of death?

- A) Alcohol → 81
 B) AIDS → 17
 C) Suicide → 30
 D) Smoking → 430 (highest)

9

Of the following, what is the ratio of number of deaths caused by alcohol to the number of deaths caused by suicide?

- A) 10/27
 B) 81/111
 C) 111/81
 D) 27/10

Solution:

$$\frac{\text{by alcohol}}{\text{by suicide}} = \frac{81}{30} = \frac{27}{10}$$

10

On average, approximately how many people died per day in 1999? (consider that 1 year=365 days)

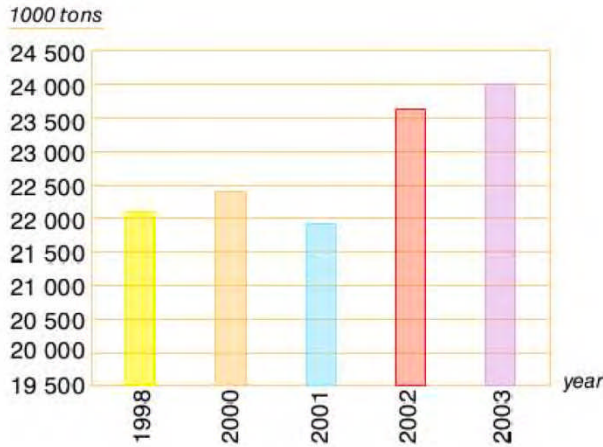
- A) 1,732 per day
 B) 17,320 per day
 C) 173,200 per day
 D) 632,000 per day

Solution:

$$\begin{aligned} \text{total deaths} &\rightarrow 17 + 81 + 41 + 19 + 14 + 30 + 430 \\ &= 632,000 \\ \text{per day} &= \frac{632,000}{365} = 1,731.5 \\ &\sim \boxed{1732} \end{aligned}$$

1

The bar graph below shows the vegetable production (measured in thousands of tons) in country X between 1998 and 2003.



Of the following, approximately what is the total production from 1998 to 2003?

- A) 110,000 tons
- B) 112,000 tons
- C) 114,000 tons
- D) 118,000 tons

Solution:

$$\begin{array}{r}
 22,000 \\
 22,500 \\
 22,000 \\
 23,500 \\
 + 24,000 \\
 \hline
 114,000 \text{ tons}
 \end{array}$$

2

The causes of 1,440 fires in a city are listed below.

Cause	Number
Electrical	367
Cooking	268
Children	98
Naked flames	120
Cigarette	188
Arson	210
Unknown	189

Of the following, what is the percentage of fires caused by electrical?

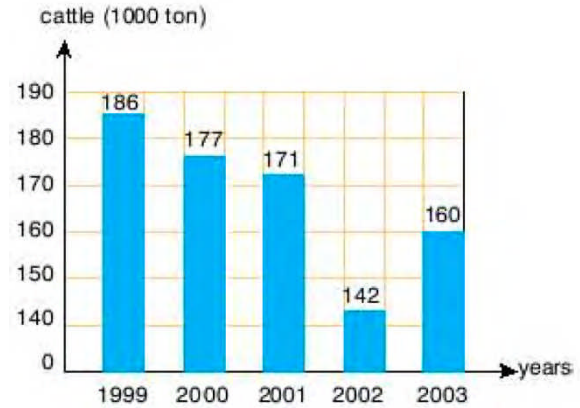
- A) 13.1%
- B) 14.5%
- C) 18.6%
- D) 25.4%

Solution:

$$\frac{\text{by Electrical}}{\text{Total causes}} = \frac{367}{1440} = 0.254 = 25.4\%$$

3

The bar graph shows the number of cattle (measured in thousands of ton) in Country X in between 1999 and 2003.



Of the following, approximately what is the average number of cattle between 1999 to 2002?

- A) 154.7 tons
- B) 164.7 tons
- C) 169.0 tons
- D) 837.0 tons

Solution:

$$\begin{aligned}
 &= \frac{186 + 177 + 171 + 142}{4} \\
 &= 169 \text{ tons}
 \end{aligned}$$

4

In a fast food restaurant, the following orders are taken. What is the mode of given data?

pizza, hot dog, chips, pizza, chips, chips, pizza, sandwich, hot dog, pizza, chips, sandwich, chips

- A) pizza
- B) chips
- C) hot dog
- D) sandwich

Solution:

mode → most occurring item

$$\begin{aligned}
 \text{chips} &= 5 \\
 \text{pizza} &= 4 \\
 \text{hotdog} &= 2 \\
 \text{sandwich} &= 2
 \end{aligned}$$

5

The following temperatures were recorded in a week.

10°C , 7°C , 9°C , 11°C , 13°C , 11°C , 14°C

What is the median of the given data?

- A) 9°C
 B) 10.7°C
 C) 11°C
 D) 12°C

Solution:

7°C , 9°C , 10°C , 11°C , 11°C , 13°C , 14°C
 ↓
 median

Questions 6-8 refer to the following information.

Number of visitors to a restaurant on each day of a month

18	21	24	24	28	27
20	31	37	42	33	39
27	24	32	38	43	41
29	27	34	37	41	43
21	24	28	35	36	39

The data shown above is the number of visitors to a restaurant on each day of the month.

$18 - 20 - 21 - 21 - 24 - 24 - 24 - 24$
 $27 - 27 - 27 - 28 - 28 - 29 - 31 - 32$
 $33 - 34 - 35 - 36 - 37 - 37 - 38 - 39$
 $39 - 41 - 41 - 42 - 43 - 43$

6

Of the following, what is the mean?

- A) 24
 B) 29.8
 C) 30.4
 D) 31.3

Solution:

$$\text{Mean} = \frac{\text{Total \# of visitor}}{\# \text{ of days}} = \frac{939}{30} = \boxed{31.3}$$

7

Of the following, what is the median?

- A) 29
 B) 30.5
 C) 33
 D) 34

Solution:

$$\text{Median} = \frac{15^{\text{th}} + 16^{\text{th}}}{2} = \frac{31 + 32}{2} = \boxed{30.5}$$

8

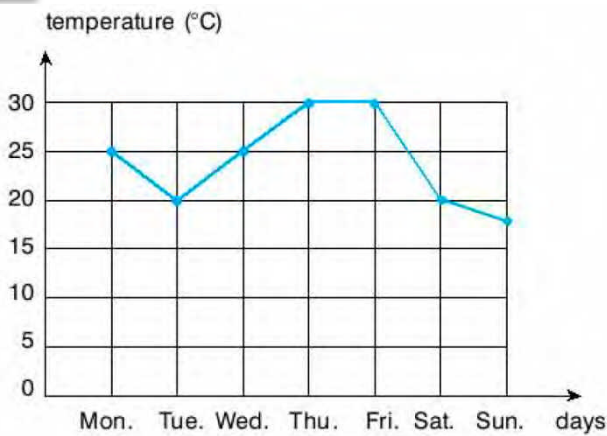
Of the following, what is the mode?

- A) 24
 B) 27
 C) 37
 D) 39

Solution:

24 appeared the most; 4 times.
 Mode is 24.

9



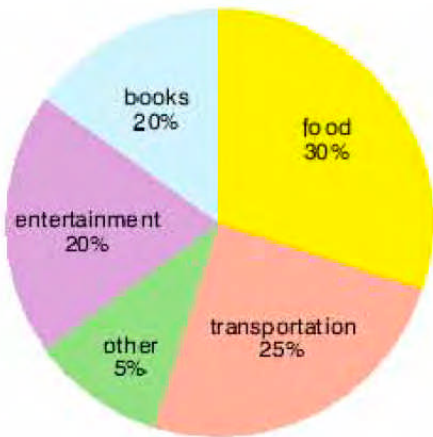
The line graph above shows the average daily temperature in a city for each day of a week in August. What is the average temperature of the week?

- A) 17°C
- B) 19°C
- C) 20°C
- D) 24°C

Solution:

$$\frac{25 + 20 + 25 + 30 + 30 + 20 + 18}{7} = 24^{\circ}\text{C}$$

10



A high school student receives \$30 pocket money a week. The circle graph above shows how student spends his pocket money. How much does student spend on transportation?

- A) \$4
- B) \$6
- C) \$7.5
- D) \$9

Solution:

$$25\% \Rightarrow 0.25(30) = \$7.5$$

Questions 11-12 refer to the following information.

15	22	19	8	14
12	25	20	10	9
24	21	15	12	28
26	19	11	14	6

11

What is the mean of data set is shown above?

- A) 14
- B) 15.75
- C) 16.50
- D) 17.25

Solution:

$$\begin{aligned} &6 - 8 - 9 - 10 - 11 - 12 - 12 - 14 - 14 - 15 - 15 \\ &19 - 19 - 20 - 21 - 22 - 24 - 25 - 26 - 28 \\ \text{mean} &= \frac{330}{20} = 16.5 \end{aligned}$$

12

What is the median of data set is shown above?

- A) 15
- B) 17
- C) 19
- D) 20

Solution:

$$\text{median} = \frac{10^{\text{th}} + 11^{\text{th}}}{2} = \frac{15 + 15}{2} = 15$$

Questions 1-3 refer to the following information.

Number of Contestants by Score and Day

Days/Points	5	4	3	2	1	0	Total
Day 1	3	2	5	1	3	2	16
Day 2	1	3	4	3	3	2	16
Day 3	3	2	5	4	1	1	16
Total	12	11	17	10	8	5	48

The same 16 contestants, on each of 3 days, answered 5 questions in order to win a gold medal. Each contestant received 1 point for each correct answer. The number of contestants receiving a given score on each day is shown in the table above.

1

Of the following, approximately What is the mean score of the contestants on Day 2?

- A) 2.4
- B) 2.6
- C) 2.8
- D) 2.9

Solution:

$$\begin{aligned} \text{Mean} &= \frac{5.1 + 4.3 + 3.4 + 2.3 + 1.3 + 0.2}{16} \\ &= \frac{38}{16} \\ &= 2.375 \sim \boxed{2.4} \end{aligned}$$

2

Of the following, approximately What is the median score of the contestants on Day 3?

- A) 2.5
- B) 3.0
- C) 3.5
- D) 3.6

Solution:

$$\begin{aligned} \text{Mean} &= \frac{5.3 + 4.2 + 3.5 + 2.4 + 1.1 + 0.1}{16} \\ &= \frac{47}{16} = 2.9375 \\ &\sim \boxed{3.0} \end{aligned}$$

3

Of the following, approximately What is the men score of the contestants in end of program?

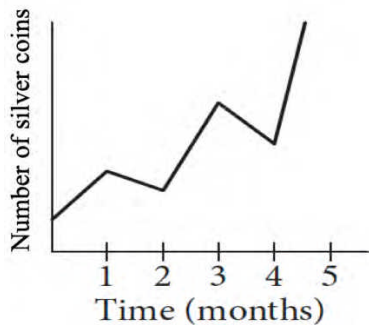
- A) 2.55
- B) 3.66
- C) 3.75
- D) 3.81

Solution:

$$\begin{aligned} \text{Mean} &= \frac{5.12 + 4.11 + 3.17 + 2.10 + 1.8 + 0.5}{48} \\ &= \frac{183}{48} \\ &= \boxed{3.81} \end{aligned}$$

4

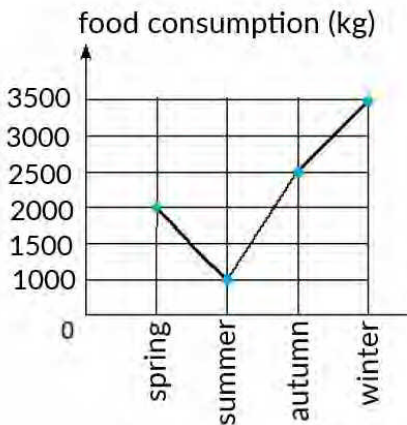
Sarah collects silver coins and she tracks the number of silver coins in her collection on the graph below.



On what interval did the number of silver coins increase the fastest?

- A) Between 1 and 2 months
- B) Between 2 and 3 months
- C) Between 3 and 4 months
- D) Between 4 and 5 months

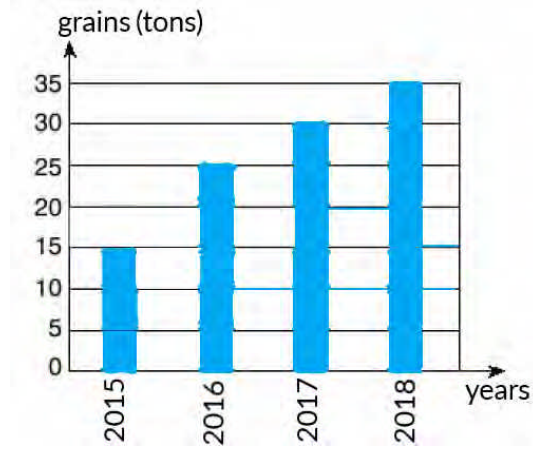
5



The line graph above is shown the food consumption of the animals on a farm for each season of a year. What is the total food consumption for the year?

- A) 7,500 kg
 - B) 8,000 kg
 - C) 9,000 kg
 - D) 9,500 kg
- Solution:**
- $$\begin{array}{r}
 2\ 000 \\
 1\ 000 \\
 2\ 500 \\
 +\ 3\ 500 \\
 \hline
 9\ 000\ \text{kg}
 \end{array}$$

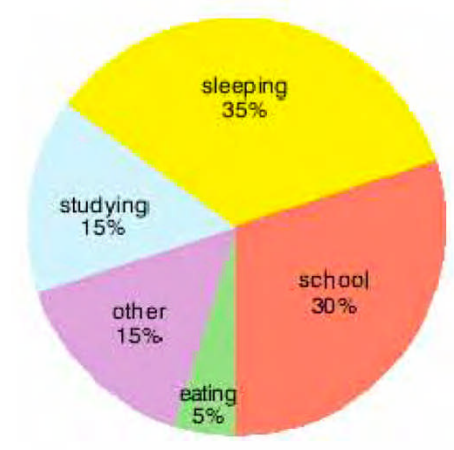
6



The bar graph above shows the amount of grains produced by a farm between 2015 and 2018. What is the percentage increase in the production from 2016 to 2018?

- A) 25 %
 - B) 30 %
 - C) 35 %
 - D) 40 %
- Solution:**
- 2016-2018
- $$25 - 35 \Rightarrow 10 \text{ tons increased}$$
- $$\frac{10}{25} = 0.4 \Rightarrow 40\%$$

7



The circle graph above shows how a high school student spends the twenty-four hours of a typical day. How many hours does the student spend at school?

- A) 3.6 hours
 - B) 7.2 hours
 - C) 8 hours
 - D) 9 hours
- Solution:**
- 30% → at school
- $$(0.3)(24) = 7.2 \text{ hours}$$

Questions 8 and 9 refer to the following information.

The following data shows the monthly cost in USD of Sean's electricity bill for first nine months of 2019.

\$33, \$27, \$24, \$42, \$16, \$28, \$30, \$43, \$36

8

Of the following, what is the mean of this data?

- A) \$29
- B) \$30
- C) \$31
- D) \$31.9

Solution:

$$16 - 24 - 27 - 28 - 30 - 33 - 36 - 42 - 43$$

$$\text{Mean} = \frac{270}{9} = \boxed{\$30}$$

9

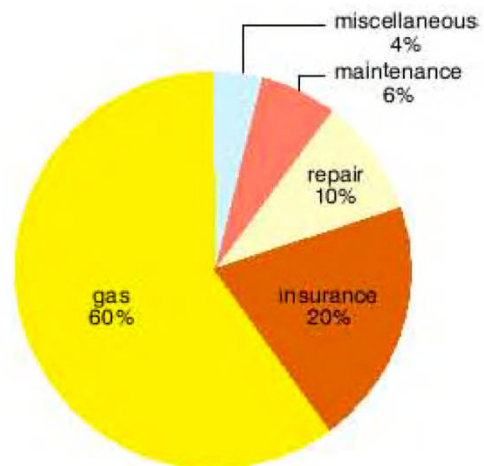
Of the following, what is the median of this data?

- A) \$29
- B) \$30
- C) \$31
- D) \$31.5

Solution:

Median is the 5th term
which is \$30.

10



The circle graph above shows the annual operating expenses for a school bus. The total expenses were \$6,400. How much was spent on repair for the school bus?

- A) \$ 256
- B) \$ 384
- C) \$ 640
- D) \$ 1,280

Solution:

$$\begin{aligned} \text{repair} &\rightarrow 10\% \\ \$6,400 &(0.1) \\ &= \$640 \end{aligned}$$

1

The arithmetic mean of a , b , and c is 42. The arithmetic mean of a , b , c , and d is 48. What is the value of d ?

- A) 18
B) 32
C) 66
D) 84

Solution:

$$\frac{a+b+c}{3} = 42 \quad \wedge \quad \frac{a+b+c+d}{4} = 48$$

$$a+b+c = 126; \quad \underbrace{a+b+c+d}_{126+d} = 192$$

$$126 + d = 192$$

$$d = 192 - 126$$

$$\boxed{d = 66}$$

2

The arithmetic mean of twelve number is 19. The mean of different set of five number is 13. What is the mean of combined the two sets of numbers?

- A) 16.34
B) 17.24
C) 18.04
D) 19.36

Solution:

$$\text{Mean} = \frac{\text{Sum of 12 numbers}}{12} = 19$$

$$\text{sum of 12 numbers} = 228$$

$$\frac{\text{another set of sum of 5 numbers} = 13}{5}$$

$$\text{sum of 5 numbers} = 65$$

$$\text{New mean} = \frac{228 + 65}{12 + 5} = \frac{293}{17}$$

$$\boxed{\text{New mean} = 17.24}$$

3

The arithmetic mean of two number m and n is 112, and m is three times n . what is value of m ?

- A) 28
B) 56
C) 112
D) 168

Solution:

$$m + n = 112 \quad \wedge \quad m = 3n$$

$$m + n = 224$$

$$3n + n = 224$$

$$4n = 224$$

$$n = 56$$

$$m = 3(56)$$

$$\boxed{m = 168}$$

4

2, 7, 6, 10, 8, 12, 16, 14, 15

What is the difference between the mean and the median of given date set shown above?

- A) 0
B) 1
C) 2
D) 3

Solution:

$$2 - 6 - 7 - 8 - 10 - 12 - 14 - 15 - 16$$

$$\downarrow$$

$$\text{median} = 10$$

$$\text{mean} = \frac{2+6+7+8+10+12+14+15+16}{9} = \frac{90}{9}$$

$$\text{mean} = 10$$

$$\text{mean} - \text{median} = 10 - 10 = \boxed{0}$$

Questions 5 and 6 refer to the following information.

Customer Purchases at a Gas Station

	Food purchased	Food not purchased	Total
Diesel purchased	56	32	88
Diesel not purchased	23	19	42
Total	79	51	130

On Sunday, a local gas station had 130 customers. The table above summarizes whether or not the customers on Sunday purchased diesel, a food, both, or neither.

5

What is the probability that a gas station customer selected at random on that day did not purchase food?

- A) $32/52$
- B) $19/42$
- C) $32/88$
- D) $51/130$

Solution:

Food not purchased = 51

$$\frac{51}{130}$$

6

What is the probability that a gas station customer selected at random on that day purchase diesel?

- A) $32/88$
- B) $56/88$
- C) $88/130$
- D) $79/88$

Solution:

Diesel purchased $\rightarrow 88$

$$\frac{88}{130}$$

7

The weights, in kilograms, for 20 cows in a barn were reported, and the mean, median, range, and standard deviation for the data were found. The cow with the highest reported weight was found to actually weigh 16 kg more than its reported weight. What value remains unchanged if the found values are reported using the corrected weight?

- A) Mean
- B) Median
- C) Range
- D) Standard deviation

Solution:

median will not change since it is the middle term of the data.

8

Blood Type				
Rhesus Factor	A	B	AB	O
+	27	11	x	32
-	9	3	2	1

Human blood can be classified into four common blood types—A, B, AB, and O. It is also characterized by the presence (+) or absence (–) of the rhesus factor. The table above shows the distribution of blood type and rhesus factor for a group of people. If one of these people who is rhesus negative (–) is chosen at random, the probability that the person has blood type B is $\frac{1}{31}$. What is the value of x ?

- A) 6 **Solution:**
 B) 8 rhesus (-) = $9 + 3 + 2 + 1 = 15$
 C) 11 $\frac{15}{x+85} \cdot \frac{3}{15} = \frac{1}{31} \Rightarrow \frac{3}{x+85} = \frac{1}{31}$
 D) 13 $93 = x + 85, \boxed{x = 8}$

Questions 9 and 10 refer to the following information.

International Tourist Arrival in millions

Rank ↕	Destination ↕	International tourist arrivals (2018) ^[1]	International tourist arrivals (2017) ^[1]
1	France	89.4 million	86.9 million
2	Spain	82.8 million	81.9 million
3	United States	79.6 million	76.9 million
4	China	62.9 million	60.7 million
5	Italy	62.1 million	58.2 million
6	Turkey	45.8 million	37.6 million
7	Mexico	41.4 million	39.3 million
8	Germany	38.9 million	37.5 million
9	Thailand	38.3 million	35.5 million

The table above shows the number of international tourist arrivals, rounded to the nearest tenth of a million, to the top nine tourist destinations in both 2017 and 2018

9

Based on the information given in the table, how much greater, in millions, was the median number of international tourist arrivals to the top nine tourist destinations in 2018 than the median number in 2017, to the nearest tenth of a million?

- A) 3.6 million
 B) 3.9 million
 C) 4.1 million
 D) 4.5 million

Solution:

median is #5 Italy

$$62.1 - 58.2 = \boxed{3.9 \text{ million}}$$

10

The number of international tourist arrivals in Turkey in 2017 was 9% greater than in 2016. The number of international tourist arrivals in Turkey was m million more in 2017 than in 2016. What is the value of m to the nearest integer?

- A) 3
 B) 4
 C) 5
 D) 6

Solution:

$$\begin{array}{ccc} \frac{2016}{34.5} & \frac{2017}{37.6} & \rightarrow 37.6 - 34.5 \\ & \nearrow 9\% \text{ more} & \underline{3.1 \text{ million}} \\ \frac{37.6}{1.09} = 34.5 & & \boxed{m = 3} \end{array}$$

1

Data A	1	2	2	4	5	6
Data B	1	2	3	4	6	6

The table above shows two lists of numbers. Which of the following is a true statement comparing data A and data B?

- A) The means are different, and the standard deviations are the same.
- B) The means are the different, and the standard deviations are the different.
- C) The means are the same, and the standard deviations are the same.
- D) The means are the same, and the standard deviations are different.

2

Survey Results	
Answer	Percent
Always	27.20%
Often	20.40%
Sometimes	18.60%
Rarely	12.30%
Never	21.50%

The table above shows the results of a survey. Based on the table, which of the following is closest to the probability that a participant answered “Often” given that participant did not answer “Never”?

- A) 0.26
- B) 0.28
- C) 0.31
- D) 0.33

Solution:

$$\frac{\text{All}}{100} - \frac{\text{Never}}{21.5} = 78.5$$

$$\frac{\text{often}}{78.5} = \frac{20.4}{78.5}$$

$$= \boxed{0.26}$$

3

The maximum value of a data set consisting of 18 positive integers is 77. A new data set consisting of 19 positive integers is created by including 86 in the original data set. Which of the following measures must be nine greater for the new data set than for the original data set?

- A) The mean
- B) The median
- C) The range
- D) The standard deviation

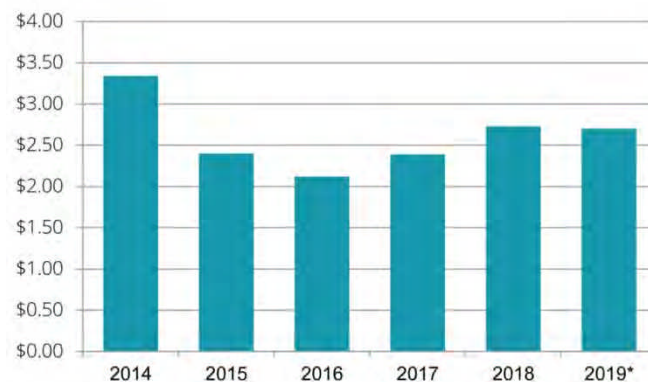
Solution:

$$\begin{array}{r} \text{18th term} \\ \text{77} \\ \text{max value} \end{array} \quad \begin{array}{r} \text{19th term} \\ \text{included} \\ \text{86} \end{array}$$

★ Range will be 9 more than previous data since 86 was included as 19th term off new data

4

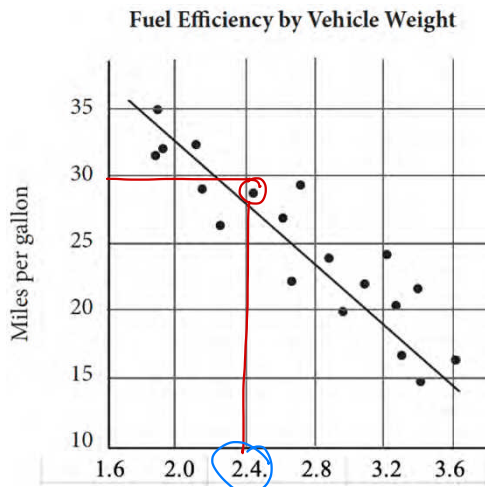
Yearly U.S national average price of gasoline



The figure above shows the average annual gas price in U.S from 2014 to 2019. Based on the graph shown, which of the following conclusions valid?

- A) The price more than doubled between 2016 and 2018.
- B) The drop-in price from 2014 to 2016 was more than \$1.00 per gallon.
- C) A gallon of gas cost more in 2017 than in 2018.
- D) The overall change in price was greater between 2017 and 2019 than it was between 2014 and 2016.

5



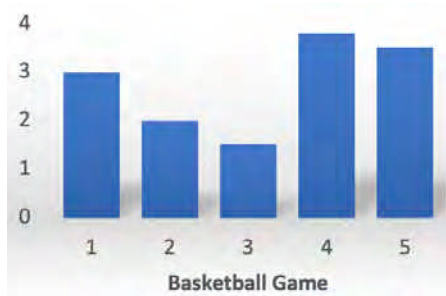
The scatterplot above shows the fuel efficiency, in miles per gallon, of a variety of vehicles weighing between 1.6 and 3.6 tons. Based on the line of best fit to the data represented, which of the following is the closest to the expected miles per gallon of a vehicle that weighs 2.4 tons?

- A) 21
- B) 25
- C) 27
- D) 29

Solution:

It is close to 30.
It can be 29 according to best time

6



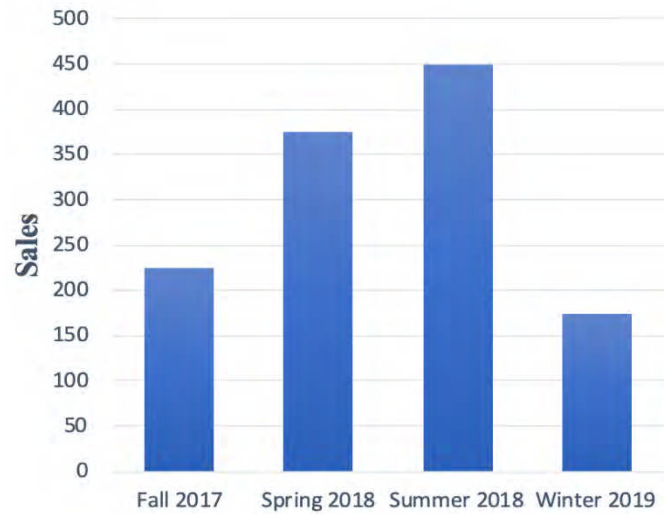
The chart above shows the number of fans in attendance for basketball games. If the total number of fans for all five games was 143,759, what is an appropriate label for the vertical axis?

- A) Fans in attendance (in hundreds)
- B) Fans in attendance (in thousands)
- C) Fans in attendance (in tens of thousands)
- D) Fans in attendance (in millions)

Solution:

$$\frac{143\ 759}{3+2+1.5+3.8+3.5} \sim \text{tens of thousands}$$

7

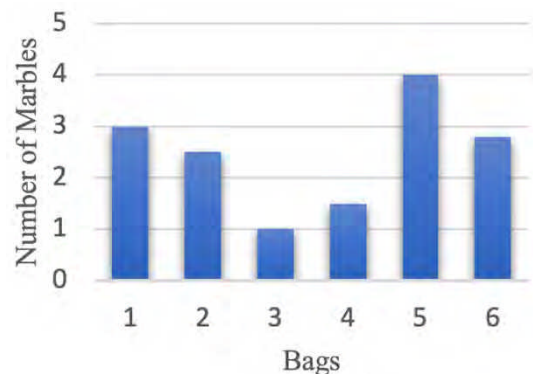


The graph above shows a sale in department store. Based on the given data, what was the approximate percent increase from fall 2017 to summer 2018?

- A) 75%
- B) 100%
- C) 125%
- D) 150%

225 → 450
225 increased
which is 100%

8



The graph above shows the distribution of number of the marbles in the six bags. Which of the following is the closest to the average number of marbles for the six bags represented?

- A) Bag 1
- B) Bag 2
- C) Bag 4
- D) Bag 6

Solution:

$$\begin{aligned} & 3 + 2.5 + 1 + 1.5 + 4 + 2.5 \\ & = \frac{14.5}{6} \\ & = \boxed{2.4} \end{aligned}$$

1

While out of a run, three joggers with an average age of 46 are joined by a group of four more joggers with an average age of t . If the average of the group of seven joggers is 39, which of the following must be true about average age of the group of four joggers?

- A) $t = 30$
 B) $t < 30$
 C) $30 < t < 33$
 D) $33 < t < 36$

Solution:

$$\frac{3 \cdot 46 + 4t}{7} = 39$$

$$138 + 4t = 273$$

$$4t = 135$$

$$t = 33.75$$

2

During Business class, Ms. Flor administers 4 quizzes. Each student receives a score between 0 and 100 inclusive. If a student in Ms. Flor's class has an average score of 81 on the first three quizzes, what is lowest score the student can score on the fourth quiz and still be able to pass class with passing score of 75?

- A) 54
 B) 57
 C) 70
 D) 75

Solution:

$x \rightarrow$ Lowest score in fourth quiz

$$75 = \frac{81 \cdot 3 + x}{4}$$

$$300 = 243 + x$$

$$x = 57$$

3

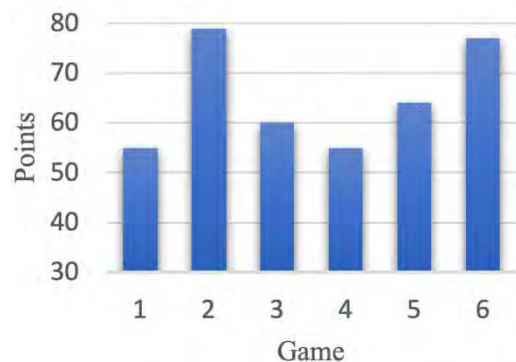
In summer classes, the median age of the high school students is 14. If there are 19 students in summer classes, which of the following must be true?

- I. If there is 12-year-old student, there is also a 16-year-old. \times
 II. The mode of summer classes students' age is 14. \times
 III. At least one of students is 14-year-old.

- A) III only
 B) I and II only
 C) I and III only
 D) I, II, and III

\rightarrow The median is 14

4



The Xavier high school basketball team has played six games for the first quarter of season. The graph shows the team's total points for each game. Based on the graph information, which of the following must be true?

- I. The mean is greater than mode. \checkmark
 II. The median is greater than range. \checkmark
 III. The mode is greater than mean \times

- A) I only
 B) I and II only
 C) II and III only
 D) I, II, and III

Solution:

55 - 55 - 60 - 65 - 77 - 79
 mode = 55 ; median = 62.5
 mean = 65 ; range = 24

5

Bernice	Jade	Rose	Liza	John	Joe	Apple
5' 8"	5' 5"	5' 10"	x	5' 11"	6' 3"	5' 3"

Based on the table, if x is the median height for staff, which of the following could be Liza's height?

- A) 5' 65"
- B) 5' 75"
- C) 5' 9"
- D) 5' 10.5"

Solution:

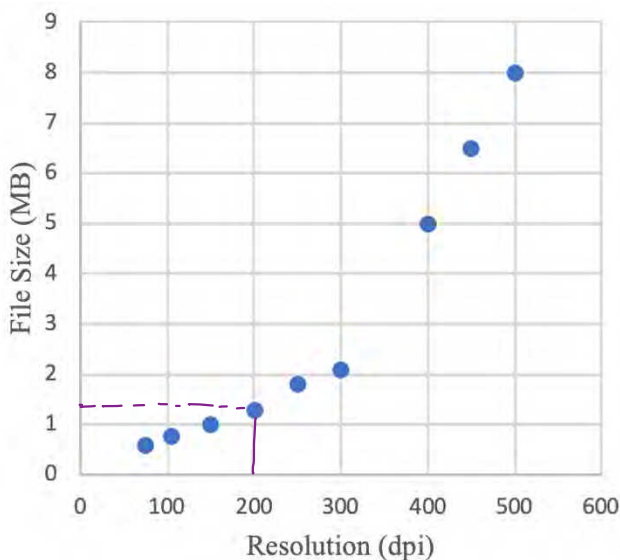
$$5' 3" - 5' 5" - 5' 8" - 5' 10" - 5' 11" - 6' 3"$$

$$5' 8" < \underline{x} < 5' 10"$$

$$5' 9"$$

Questions 6-8 refer to the following information.

The scatterplot graph below shows document scan resolution and file size.



6

What type of function does scatterplot closely resemble?

- A) Logarithmic
- B) Linear
- C) Exponential
- D) Moving Average

Solution:

The scatterplot is exponential

7

What is the best estimate for file size based on 200 dpi?

- A) 0.9 MB
- B) 1.0 MB
- C) 1.1 MB
- D) 1.3 MB

Solution:

Based on the graph, it can be 1.3 MB

8

What is the mean of data is given in the scatterplot?

- A) 2.45
- B) 3.00
- C) 3.25
- D) 3.45

Solution:

$$\frac{0.6 + 0.8 + 1 + 1.3 + 1.9 + 2.1 + 5 + 6.5 + 8}{9} \approx 3$$

9

Stuffed Animal	Price
Bear	\$ 9.25
Dinosaur	\$ 13.60
Panda	\$ 9.75
Rabbit	\$ 7.50
Monkey	\$ 8.75

Rose bought one of each of the five stuffed animals in the above list. What is the difference between mean and median price for the five stuffed animals?

- A) \$0.52
 B) \$4.25
 C) \$9.25
 D) \$9.75

Solution:

$$7.5 - 8.75 - 9.25 - 9.75 - 13.60$$

↓
median

$$\text{mean} = 9.77$$

$$9.77 - 9.25 = 0.52$$

Questions 10-12 refer to the following information.

Imelda goes bird watching for 21 days. The number of birds he sees each day are:

11, 5, 13, 16, 10, 12, 17, 9, 11, 14, 20, 10, 10, 7, 9, 13, 7, 10, 6, 13, 8

median ↑

5 - 6 - 7 - 7 - 8 - 9 - 9 - 10 - 10 - 10 - 10 - 10 - 10 - 11 - 11 - 12 - 13 - 13 - 13 - 14 - 16 - 17 - 20

10

What is the mean of data set is shown above?

- A) 10
 B) 11
 C) 12.50
 D) 13

Solution:

$$\text{mean} = \frac{231}{21} = 11$$

11

What is the median of data set is shown above?

- A) 9
 B) 10
 C) 11
 D) 12

Solution:

median is the 11th term
 which is 10

12

What is the difference of median and mode of data set is shown above?

- A) 0
 B) 1
 C) 1.5
 D) 3

Solution:

$$\begin{array}{r} \text{mode is } 10 \\ \text{median is } 10 \\ \hline 10 - 10 = 0 \end{array}$$

1

The mean score of 10 players in a basketball game was 9.1 points. If the highest individual score is removed, the mean score of the remaining 9 players is 7. What was the highest score?

- A) 19
B) 23
C) 26
D) 28

Solution:

$$\begin{aligned} 10 \text{ players} &\rightarrow (10)(9.1) = 91 \text{ total points} \\ 9 \text{ players} &\rightarrow (9)(7) = 63 \text{ total points} \\ \hline &28 \text{ highest score} \end{aligned}$$

2

The average (arithmetic mean) of a set of eleven numbers is 64. If one of the numbers is discarded, the average of the remaining numbers is 61. What is the value of the number that was discarded?

- A) 91
B) 93
C) 94
D) 99

Solution:

$$\begin{aligned} 11 \text{ numbers} &\rightarrow 11 \cdot 64 = 704 \\ 10 \text{ numbers} &\rightarrow 10 \cdot 61 = 610 \\ \hline &94 \text{ discarded numbers} \end{aligned}$$

3

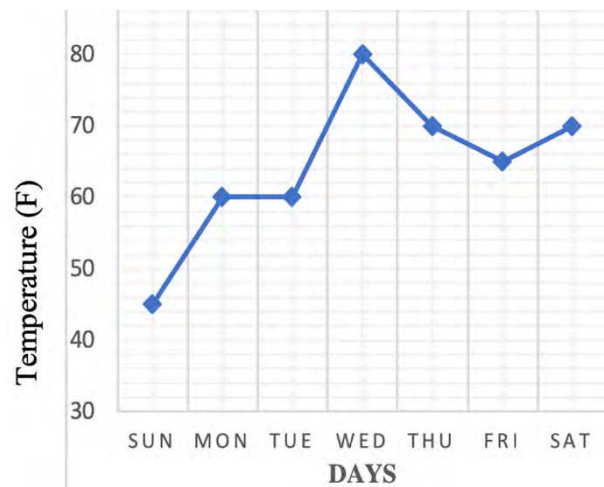
The lowest value in an arithmetic sequence is x and the highest value is y . If each value of sequence is increased by k , then which of the following must be true for the revised arithmetic sequence?

- I. The range is k .
II. The median remains unchanged.
III. The mean increased by k .

Solution:

- A) I only
B) III only
C) I and III only
D) II and III only
- \times I. Range $(y+k) - (x+k) = y-x$
 \times II. medians increased by k .
 \checkmark III. mean will be increased by k .

4

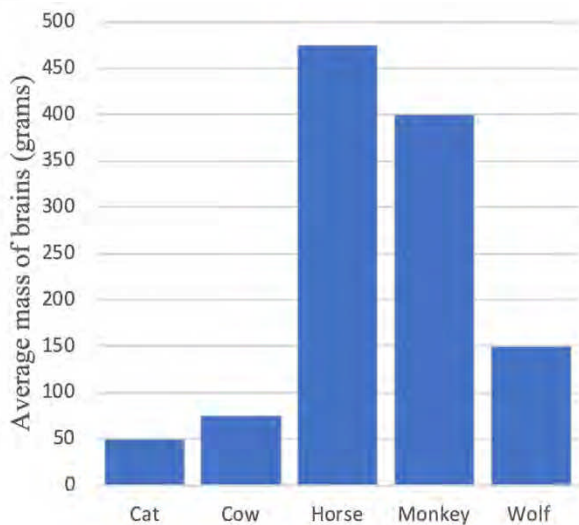


The graph above shows the average daily temperature during a particular week in May in a certain city. Which statement best describes the temperature data in the graph above?

- A) median $>$ mean
B) median $<$ mean
C) median = mode
D) mean = mode

Solution: $45 - 60 - 60 - 65 - 70 - 70 - 80$
Mean = 64.2
Median = 65

9



According to the graph above, the average mass of a cat's brain is what fraction of the average mass of a horse's brain?

- A) $\frac{2}{11}$
 B) $\frac{2}{15}$
 C) $\frac{2}{17}$
 D) $\frac{2}{19}$

Solution:

$$\frac{\text{cat} \rightarrow 50}{\text{horse} \rightarrow 475} = \frac{2}{19}$$

Questions 10 and 11 refer to the following information

Spin	Frequency
1	4
2	3
3	0
4	2
5	5
6	1
7	6
8	4
9	3
10	2

Handwritten notes next to the table:

- 4 → 4
- 3 → 6
- 0 → 0
- 2 → 8
- 5 → 25
- 1 → 6
- 6 → 42
- 4 → 32
- 3 → 27
- 2 → 20

$\frac{170}{19}$

The spinner for a board game has 10 sectors, number 1 through 10. It is 30 times and results summarized in the table above.

10

Of the following, what is the mean value of these 30 spins?

- A) 4.66
 B) 4.99
 C) 5.33
 D) 5.66

Solution:

$$\text{mean} = \frac{170}{30} = 5.66$$

11

Of the following, what is the median value of these 30 spins?

- A) 6.5
 B) 7.0
 C) 7.5
 D) 10

Solution:

Median is average of 15th and 16th terms.

$$\begin{array}{l} 15\text{th term is } 6 \\ 16\text{th term is } 7 \end{array} \left. \vphantom{\begin{array}{l} 15\text{th term is } 6 \\ 16\text{th term is } 7 \end{array}} \right\} \frac{6+7}{2}$$

$$\text{median} = 6.5$$

Questions 1-3 refer to the following information.

2016 Summer Olympic Medal Table

Rank	Country	Gold	Silver	Bronze	Total
1	USA	46	37	38	121
2	Great Britain	27	23	17	67
3	China	26	18	26	70
4	Russia	19	17	20	56
5	Germany	17	10	15	42
Total		135	105	116	356

The table above shows distribution of medals awarded at the 2016 Brazil Summer Olympics.

1

If an Olympic medalist is to be chosen at random from one of the countries in the table, which country gives the highest probability of selecting a Bronze medalist?

- A) USA
- B) Great Britain
- C) China
- D) Russia

Solution:

Probability to get bronze per country:

$$\text{USA} = \frac{38}{121} = 0.31$$

$$\text{GB} = \frac{17}{67} = 0.25$$

$$\text{China} = \frac{26}{70} = 0.37$$

$$\text{Russia} = \frac{20}{56} = 0.36$$

2

If an Olympic medalist is to be chosen at random from one of the countries in the table, which country gives the highest probability of selecting a Silver medalist?

- A) USA
- B) Great Britain
- C) China
- D) Russia

Solution:

$$\text{USA} = \frac{37}{121} = 0.31$$

$$\text{GB} = \frac{23}{67} = 0.34$$

$$\text{China} = \frac{18}{70} = 0.26$$

$$\text{Russia} = \frac{17}{56} = 0.30$$

3

If an Olympic medalist is to be chosen at random from one of the countries in the table, which country gives the highest probability of selecting a Gold medalist?

- A) Great Britain
- B) USA
- C) China
- D) Russia

Solution:

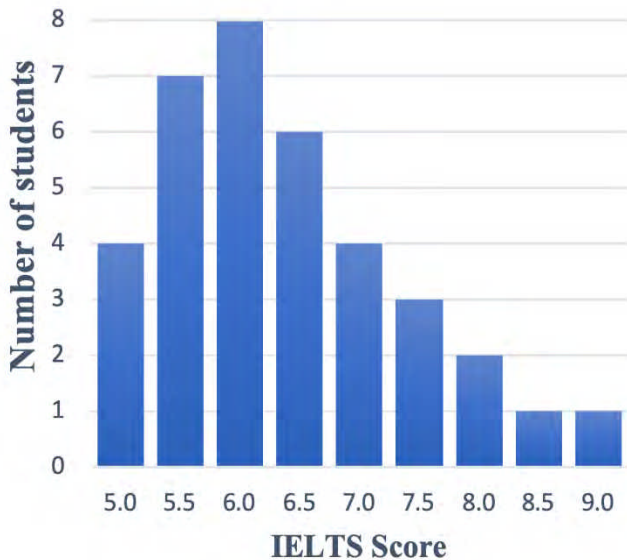
$$\text{USA} = \frac{46}{121} = 0.38$$

$$\text{GB} = \frac{27}{67} = 0.4$$

$$\text{China} = \frac{26}{70} = 0.37$$

$$\text{Russia} = \frac{19}{56} = 0.34$$

Questions 4-6 refer to the following information



The graph above shows distribution of IELTS score of 36 students.

4

What percentage of these students received 7.0 or more?

- A) 25.2%
- B) 26.7%
- C) 29.5%
- D) 30.5%

Solution:

$$7.0 \text{ or more} \rightarrow 4 + 3 + 2 + 1 + 1 = 11$$

Total 36 students

$$\frac{11}{36} = 0.305 \approx \boxed{30.5\%}$$

5

What is the median number of IELTS score these students received?

- A) 5.5
- B) 6.0
- C) 6.5
- D) 7.0

Solution:

There are 36 students.

The median is the average score of 18th and 19th students

$$\left. \begin{array}{l} 18\text{th student} - 6.0 \\ 19\text{th student} - 6.0 \end{array} \right\}$$

$$\text{Median} = \frac{6.0 + 6.0}{2} = \boxed{6.0}$$

6

What is the mean number of IELTS score these students received?

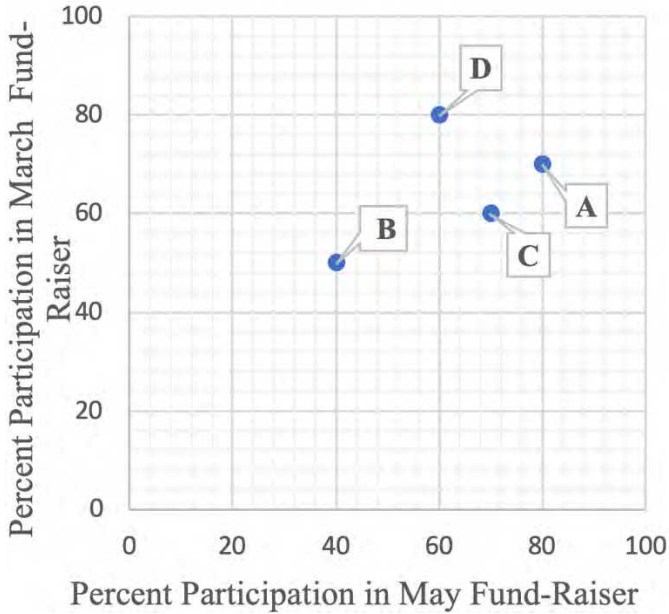
- A) 5.75
- B) 6.25
- C) 6.38
- D) 6.75

Solution:

$$\begin{array}{l} (4)(5.0) = 20 \\ (7)(5.5) = 38.5 \\ (8)(6.0) = 48 \\ (6)(6.5) = 39 \\ (4)(7.0) = 28 \\ (3)(7.5) = 22.5 \\ (2)(8.0) = 16 \\ (1)(8.5) = 8.5 \\ (1)(9) = 9.0 \\ \hline 229.5 \end{array}$$

$$\begin{array}{l} \text{Mean} = \frac{229.5}{36} \\ = 6.375 \\ \approx \boxed{6.38} \end{array}$$

Questions 7 and 8 refer to the following information



The graph above shows for different classes at San Juan Elementary schools participated in two fund-raisers last year in March and May.

7

Which class had greatest change in percentage in participation from March fund-raiser to the May fund-raiser?

Solution:

- A) Class A → 70 ~ 80 (10)
- B) Class B → 50 ~ 40 (10)
- C) Class C → 55 ~ 65 (10)
- D) Class D → 80 ~ 60 (20) ✓

8

If there were 40 students each in Class A and D, and 30 students each in Class B and Class C. How many students participated in the March fund-raiser?

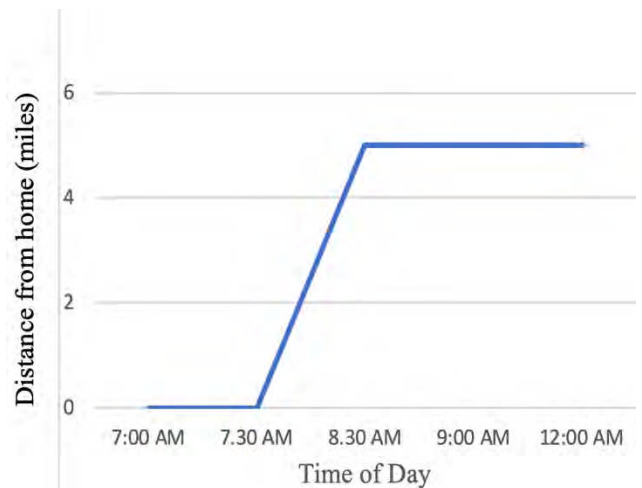
- A) 33
- B) 60
- C) 93
- D) 97

Solution:

March Fund-Raiser
 class A B C D
 70% 50% 60% 80%

40 students class A and class D → $40(0.7) + 40(0.8) = 60$
 30 student class B and C = $30(0.5) + 30(0.6) = 33$
 Total March fund-raiser = $60 + 33 = 93$

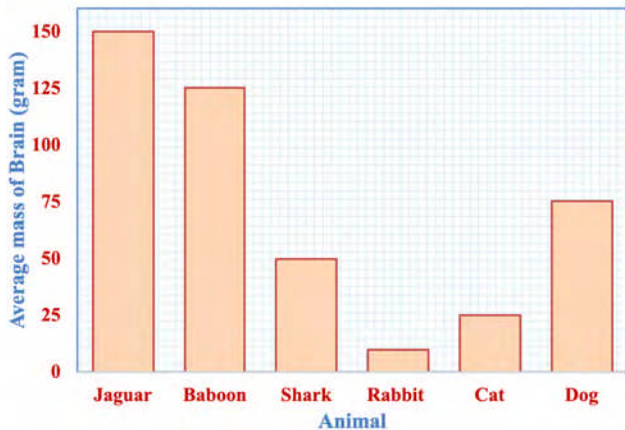
9



The graph above shows the distance of Ariel's car from his home over a period of time on a particular day. Which of the situations below best fits the given information?

- A) Ariel leaves home, drives to restaurant for breakfast and returns home.
- B) Ariel leaves home, drives to work and remains there
- C) Ariel leaves work, drives restaurant for lunch and drives back work.
- D) Ariel is at supermarket, takes groceries home, and then drives back to work.

1



According to graph above, which of the following is true?

- A) Average mass of brain is proportional to animals' sizes. \rightarrow FALSE
 B) Jaguar is the smartest animal. \rightarrow not sure
 C) Total mass of brain of dog and shark equals to mass of brain of baboon. $\rightarrow 50 + 75 = 125$
 D) Jaguar is two times faster as much as dog. \rightarrow can't be verified based on the graph.

2

According to graph above, the average baboon brain is what fraction of average mass of a dog's brain?

- A) 3
 B) 2
 C) $\frac{5}{3}$
 D) 1

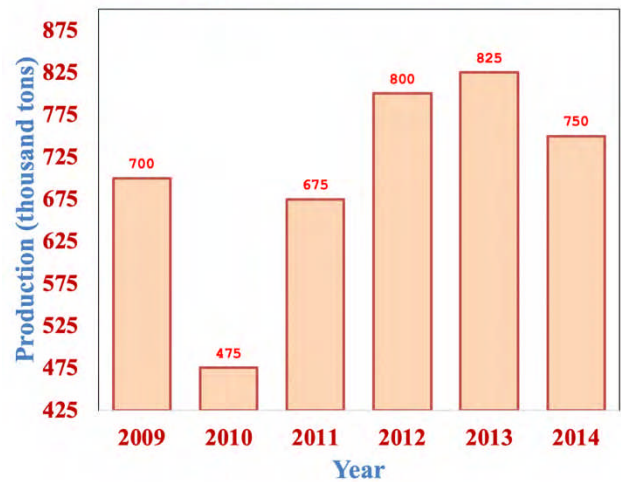
Solution:

mass of Baboon's brain = 125
 mass of Dog's brain = 75

$$\frac{125}{75} = \frac{5}{3}$$

3

Annual Apricot Production In Turkey



According to graph above, which of the following is true?

- A) Annual apricot production's percentage increase was the highest from 2011 to 2012. $\rightarrow \frac{125}{675} = 0.18$
 B) Production of apricot was affected by insects in 2010. $\rightarrow ?$
 C) Farmers were not worked hard in 2014. $\rightarrow ?$
 D) Annual apricot production's percentage increase was the highest from 2010 to 2011.

4

According to graph above, approximately what is the average of annual apricot production from 2009 to 2014?

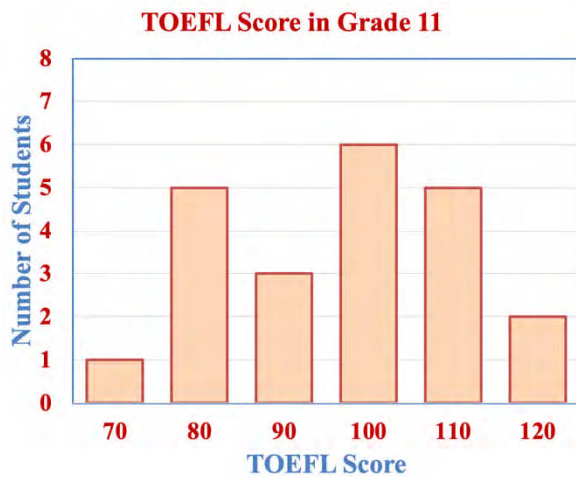
- A) 704
 B) 725
 C) 750
 D) 755

Solution:

$$700 + 475 + 675 + 800 + 825 + 750 = 4225$$

$$4225 \div 6 = 704.1$$

Questions 5-7 refer to the following information



The graph above shows distribution of TOEFL score of 27 students.

5

What percentage of these students received 110 or more?

- A) 23.2%
B) 24.7%
C) 25.9%
D) 28.5%

Solution:

110 or more $\rightarrow 5+2=7$

$$\frac{7}{27} = 0.259 \approx 25.9\%$$

6

What is the median number of TOEFL score these students received?

- A) 90
B) 95
C) 97.5
D) 100

Solution:

There are 27 students.
14th student score is median.
14th student got 100.

So median is 100.

7

What is the mean number of TOEFL score these students received?

- A) 75.75
B) 78.89
C) 82.50
D) 84.25

Solution:

$$\begin{aligned} 1(70) &= 70 \\ 5(80) &= 400 \\ 3(90) &= 270 \\ 6(100) &= 600 \\ 5(110) &= 550 \\ 2(120) &= 240 \\ \hline &2130 \end{aligned}$$

$$\begin{aligned} \text{Mean} &= \frac{2130}{27} \\ &= 78.89 \end{aligned}$$

Questions 8-10 refer to the following information

	Years of Experience				Total
	1	2	3	4+	
Carpenter	1,463	1,983	1,563	1,702	6,711
Mason	2,156	2,007	2,381	2,279	8,823
Plumber	759	803	512	699	2,773
Painter	1,045	790	1,451	1,802	5,088
Total	5,423	5,583	5,907	6,482	23,395

The table above shows the number of workers in City X with at least one year of experience in four different construction related occupations.

8

If a painter in City X is chosen random, which of the following is closest to the probability that the painter has at least two years of experience?

- A) 59.2%
B) 63.9%
C) 79.4%
D) 81.5%

Solution:

at least two years

$$790 + 1451 + 1802 = 4043$$

$$\frac{4043}{5088} = 0.794 \approx 79.4\%$$

9

If a carpenter in City X is chosen random, which of the following is closest to the probability that the carpenter has at least four years of experience?

- A) 7.2%
 B) 25.3%
 C) 49%
 D) 52.5%

Solution:

Carpenter at least four years

$$\frac{1702}{6711} = 0.253 \approx \boxed{25.3\%}$$

10

If a worker with at least three years of experience in City X is chosen random from those included in the table, which of the following is closest to the probability that the person is Mason?

- A) 25.1%
 B) 29.7%
 C) 37.6%
 D) 71.2%

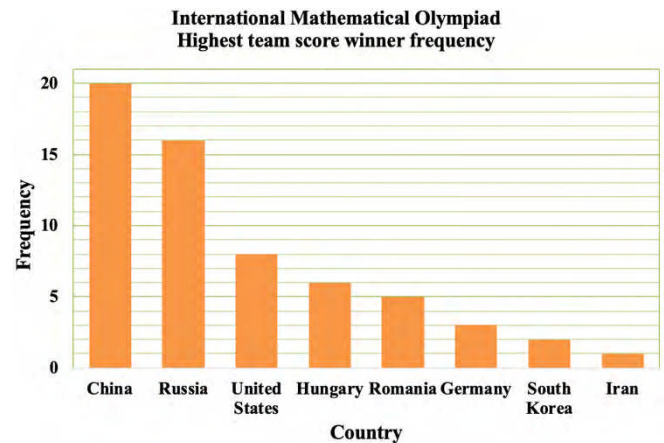
Solution:

At least 3 years of Experience
 chosen $\rightarrow \frac{5907 + 6482}{12,389}$

At least 3 years of Experience
 mason $\rightarrow \frac{2381 + 2279}{4660}$

$$\frac{4,660}{12,389} = 0.376 \approx \boxed{37.6\%}$$

Questions 11-12 refer to the following information



The table above shows 61 students from eight nations have achieved the highest team score in the IMO.

11

Based on the graph, what fraction of IMO highest team score winner was from Germany?

- A) 4/61
 B) 3/61
 C) 61/4
 D) 61/3

Solution:

Germany $\rightarrow 3$; 61 students are winner
 so; $\frac{3}{61}$ is answer

12

Based on the graph, what fraction of IMO highest team score winner was from Russia and Iran?

- A) 17/61
 B) 16/61
 C) 61/17
 D) 61/16

Solution:

Russia and Iran $\rightarrow 16 + 1 = 17$

$$\boxed{\frac{17}{61}}$$

Questions 13-14 refer to the following information

	Human caused fires	Lightning caused fires	Total
Mediterranean Region	63	75	138
Aegean Region	34	29	63
Total	97	104	201

The incomplete table above shows the number of wildfires that occurred in two regions of Turkey in between 2015 and 2018.

13

Based on the table, what fraction of all wildfires in Aegean region were lightning caused?

- A) 63/201
B) 104/201
C) 63/104
D) 29/63

Solution:

Aegean region \rightarrow lightning \rightarrow 29

$$\frac{29}{63}$$

14

Based on the table, what fraction of all wildfires in Aegean and Mediterranean regions were human caused?

- A) 97/201
B) 104/201
C) 63/138
D) 34/63

Solution:

Human caused \rightarrow 97

$$\frac{97}{201}$$

Questions 15-16 refer to the following information

	Covid -19 Test Negative	Covid -19 Test Positive	Total
Female	343	67	410
Male	480	70	550
Total	823	137	960

The table above shows the results of Covid-19 test in a certain city.

15

Based on the table, if a person is chosen random, which of the following is closest to the probability that person is male with positive COVID - 19 tests? \rightarrow 70

- A) 0.072
B) 0.127
C) 0.50
D) 0.878

Solution:

$$\frac{70}{960} = 0.072$$

16

Based on the table, if a female is chosen random, which of the following is closest to the probability that person is female with negative COVID - 19 tests? 343

- A) 0.069
B) 0.134
C) 0.357
D) 0.836

$$\frac{343}{410} = 0.836$$

Solution.

Questions 1 and 2 refer to the following information.

Rose opened a saving bank account that earns 4% interest compounded annually. Her initial deposit was £ 200, and she uses the expression $200 \cdot (x)^t$ to find the value of the account after t years.

1

What is the value of x in the expression?

- A) 1.02
- B) 1.04
- C) 202
- D) 204

Solution:

$$4\% \rightarrow \text{interest} \rightarrow \underline{1.04}$$

$$200 (1.04)^t$$

$$\downarrow$$

$$x = \boxed{1.04}$$

2

Rose's friend Amber found an account that earns 3% interest compounded annually. Amber made an initial deposit of £ 200 into this account at the same time Rose made a deposit of £ 200 into her account. After 5 years, how much more money will Rose's initial deposit have earned than Amber's initial deposit? (Round your answer to the nearest cent)

- A) £ 11.5
- B) £ 17.5
- C) £ 22;4
- D) £ 35.8

Solution:

$\begin{array}{l} \text{Amber} \\ \hline 200 (1.03)^5 \\ = 231.85 \end{array}$	$\begin{array}{l} \text{Rose} \\ \hline 200 (1.04)^5 \\ = 243.33 \end{array}$
$\underbrace{\hspace{10em}}_{\sim \boxed{11.5}}$	

3

In planning maintenance for a city's infrastructure, city hall civil engineers estimate that, starting from the present, the population of the city will decrease by 8 percent every 15 years. If the present population of the city is 32,000, which of the following expressions represents the engineer's estimate of the population of the city t years from now?

- A) $32,000(0.08)^{15t}$
- B) $32,000(0.08)^{\frac{t}{15}}$
- C) $32,000(0.92)^{15t}$
- D) $32,000(0.92)^{\frac{t}{15}}$

Solution:

$$8\% \text{ decreases} \rightarrow 0.92 \text{ for every } 15 \text{ years,}$$

$$\text{After } t \text{ years } 32000 (0.92)^{\frac{t}{15}}.$$

Questions 4 and 5 refer to the following information.

The stock price of one share in ice cream company is worth \$2,400 today. A stock analyst believes that the stock will lose 16 percent of its value each week for the next three months. The analyst uses the equation $I = 2,400 \cdot x^t$ to model the value, I , of the stock after t months.

4

What value should the analyst use for x ?

- A) 0.84
- B) 3
- C) 16
- D) 84

Solution:

16% losses \rightarrow 0.84 every week

$$I = 2,400 (0.84)^t$$

\downarrow

$$x = 0.84$$

5

What does the analyst believe the value of the stock will be at the end of three months to the nearest dollar?

- A) \$ 2,016
- B) \$ 1,422.5
- C) \$ 843.1
- D) \$ 419.8

Solution:

$$2,400 (0.84)^3 = 1422.5$$

6

$$1,200 \left(1 + \frac{r}{1,200} \right)^{12}$$

The expression above gives the amount of money, in GBP, generated in a year by a £ 1,200 deposit in a saving bank account that pays an annual interest rate of $r\%$, compounded monthly. Which of the following expressions shows how much additional money is generated at an interest rate of 7% than at an interest rate of 4%?

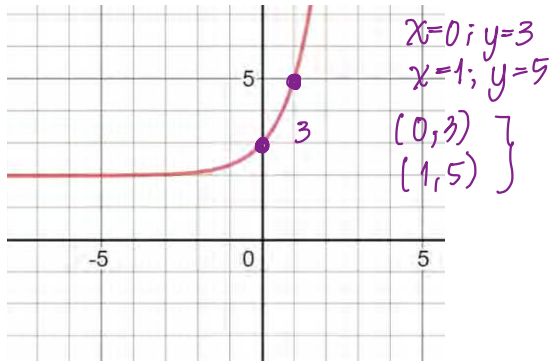
- A) $1,200 \left(1 + \frac{7-4}{1,200} \right)^{12}$
- B) $1,200 \left(1 + \frac{7}{1,200} \right)^4$
- C) $1,200 \left(1 + \frac{7}{1,200} \right)^{12} - 1,200 \left(1 + \frac{4}{1,200} \right)^{12}$
- D) $1,200 \left(1 + \frac{4}{1,200} \right)^7$

7

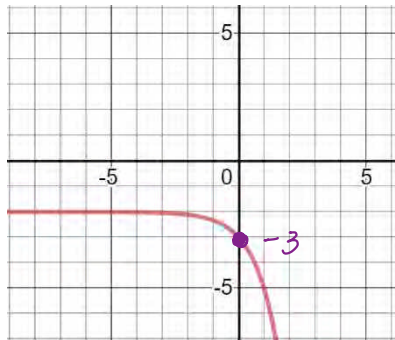
$$f(x) = 3^x + 2$$

The function f is defined by the equation above. Which of the following is the graph of $y = -f(x)$ in the xy -plane?

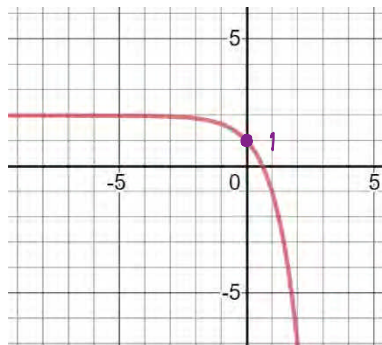
A)



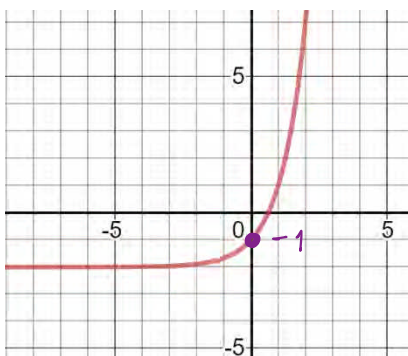
B)



C)



D)



8

The Asia's population has grown at an average rate of 1.9 percent per year since 1960. There were approximately 3.2 billion people in the world in 1990. Which of the following functions represents the Asia's population P , in billions of people, t years since 1990?

A) $P(t) = 1.09t + 3.2$

B) $P(t) = 1.019t + 3.2$

C) $P(t) = 3.2 \cdot (1.019)^t$

D) $P(t) = t \cdot (1.019)^{3.2}$

Solution:

$$P = 3.2 (1.019)^t$$

9

$$P = 1,650 \cdot (1.03)^t$$

The equation above models the number of people, P , of a club t years after the club opens. Which equation models the number of people of the club q quarter years after the club opens?

A) $P = 1,650 \cdot (1.03)^{\frac{q}{4}}$

B) $P = 1,650 \cdot (1.03)^q$

C) $P = 1,650 \cdot (1.03)^{\frac{q}{4}}$

D) $P = 1,650 \cdot (1.03)^{4q}$

Solution:

$$q \text{ quarters years} \rightarrow \frac{q}{4} \text{ years}$$

so

$$P = 1650 (1.03)^{\frac{q}{4}}$$

10

A bacteria population, B , can be modeled by the equation $B = B_0 \cdot (10)^t$, where B_0 is the bacteria population at the beginning of the experiment, t is the time in hours since the beginning of the experiment. Which of the following gives the B , if the $B_0 = 2$ and $t = 8$?

- A) 200,000
- B) 2,000,000
- C) 20,000,000
- D) 200,000,000

Solution:

$$B = 2 \cdot 10^8$$

$B = 200\,000\,000$ bacteria after
8 hours

11

Kate's mother put \$1,000 into a bank account for her when she was born. The account gained interest at a rate of 4% per year, compounded annually. Assuming no more money was deposited and none was withdrawn, how much money will be in the account when Kate turns 18?

- A) \$1,325.6
- B) \$1,525.4
- C) \$1,800.9
- D) \$2,025.8

Solution:

$$1000 (1.04)^{18}$$

$$= \$2025.8$$

12

Iron 55 is a radioactive element used in science experiment. It has a half-life of about 2.75 years. Suppose a laboratory has 100 grams of iron 55. If scientists don't use it, how much will still be iron 55 in 11 years?

- A) 50
- B) 25
- C) 12.5
- D) 6.125

Solution:

$\frac{11}{2.75} = 4 \rightarrow$ 4 times half life

100 $\xrightarrow{1}$ 50 $\xrightarrow{2}$ 25 $\xrightarrow{3}$ 12.5 $\xrightarrow{4}$ 6.125

OR

$$100 (0.5)^{\frac{11}{2.75}} = 100 (0.5)^4$$

$$= 6.125$$

13

Jacob's father put \$3,600 into a bank account for him when he was born. The account gained interest at a rate of 6.6% per year, compounded annually. Assuming no more money was deposited and none was withdrawn, how much money will be in the account when Jacob turns 18?

- A) \$11,113.7
- B) \$11,248.8
- C) \$11,374.5
- D) \$11,674.6

Solution:

$$3600 (1.066)^{18}$$

$$= \$11,374.5$$

1

If the initial population of rabbits was 15 and grew to 24 after the second year, which of the following function best models the population of rabbits R with respect to the number of years t if the population growth of rabbits is considered to be exponential?

- A) $R = 5t + 15$
 B) $R = 15(10)^t$
 C) $R = 5t^2 + 15$
 D) $R = 15(1.26)^t$

Solution:

$$24 = 15x^2 \xrightarrow{\text{after second year}} \Rightarrow x^2 = 1.6$$

$$x = 1.264$$

$$R = 15(1.26)^t$$

2

If the initial population of rabbits was 115 and grew to 138 after a year, which of the following function best models the population of rabbits P with respect to the number of years t if the population growth of rabbits is considered to be linear?

- A) $P = 25t + 115$
 B) $P = 15t^2 + 5t + 115$
 C) $P = 115(1.2)^t$
 D) $P = 115(1.25)^t$

Solution:

$$138 = 115 \cdot x^1 \Rightarrow x = 1.2$$

$$P = 115(1.2)^t$$

3

The population of trees in a forest has been decreasing by 7% every 3 years. The population at the beginning of 2017 was estimated to be 12,000. If F represents the population of trees t years after 2017, which of the following equations gives the population of trees over time?

- A) $F = 12,000(0.93)^{\frac{t}{3}}$
 B) $F = 12,000(0.93)^t$
 C) $F = 12,000(0.93)^{3t}$
 D) $F = 12,000(0.07)^{\frac{t}{3}}$

Solution:

7% decreasing $\rightarrow 0.93$ and every 3 years $\frac{t}{3}$

$$F = 12,000(0.93)^{\frac{t}{3}}$$

4

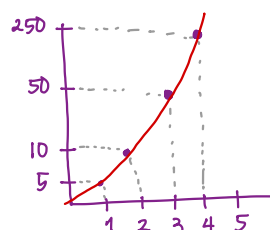
Nina owes Bernice some money and decides to pay her back in the following way. Bernice receives 5 dollars the first day, 10 dollars the second day, 50 dollars the third day, 250 dollars the fourth day. Which of the following best describes the relationship between time and the total amount of money Bernice received from Nina over of these four days?

- A) Exponential decay
 B) Exponential growth
 C) Increasing linear
 D) Decreasing linear

Solution:

$\$5 \rightarrow \$10 \rightarrow \$50 \rightarrow \250

there is exponential growth



5

Jimmy has a large of PC games. He decides to trade in three of his PC games for one new PC games each month at a PC store. Which of the following best describes the relationship between time and total number of PC games?

- A) Exponential decay
- B) Exponential growth
- C) Increasing linear
- D) Decreasing linear

Solution:

3 old PC games \rightarrow 1 new PC games

if it is like that every month,
it will be decreasing linear.

6

A biologist counts 64 cells in a petri dish and each of them splits into two new cells every hour. He uses the function $P(t) = cr^t$ to calculate the total number of cells after t hours. Which of the following shows the correct values to c and r ?

- A) $c = 64, r = 2$
- B) $c = 64, r = 1$
- C) $c = 64, r = 0.5$
- D) $c = 32, r = 2$

Solution:

split into two new sets means
doubled. so;

$$P(t) = 64 \cdot 2^t$$

$$c = 64, r = 2$$

7

Rose modeled the growth of a tree population by estimating the number of the trees' pollen grains per square feet that were deposited each. She estimated there were 4,200 pollen grains per square feet the first year the grains were deposited, with a 1.5% annual increase in the number of grains per square feet thereafter. Which of the following functions models $M(t)$, the number of pollen grains per square centimeter t years after the first year the grains were deposited?

- A) $M(t) = 4,200^{1.015t}$
- B) $M(t) = 4,200(0.985)^t$
- C) $M(t) = 4,200(1.015)^t$
- D) $M(t) = 4,200^t$

Solution:

1.5% \rightarrow 0.015

$$M(t) = 4,200(1.015)^t$$

8

A scientist feeds two pet rabbits in the zoo. Due to the short gestation period of rabbits, and the rabbit population doubles each month. If $P(t)$ represents the rabbit population after t years, then which of the following equations best models the rabbit population in this zoo over time?

- A) $P(t) = 2 \times 2^{t+1}$
- B) $P(t) = 2 \times 2^t$
- C) $P(t) = 2 \times 2^{12t}$
- D) $P(t) = 2 \times 2^{\frac{t}{12}}$

Solution:

Initially, two rabbits, doubles each
month so,

$$P(t) = 2 \cdot 2^t$$

9

In 2012, the population of pink salmon in a pond was 123. In 2014, it was 9,963. What model of $y = axb^x$ could be used for this exponential growth?

- A) $y = 123x(81)^x$
 B) $y = 123 \cdot (9)^x$
 C) $y = 3x(123)^x$
 D) $y = 123x(9,963)^x$

Solution:

After 2 years it increased to 9963.

$$y = ab^x$$

$$9963 = 123 \cdot b^2 \Rightarrow b^2 = 81$$

$$b = 9$$

$$y = 123 \cdot 9^x$$

10

If Benne has \$20,000 deposited in the bank, and receives a 2% interest annually, how much did she receive from bank after three years with her capitals?

- A) \$20,400
 B) \$20,808
 C) \$21,224
 D) \$22,256

Solution:

2% \rightarrow annual interest $\rightarrow 1.02$

$$20\,000 (1.02)^3$$

$$= \$21,224$$

11

The population of Hometown 2011 was estimated to be 32,000 people with an annual rate of increase of 4%. Which of the following is approximately population of Hometown after 5 years?

- A) 38,932
 B) 38,995
 C) 39,934
 D) 39,943

Solution:

$$32\,000 (1.04)^5$$

$$= 38\,932$$

12

Cobalt 60 is a radioactive element used in science experiment. It has a half-life of about 5.4 years. Suppose a laboratory has 150 grams of cobalt 60. If scientists don't use it, how much will still be cobalt 60 in 27 years?

- A) 37.5
 B) 18.75
 C) 9.37
 D) 4.69

Solution:

$$\frac{27}{5.4} = 5 \left. \begin{array}{l} \text{half life } 50\% \\ \text{decrease every} \\ 5.4 \text{ years} \end{array} \right\}$$

$$150 (0.5)^5 = 4.687$$

$$\cong 4.69$$

Questions 5 and 6 refer to the following information.

$$I = \frac{V}{(1+r)^t}$$

The formula above indicates the initial investment, I , that must be made in an account with an annual interest rate of r to ensure a future value of V after period of t years.

5

To the nearest dollar, what initial investment should be made in an account that earns 12% annually ($r = 12$) in order to ensure a future value of \$736 in four years?

- A) \$436
- B) \$448
- C) \$458
- D) \$468

Solution:

$$736 = I (1.12)^4$$

$$I = 467.7$$

$$\sim \boxed{\$468}$$

6

What value of r , to the nearest thousandth, would ensure that the value of an investment would increase by 44% in two years?

- A) 12
- B) 13
- C) 15
- D) 18

Solution:

$$V = I (1+r)^t$$

↓
44% increase → 2 years

$$1.44I = I (1+r)^2 \Rightarrow 1.44 = (1+r)^2$$

$$1.12 = 1+r$$

$$r = 0.12 \sim 12\%$$

7

A total of \$1600 is deposited in two savings accounts for one year, part at 6% and the remainder at 8%. If \$116 was earned in interest, how much was deposited at 8%?

- A) \$600
- B) \$800
- C) \$1,000
- D) \$1,100

Solution:

$$\left. \begin{array}{l} 8\% \rightarrow \text{deposited} \rightarrow A \\ 6\% \rightarrow \text{deposited} \rightarrow 1600 - A \end{array} \right\}$$

$$A (1.08) + (1600 - A) (1.06) = 1600 + 116$$

$$1.08A + 1600 (1.06) - 1.06A = 1716$$

$$0.02A + 1696 = 1716$$

$$0.02A = 20$$

$$\boxed{A = 1000}$$

8

A town has a population growth rate of 10% per year. The population in 2016 was 6,000. What was the population in 2018?

- A) 6,750
- B) 6,960
- C) 7,160
- D) 7,260

Solution:

$$\begin{aligned}
 &2016 \rightarrow 2018 \Rightarrow \text{after 2 years} \\
 &6000 (1.1)^2 \\
 &= \boxed{7260}
 \end{aligned}$$

9

In 2013, the population of rabbit in a farm was 32. In 2018, it was 243. What model of $y = a \cdot b^x$ could be used for this exponential growth?

- A) $y = 32x(1.5)^x$
- B) $y = 32x(3)^x$
- C) $y = 243x(32)^x$
- D) $y = 32x(0.243)^x$

Solution:

$$\begin{aligned}
 &y = a \cdot b^x \\
 &243 = 32 \cdot b^5 \\
 &b^5 = \frac{243}{32} \\
 &b = \frac{3}{2} = 1.5 \\
 &\boxed{y = 32 (1.5)^x}
 \end{aligned}$$

10

If Jenny has \$4,800 deposited in the bank, and receives a 4% interest annually, how much did she receive from bank after four years with her capitals?

- A) \$4,903.5
- B) \$4,915.3
- C) \$5,603.5
- D) \$5,615.3

Solution:

$$\begin{aligned}
 &\$4800 (1.04)^4 \\
 &= \boxed{\$5,615.3}
 \end{aligned}$$

11

The population of Hometown 2011 was estimated to be 80,000 people with an annual rate of increase of 6%. Which of the following is approximately population of Hometown after 10 years?

- A) 142,358
- B) 143,268
- C) 148,263
- D) 152,264

Solution:

$$\begin{aligned}
 &80,000 (1.06)^{10} \\
 &\boxed{\sim 143,268}
 \end{aligned}$$

ANSWER KEY

Ration and Proportion

TEST 1	
1	A
2	D
3	A
4	C
5	B
6	B
7	C
8	A
9	C
10	D
11	C
12	B
13	C
14	B
15	D
16	D

TEST 2	
1	D
2	D
3	C
4	A
5	D
6	B
7	D
8	B
9	C
10	C
11	A
12	A
13	B
14	C
15	D
16	C

TEST 3	
1	D
2	A
3	C
4	D
5	B
6	B
7	C
8	D
9	A
10	A
11	B
12	C
13	B
14	C
15	C
16	D

TEST 4	
1	C
2	D
3	D
4	A
5	B
6	B
7	A
8	D
9	C
10	C
11	B
12	D
13	D
14	C
15	B
16	A

TEST 5	
1	C
2	D
3	B
4	A
5	D
6	B
7	C
8	B
9	B
10	D
11	B
12	A
13	C
14	A
15	C
16	D

TEST 1	
1	A
2	B
3	C
4	C
5	B
6	A
7	D
8	A
9	D
10	B
11	C
12	D
13	A
14	D
15	B
16	D

TEST 2	
1	A
2	C
3	D
4	A
5	B
6	B
7	D
8	C
9	C
10	A
11	B
12	A
13	C
14	D
15	C

TEST 3	
1	B
2	C
3	B
4	D
5	A
6	A
7	B
8	D
9	C
10	C
11	B
12	C
13	A

TEST 4	
1	C
2	D
3	B
4	D
5	C
6	A
7	C
8	B
9	C
10	B
11	D
12	A
13	D
14	C
15	B
16	A

Data and Statistics

TEST 1	
1	A
2	B
3	A
4	A
5	D
6	C
7	B
8	C
9	D
10	C
11	C

TEST 2	
1	B
2	A
3	B
4	C
5	D
6	C
7	C
8	A
9	D
10	B
11	B

TEST 3	
1	B
2	A
3	C
4	C
5	B
6	C
7	C
8	D
9	B
10	D

TEST 4	
1	C
2	A
3	C
4	D
5	A
6	B
7	C
8	D
9	D
10	A

TEST 5	
1	C
2	D
3	C
4	B
5	C
6	D
7	B
8	A
9	D
10	C
11	C
12	A

TEST 6	
1	A
2	B
3	D
4	D
5	C
6	D
7	B
8	B
9	B
10	C

TEST 7	
1	C
2	B
3	D
4	A
5	D
6	C
7	B
8	B
9	B
10	A

TEST 8	
1	B
2	A
3	C
4	B
5	D
6	C
7	B
8	B

ANSWER KEY

Data and Statistics

Linear Growth

TEST 9	
1	D
2	B
3	A
4	B
5	C
6	C
7	D
8	B
9	A
10	B
11	B
12	A

TEST 10	
1	D
2	C
3	B
4	A
5	B
6	C
7	C
8	B
9	D
10	D
11	A

TEST 11	
1	C
2	B
3	A
4	D
5	B
6	C
7	D
8	C
9	B

TEST 12	
1	C
2	C
3	D
4	A
5	C
6	D
7	B
8	C
9	B
10	C
11	B
12	A
13	D
14	A
15	A
16	D

TEST 1	
1	B
2	A
3	D
4	A
5	B
6	C
7	A
8	C
9	C
10	D
11	D
12	D
13	C

TEST 2	
1	D
2	C
3	A
4	B
5	D
6	A
7	C
8	B
9	B
10	C
11	A
12	D

TEST 3	
1	B
2	C
3	B
4	C
5	D
6	A
7	C
8	D
9	A
10	D
11	B

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ADDITIONAL TOPICS

IN MATH

$$y = kx$$

$$2 = m$$

$$\frac{7a + a}{4a}$$

$$\frac{2y +}{8}$$

$$4a$$

$$7x$$