

# Heart of Algebra Drill 1

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

- Each student at a high school throws away two pounds of garbage a day. If there are  $s$  students at the school and the non-students at the school throw away a total of 350 pounds of garbage a day, which of the following expressions represents how many pounds of garbage are thrown away at the school each day?
  - $2(s + 175)$
  - $2(s + 350)$
  - $350(s + 2)$
  - $350s$
- If  $2x - 2 = -1$ , then  $x =$ 
  - 1
  - 0.5
  - 1.5
  - 3
- If  $q = \frac{q+6}{3}$ , then  $q =$ 
  - 2
  - 3
  - 5
  - 6
- What is the value of  $z$  if  $2(z + 3) = 6$ ?
  - 6
  - 3
  - 2
  - 0

## Heart of Algebra Drill 2

5. If  $\frac{2x+1}{3} = \frac{4}{3}$ , then  $x =$

- A) 1
- B) 1.33
- C) 1.5
- D) 3

6. If  $\frac{x+2}{3} = 2$ , then  $x =$

- A) 2
- B) 4
- C) 6
- D) 8

7. If  $\frac{z+1}{3} = 0$ , then  $z + 1 =$

- A) -1
- B)  $-\frac{1}{3}$
- C) 0
- D) 2

8. If  $4(k+1) = k+10$ , then  $3k =$

- A)  $\frac{3}{2}$
- B)  $\frac{5}{2}$
- C) 2
- D) 6

## Part of Algebra Drill 1

9. If  $\frac{3a+2}{a} = 11$ , then what is the value of  $\frac{1}{a}$ ?

- A)  $\frac{1}{4}$
- B) 4
- C) 8
- D) 11

---

10. What is the value of  $p$  if  $\frac{5(p-1)}{4} - 1 = 0$ ?

- A) 1
- B)  $\frac{5}{9}$
- C)  $\frac{5}{4}$
- D)  $\frac{9}{5}$

# Heart of Algebra Drill 2

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

1. If  $3w < 27$ , then which of the following describes all possible values of  $w$ ?
  - A)  $w > 9$
  - B)  $w > 7$
  - C)  $w < 8$
  - D)  $w < 9$
3. If  $x > 6(x - 5)$ , then which of the following must be true?
  - A)  $x > 6$
  - B)  $x > 5$
  - C)  $x < 6$
  - D)  $x < -6$

- 
2. If  $6t + 2 < 26$ , then which of the following is a possible value for  $t$ ?
    - A) 3.5
    - B) 4
    - C) 4.5
    - D) 5
  4. If  $-13 \leq -2z - 3 \leq 1$ , then which of the following describes all possible values of  $z$ ?
    - A)  $-5 \leq z \leq 2$
    - B)  $-2 \leq z \leq 5$
    - C)  $2 \leq z \leq 5$
    - D)  $-5 \leq z \leq -2$

# Heart of Algebra Drill 5

5. If  $7s - 14 \leq 4 + 6s$ , which of the following must be true?
- A)  $s \geq 17$
  - B)  $s \leq 18$
  - C)  $s < 19$
  - D)  $s < 18$

- 
6. If  $8 < -16 - 3c$ , which of the following describes all possible values of  $c$ ?
- A)  $c > 8$
  - B)  $c > 9$
  - C)  $c < -9$
  - D)  $c < -8$

7. If  $\left(\frac{3d}{2}\right)\left(\frac{8d}{3}\right) \leq 1$ , which of the following inequalities must be true?

- A)  $d \leq \frac{1}{4}$
- B)  $d \leq \frac{1}{2}$
- C)  $-\frac{1}{4} \leq d \leq \frac{1}{4}$
- D)  $-\frac{1}{2} \leq d \leq \frac{1}{2}$

- 
8. For all  $z$  such that  $z > 0$ , the square of one-half  $z$  is greater than 1 but less than 4. Which of the following inequalities gives all possible values of  $z$ ?

- A)  $2 < z < 4$
- B)  $\sqrt{2} < z < \sqrt{8}$
- C)  $1 < z < 16$
- D)  $2 < z < 32$

9. When selecting a scarf pattern to knit, Victoria will only choose a pattern that requires at least 480 rows and no more than 520 rows. If  $r$  represents a number of rows that she will not knit, an inequality that represents all possible values of  $r$  is
- A)  $|r - 20| > 20$
  - B)  $|r - 500| > 20$
  - C)  $|r - 500| < 20$
  - D)  $|r + 100| > 20$

# Heart of Algebra Drill 3

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

1. Andy runs and eats breakfast every morning before work. When he runs, he burns 160 calories per mile for the first 3 miles. When he runs more than 3 miles, he burns 98 calories per additional mile. On Tuesday morning, Andy runs an additional  $x$  miles over 3 miles and then consumes  $y$  calories for breakfast. Which of the following functions,  $f$ , models the net number of calories Andy has lost after running and eating breakfast on Tuesday morning?

- A)  $f(x, y) = 98x - y$   
B)  $f(x, y) = 160x + 98x - y$   
C)  $f(x, y) = 480 + 98x + y$   
D)  $f(x, y) = 480 + 98x - y$

2. Sheila walks dogs on the weekend for extra income. For every dog she walks, she charges a flat rate of \$20.00 for the first hour. For every additional minute of walking a dog, she charges an additional fee. If Sheila is asked to walk a dog an additional  $a$  minutes after the first hour, and she charges  $b$  dollars per additional minute, which of the following functions,  $d$ , models how much she will earn in terms of  $a$  and  $b$ ?

- A)  $d(a, b) = 20 + a + b$   
B)  $d(a, b) = 20ab$   
C)  $d(a, b) = 20 + ab$   
D)  $d(a, b) = 20 + 2(ab)$

3. Sam saved his money until he had \$10,000 to invest. He invested  $x$  dollars into a certificate of deposit (CD) with an annual interest rate of 2.0%, and the remaining  $y$  dollars into a mutual fund with an annual interest rate of 1.5%. If his total interest earned from both accounts after one year was \$193 dollars, which of the following is the value of  $y$ ?

- A) \$9,807  
B) \$8,600  
C) \$1,400  
D) \$350

4. Hap is driving on the highway when his gasoline tank begins to leak. When he has one gallon left in his tank, he finds a gas station to pump more gas into the tank. As he pumps, he loses one-fourth of a gallon every ten minutes. If he pumps  $g$  gallons of gas over a period of  $m$  minutes, which of the following models the total amount of gas, in ounces, he has in his tank? (Note: 1 gallon = 128 ounces)

- A)  $f(g, m) = 128(g) + g + m(g)$   
B)  $f(g, m) = 128 + 128(g) - 32\left(\frac{m}{10}\right)$   
C)  $f(g, m) = 128 + 128(g) - 128\left(\frac{m}{10}\right)$   
D)  $f(g, m) = 1 + g - 32\left(\frac{m}{10}\right)$

5. An airplane flies at a constant altitude of 40,000 feet above sea level. As it starts to land, it descends at a constant rate of  $x$  feet per minute. At what altitude is the plane  $y$  minutes after it begins to descend?

- A)  $f(x, y) = 40,000 - xy$
- B)  $f(x, y) = 40,000 - 60xy$
- C)  $f(x, y) = 40,000 - x - y$
- D)  $f(x, y) = 40,000 - 60x - y$

- 
6. Sara has a jar filled with 135 coins, which consist only of quarters and nickels. If Sara has a total of \$22.75 in the jar, which of the following is the number of nickels Sara has in the jar?

- A) 25
- B) 55
- C) 80
- D) 130

# Heart of Algebra Drill 4

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

1. If  $1 < r < 4$  and  $0 < s < 5$ , then what is the range of  $r + s$ ?

A)  $-4 < r + s < 1$   
B)  $1 < r + s < 9$   
C)  $0 < r + s < 5$   
D)  $0 < r + s < 10$

2. If  $\frac{3x-2}{4} = x$ , then what is the value of  $x$ ?

A)  $-2$   
B)  $0$   
C)  $\frac{1}{3}$   
D)  $2$

$$-4 < x < 2$$

$$-1 < y < 3$$

3. Given the inequalities shown above, if  $x$  and  $y$  are integers, then which of the following expresses all the possible values of  $\frac{x}{y}$ , where  $\frac{x}{y}$  is defined?

A)  $-12 \leq \frac{x}{y} \leq 6$

B)  $-\frac{4}{3} \leq \frac{x}{y} \leq \frac{2}{3}$

C)  $-2 \leq \frac{x}{y} \leq \frac{2}{3}$

D)  $-3 \leq \frac{x}{y} \leq 1$

4. What is the value of  $x + 2$  if  $\frac{5(x+2)}{3} = 10$ ?

A) 1  
B) 4  
C) 5  
D) 6

# Heart of Algebra Drill 5

This section contains two types of questions. For multiple-choice questions, solve each problem and circle the letter of the answer that you think is the best of the choices given. For Student-Response questions, denoted by the grid-in icon, write your answer in the blank space provided.



1. If  $3x + y = 11$  and  $2x + y = 7$ , then  $x =$

2. If  $x + y = 9$ , and  $8(x + 3y) = 120$ , what is the value of  $x - y$ ?

- A) 0
- B) 3
- C) 7
- D) 9

3. The sum of  $a$  and 10 is twice as large as  $b$ , where both  $a$  and  $b$  are integers. If the sum of  $a$  and  $b$  is divisible by 4, which of the following CANNOT be the value of  $b$ ?

- A) 6
- B) 8
- C) 10
- D) 14

4. Chloe is purchasing different types of yarn. She purchases  $a$  skeins of alpaca yarn for \$3.49 each, and  $s$  skeins of silk yarn for \$5.52 each, after taxes. If Chloe purchased a total of 14 skeins of yarn and spent a total of \$73.22, which of the following sets of equations is true?

- A)  $a + s = 14$   
 $\$5.52a + \$3.49s = \$73.22$
- B)  $2a + 12s = 14$   
 $(\$3.49 + \$5.52)(a + s) = \$73.32$
- C)  $a + s = 14$   
 $\$3.49a + \$5.52s = \$73.22$
- D)  $as = 14$   
 $\$3.49a + \$5.52s = \$73.22$

5. If  $4e - f = 9$  and  $-2e + f = 5$ , what is the value of  $e$ ?

- A) 7
- B) 8
- C) 11
- D) 14

6. If  $7x + 12y = 10$  and  $3x - 2y = 5$ , what is value of  $5x + 5y$ ?

- A) 5
- B) 7.5
- C) 10.5
- D) 15

$$x + 3y = -7$$

$$2x - 3y = 13$$

7. Based on the system of equations above, what is the value of  $\frac{x}{y}$ ?

- A) -3
- B)  $-\frac{18}{13}$
- C)  $-\frac{2}{3}$
- D) 2

$$\frac{7}{2}x + \frac{4}{3}y = 4$$

$$21x = 8(3 - y)$$

8. What is the solution set, if any, of the system of equations shown above?

- A)  $(2, \frac{9}{4})$
- B)  $(0, 3)$
- C) No solutions
- D) Infinitely many solutions

# Heart of Algebra Drill 6

For each question in this section, solve the problem and circle the letter of the answer that you think is the best of the choices given.

1. If  $2s + 10r = 2(2s - 5r) = 42$ , then what is the value of  $r$ ?

A) 0  
B) 1  
C) 1.4  
D) 14

3. If  $q = p - 3$ , and  $(4p + 4)/(2q) = 10$ , what is the value of  $p$ ?

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

2. Line  $m$  contains the points  $(4, 16)$  and  $(0, 8)$ . At what point will line  $m$  intersect with line  $n$  if the equation of line  $n$  is  $-8x + 4y = 24$ ?

A)  $(0, 0)$   
B)  $(-4, 0)$   
C) These lines do not intersect  
D) These lines intersect at infinite number of points

4. A yoga studio charges \$8 dollars per student for its morning class and \$16 dollars per student for its evening class. Three times as many students attended the evening class as attended the morning class. If the yoga studio earned \$2,520 on Friday, how many people attended the morning class?

A) 15  
B) 45  
C) 56  
D) 135

5. If  $x - y = 4$  and  $2x + 3y = 10$ , what is the value of  $3x + 2y$ ?

- A) 4
- B) 6
- C) 10
- D) 14

---

$$\begin{aligned} 4x - 1y &= 10 \\ -4x + 1y &= -10 \end{aligned}$$

6. Based on the system of equations above, which of the following must be true?

- A) There is no solution to this system of equations.
- B) (2, 10)
- C) (20, -5)
- D) There is an infinite number of solutions to this system.

$$\begin{aligned} 2x - 3y &= 17 \\ -2x + 4y &= -20 \end{aligned}$$

7. Based on the system of equations above, which of the following is a possible solution?

- A) (-4, -3)
- B) (-3, 4)
- C) (3, 4)
- D) (4, -3)