# 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) $f(g, m) = 128 + 128(g) - 32\left(\dfrac{m}{10}\right)$

    C) $f(g, m) = 128 + 128(g) - 128\left(\dfrac{m}{10}\right)$

    D) $f(g, m) = 1 + g - 32\left(\dfrac{m}{10}\right)$

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

# Passport to Advanced Math Drill 3

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 $x^2 - 12x = -11$, and $x > 1$, then $x =$

3. $[x^3 - 2x + 3] + [2x^2 + 2x - 4] =$

    A) $x^3 - 2x^2 - 4x + 7$
    B) $x^3 + 2x^2 - 1$
    C) $2x^5 + 2x^4 - 8x^3 + 10x^2 + 14x - 12$
    D) $3x^2 - 1$

2. What is the positive difference between the roots of the equation $(x + 1)^2 = 16$?

    A) 2
    B) 5
    C) 8
    D) 16

4. For which value of $c$ does the equation $2x^2 + c = 8x$ have exactly 1 value for $x$?

    A) $-8$
    B) 0
    C) 2
    D) 8

5. If $7x + 3 = -x^2$, then $x =$

A) $\dfrac{-7 \pm \sqrt{61}}{-2}$

B) $\dfrac{-7 \pm \sqrt{37}}{2}$

C) $\dfrac{-3 \pm \sqrt{-19}}{14}$

D) $\dfrac{3 \pm \sqrt{37}}{2}$

6. $(5z^8 - 2z^3 + z) - (-4z^4 + 2z^3 + z) =$

A) $5z^8 + 4z^4$
B) $5z^8 - 4z^4 + 2z$
C) $5z^8 - 4z^4 - 4z^3 + 2z$
D) $5z^8 + 4z^4 - 4z^3$

# Problem Solving and Data Analysis Drill 3

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.

*Questions 1 through 5 refer to the following graph.*

INCOME BASED ON YEARS OF EXPERIENCE AT COMPANY X



Years of Experience
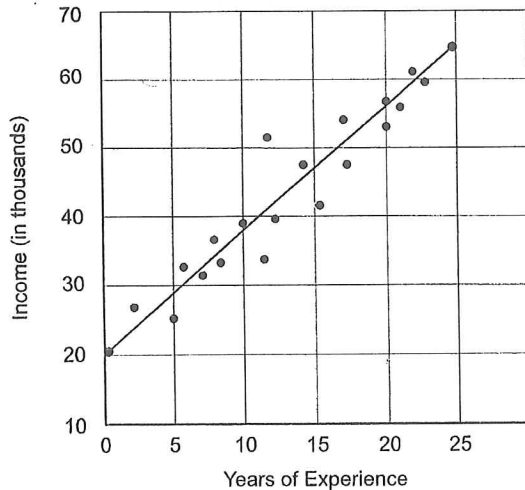
1. The scatterplot above shows the income, in thousands, of all the employees of Company X, based on years of experience in the industry. Based on the line of best fit to the data represented, what is the minimum starting salary, in thousands of dollars, at Company X?

2. The scatterplot above shows the income, in thousands, of all the employees of Company X, based on years of experience in the industry. Based on the line of best fit to the data represented, which of the following is the closest to the expected number of years of experience of an employee whose income is $30,000?

A) 5
B) 5.55
C) 37
D) 74

3. The scatterplot to the left shows the income, in thousands, of all the employees of Company X, based on years of experience in the industry. Based on the line of best fit to the data represented, which of the following is the expected income of an employee with 35 years of experience?

A) $61,800
B) $65,000
C) $83,000
D) $96,000

4. The scatterplot to the left shows the income, in thousands, of all the employees of Company X, based on years of experience in the industry. Based on the line of best fit to the data represented, which of the following is the closest to the average increase in income per additional year of experience?

A) $900
B) $1,800
C) $4,500
D) $9,000

5. The scatterplot on the previous page shows the income, in thousands, of all the employees of Company X, based on years of experience in the industry. Which of the following could be the equation of the line of best fit to the data represented, as shown on the graph?

A) $y = 1.8x + 20$
B) $y = 2x + 20{,}000$
C) $y = 70x + 25$
D) $y = 1{,}800x + 20{,}000$
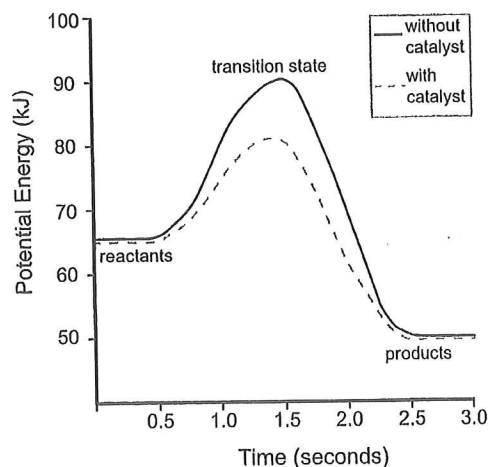


6. A chemistry student is studying the effect of a catalyst on a chemical reaction. She heats solid potassium chlorate ($KClO_3$), which becomes potassium chloride (KCl) and oxygen ($O_2$). She runs the reaction again, adding solid manganese dioxide ($MnO_2$) as a catalyst. She graphs the potential energy, in kilojoules, as a function of time. Which of the following statements is true of the graph above?

A) The potential energy of the reactants was less than that of the products.
B) The potential energy of the reaction was lowest during the transition state.
C) The addition of the catalyst lowered the potential energy of the reaction during the transition state.
D) The addition of the catalyst had no effect on the potential energy of the reaction.
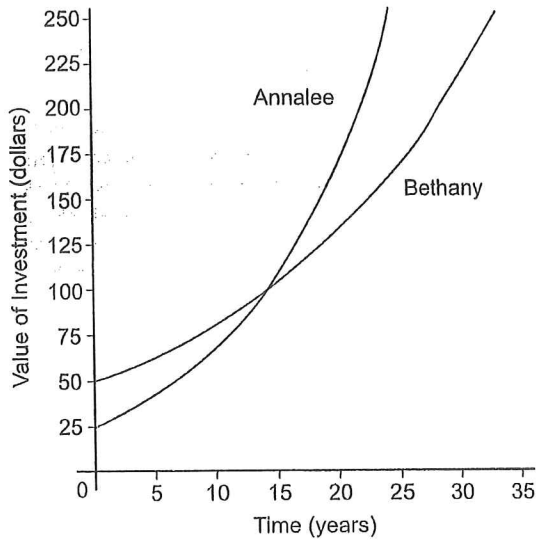
7. Annalee and Bethany start investing at the same time in accounts that will earn interest compounded annually. Both women intend to leave their investments in place until the total value reaches $250. After the initial deposit ($t = 0$), Annalee and Bethany check and record the value of their investments once every year. The value of the two investments was graphed and fitted with a smooth curve, as shown above, where each curve represents the value of one investment, in dollars, as a function of time, in years. Which of the following is a true statement regarding the investment values shown above?

A) For the first 15 years, Bethany's investment is growing at a higher average rate than Annalee's investment.

B) At $t = 0$, both investments are worth $100.

C) At $t = 0$, the value of Annalee's investment is 200% that of Bethany's investment.

D) At $t = 0$, Annalee has reached 10% of her goal and Bethany has reached 20% of hers.

# Additional Topics 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. In rectangle $PQRS$, shown below, the diagonal $PR$ is 15 meters. If the sine of $\angle SPR$ is 7/10, what is the value of $RS$?
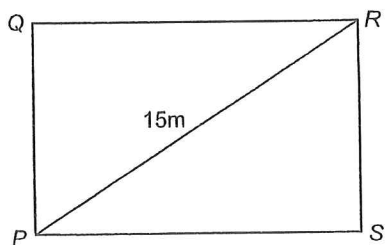


A) 0.01
B) 0.70
C) 7.0
D) 10.5

2. In the figure below, $ABC$ is an isosceles triangle. The height of the triangle, $BD$, is 8 cm. $AB = BC = 10$. What is the value of $\tan C$?
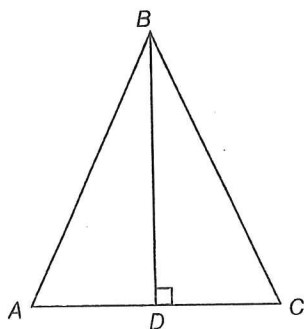


A) 10/6
B) 6/8
C) 8/6
D) 6/10

3. A child sits in a tree 9 meters off the ground. His line of sight to the ground forms a 36° angle with the tree. If he is looking at a cat on the ground, approximately how far is the cat from the base of the tree in feet?

A) 6.5
B) 11.0
C) 13.8
D) 15.0

4. In the $xy$-plane, a circle is centered on the origin and the point $(p, q)$ lies on the circumference of the circle. What is the radius of the circle, in terms of $p$ and $q$ ?

A) $p + q$
B) $p - q$
C) $p^2 + q^2$
D) $\sqrt{p^2 + q^2}$

5. The diameter of the circle falls on the line $y = \frac{1}{2}x + 4$. If the radius of the circle is 4, which of the following could be the equation of the circle?

A) $(x + 4)^2 + (y + 6)^2 = 4$
B) $(x - 2)^2 + (y - 5)^2 = 16$
C) $(x - 2)^2 + (y + 3)^2 = 4$
D) $(x + 2)^2 + (y + 5)^2 = 16$

6. What is the radius of a circle represented by the equation $x^2 + y^2 - 6x + 4y = 12$?

A) 5
B) 4
C) 3
D) 2