

Heart of Algebra Drill 7

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. At 7:00 A.M., a sewage treatment tank contains 3,000,000 gallons of water. Starting at 7:00 A.M., x gallons per minute flow into the tank, and y gallons per minute flow out of the tank. No water enters or leaves the tank otherwise. Which of the following functions, f , models the number of gallons of water in the sewage treatment plant at 8:00 A.M.? (Note: 1 hour = 60 minutes)

- A) $f(x, y) = 3,000,000 + 60xy$
B) $f(x, y) = 3,000,000 - 60(x + y)$
C) $f(x, y) = 3,000,000 + 60(x - y)$
D) $f(x, y) = 3,000,000 + x - y$

2. When a solute is added to a solvent to create a solution, the change in freezing point can be determined by using the formula $\Delta T = K_f \times m \times i$, where ΔT = freezing point of pure solvent - freezing point of solution, in degrees Celsius; K_f is the freezing point depression constant for the solvent; m is the concentration of solute in molality, and i is the van 't Hoff factor. Pure water has a freezing point of 0°C . Solute NaCl (van 't Hoff factor = 2) is added to the solvent water to create a 0.1 molal solution with a freezing point of -0.372°C . Which of the following equations, if solved, would accurately determine the freezing point depression constant of water, given the provided information?

- A) $K_f = \frac{0 - (-0.372)}{(0.1)(2)}$
B) $K_f = \frac{(0.1)(2)}{0 - (-0.372)}$
C) $K_f = [0 - (-0.372)](0.1)(2)$
D) $K_f = \frac{(0)(-0.372)}{2 - 0.1}$

3. Bombast Cable Company charges a flat monthly rate of \$22.95 for its basic cable package. For every additional 10 channels added, a customer has an additional monthly charge of \$1.25. Additional channels can only be purchased in groups of 10. For example, if a customer wants to add 12 channels, the customer would actually be charged for 20 channels or two groups of 10 channels. If a customer adds x channels to the package then, in terms of x , what is the charge after one year?

- A) $22.95 + 1.25\left(\frac{x}{10}\right)$
B) $12(22.95) + 12(1.25)\left(\frac{x}{10}\right)$
C) $12(22.95) - 12(1.25)\left(\frac{x}{10}\right)$
D) $22.95 + \frac{12(1.25)x}{10}$

4. Marguerite and Whitney are collecting canned goods for their neighborhood ThanksGiving-a-Can can drive. For each house they visit when collecting, they receive an average of 2 canned goods. If Whitney started with 4 cans from her own kitchen for the drive while Marguerite started with none, which of the following situations is correct at a given point during their can drive?

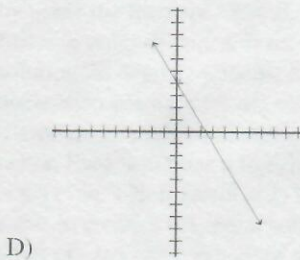
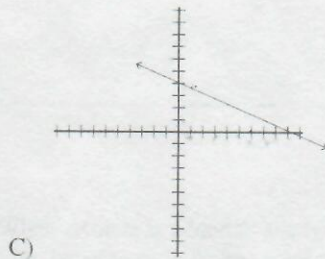
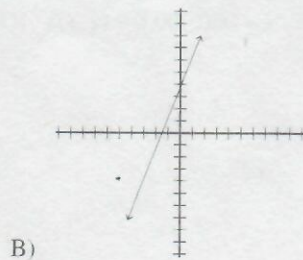
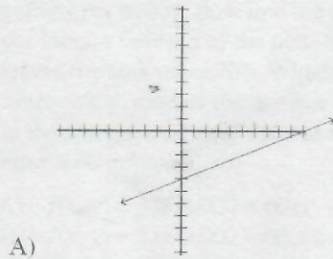
- A) When Marguerite has 4 cans, Whitney has 4 cans
B) When Marguerite has 8 cans, Whitney has 12 cans
C) When Marguerite has 12 cans, Whitney has 20 cans
D) When Marguerite has 16 cans, Whitney has 24 cans

5. Chad and Julia run a life-coaching business, Go Get 'Em, that charges \$150 per hour per client. They each have a weekly schedule of 20 clients who have 1-hour sessions each. Chad and Julia meet their students in an office for which they each pay \$500 in monthly rental fees. If r represents the hourly rate that Go Get 'Em charges its clients, which of the following represents Go Get 'Em's profit, P , in one month? (Note: 1 month = 4 weeks)
- A) $P = 80r - 500$
 - B) $P = 80r - 1,000$
 - C) $P = 160r - 500$
 - D) $P = 160r - 1,000$

Heart of Algebra Drill 8

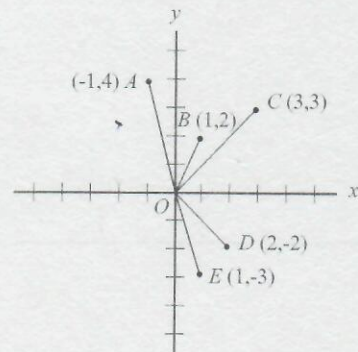
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1. Which of the following lines is perpendicular to $3x - 7y = 28$?

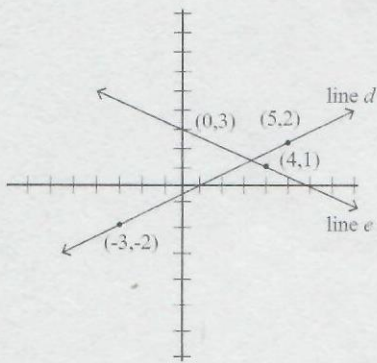


2. Line p has a slope of zero and a y -intercept of 4. Line q has a slope that is undefined and an x -intercept of 3. What is the distance between the origin and the point of intersection between these two lines?

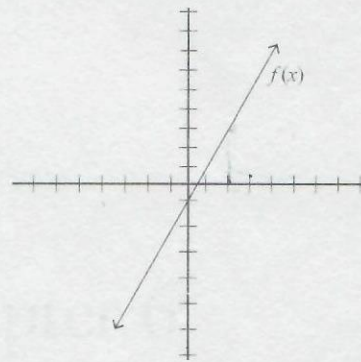
- A) $3\sqrt{2}$
 B) 4
 C) $4\sqrt{2}$
 D) 5



3. In the figure above, what is the average (arithmetic mean) of the slopes of OA , OB , OC , OD , and OE ?
- A) -5
 B) -1
 C) 0
 D) 1



4. Which of the following systems of equations defines lines d and e in the xy -coordinate plane above?
- A) line d : $5x + 2y = 10$
line e : $4x + y = 6$
 - B) line d : $x + 5y = 15$
line e : $3x - y = 6$
 - C) line d : $-3x + 4y = 10$
line e : $2x + 2y = 6$
 - D) line d : $2x - 4y = 2$
line e : $3x + 6y = 18$



5. The graph of $f(x)$ is shown above. If the function d is defined by $d(x) = f\left(\frac{1}{2}x - 1\right)$, what is the value of $d(6)$?
- A) -1
 - B) 1
 - C) 3
 - D) 5

6. Line l passes through points $\left(9, \frac{31}{7}\right)$ and $\left(0, -\frac{4}{7}\right)$.
Line m is defined by the equation $y = -\frac{4}{7}x + \frac{5}{9}$.
What is the point of intersection of line l and line m ?
- A) $\left(1, -\frac{1}{63}\right)$
 - B) $\left(0, \frac{5}{9}\right)$
 - C) $\left(-\frac{1}{63}, 1\right)$
 - D) $\left(0, -\frac{4}{7}\right)$