SAT
Math Concepts
Packet

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If $t > 0$ and $t^2 - 4 = 0$, what is the value of t ?

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A) 4
B) 9
C) 11
D) 20

1 Test 8 Sec 3

$$3x + x + x + x - 3 - 2 = 7 + x + x$$

In the equation above, what is the value of x ?

A) $-\frac{5}{7}$

B) 1

C) $\frac{12}{7}$

D) 3

5 Test 5 Sec 3

$$\sqrt{k+2} - x = 0$$

In the equation above, k is a constant. If $x = 9$, what is the value of k ?

A) 1
B) 7
C) 16
D) 79

Isolating a variable

16 Test 7 Sec 3

If $2x + 8 = 16$, what is the value of $x + 4$?

17 Test 5 Sec 3

$$2(p + 1) + 8(p - 1) = 5p$$

What value of p is the solution of the equation above?

2 Test 3 Sec 3

If $3r = 18$, what is the value of $6r + 3$?

A) 6
B) 27
C) 36
D) 39

5 Test 2 Sec 3

$$\sqrt{2k^2 + 17} - x = 0$$

If $k > 0$ and $x = 7$ in the equation above, what is the value of k ?

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

Isolating a variable

9 Test 6 Sec 3

If $\sqrt{x} + \sqrt{9} = \sqrt{64}$, what is the value of x ?

A) $\sqrt{5}$

B) 5

C) 25

D) 55

20 Test 1 Sec 3

If $a = 5\sqrt{2}$ and $2a = \sqrt{2x}$, what is the value of x ?

Isolating a variable (Word Problem Variety)

13 Test 3 Sec 4

$$h = -16t^2 + vt + k$$

The equation above gives the height h, in feet, of a ball t seconds after it is thrown straight up with an initial speed of v feet per second from a height of k feet. Which of the following gives v in terms of h, t, and k ?

A) $v = h + k - 16t$

B) $v = \dfrac{h - k + 16}{t}$

C) $v = \dfrac{h + k}{t} - 16t$

D) $v = \dfrac{h - k}{t} + 16t$

7 Test 6 Sec 3

A bricklayer uses the formula $n = 7\ell h$ to estimate the number of bricks, n, needed to build a wall that is ℓ feet long and h feet high. Which of the following correctly expresses ℓ in terms of n and h ?

A) $\ell = \dfrac{7}{nh}$

B) $\ell = \dfrac{h}{7n}$

C) $\ell = \dfrac{n}{7h}$

D) $\ell = \dfrac{n}{7 + h}$

Isolating a variable (Word Problem Variety)

Questions 9 and 10 refer to the following information.

$$a = 1{,}052 + 1.08t$$

The speed of a sound wave in air depends on the air temperature. The formula above shows the relationship between a, the speed of a sound wave, in feet per second, and t, the air temperature, in degrees Fahrenheit (°F).

9 Test 1 Sec 4

Which of the following expresses the air temperature in terms of the speed of a sound wave?

A) $t = \dfrac{a - 1{,}052}{1.08}$

B) $t = \dfrac{a + 1{,}052}{1.08}$

C) $t = \dfrac{1{,}052 - a}{1.08}$

D) $t = \dfrac{1.08}{a + 1{,}052}$

10 Test 1 Sec 4

At which of the following air temperatures will the speed of a sound wave be closest to 1,000 feet per second?

A) −46°F

B) −48°F

C) −49°F

D) −50°F

$$I = \frac{P}{4\pi r^2}$$

At a large distance r from a radio antenna, the intensity of the radio signal I is related to the power of the signal P by the formula above.

22 Test 2 Sec 4

Which of the following expresses the square of the distance from the radio antenna in terms of the intensity of the radio signal and the power of the signal?

A) $r^2 = \dfrac{IP}{4\pi}$

B) $r^2 = \dfrac{P}{4\pi I}$

C) $r^2 = \dfrac{4\pi I}{P}$

D) $r^2 = \dfrac{I}{4\pi P}$

Combining Like Terms

2 Test 1 Sec 3

For $i = \sqrt{-1}$, what is the sum $(7 + 3i) + (-8 + 9i)$?

A) $-1 + 12i$

B) $-1 - 6i$

C) $15 + 12i$

D) $15 - 6i$

5 Test 1 Sec 3

$$(x^2y - 3y^2 + 5xy^2) - (-x^2y + 3xy^2 - 3y^2)$$

Which of the following is equivalent to the expression above?

A) $4x^2y^2$

B) $8xy^2 - 6y^2$

C) $2x^2y + 2xy^2$

D) $2x^2y + 8xy^2 - 6y^2$

3 Test 6 Sec 3

What is the sum of the complex numbers $2 + 3i$ and $4 + 8i$, where $i = \sqrt{-1}$?

A) 17

B) $17i$

C) $6 + 11i$

D) $8 + 24i$

6 Test 5 Sec 3

Which of the following is equivalent to the sum of the expressions $a^2 - 1$ and $a + 1$?

A) $a^2 + a$

B) $a^3 - 1$

C) $2a^2$

D) a^3

Rational Equations (One-variable cross multiply)

7 Test 3 Sec 4

If $\frac{3}{5}w = \frac{4}{3}$, what is the value of w ?

A) $\frac{9}{20}$

B) $\frac{4}{5}$

C) $\frac{5}{4}$

D) $\frac{20}{9}$

1 Test 1 Sec 3

If $\frac{x-1}{3} = k$ and $k = 3$, what is the value of x ?

A) 2

B) 4

C) 9

D) 10

5 Test 3 Sec 3

If $\frac{5}{x} = \frac{15}{x+20}$, what is the value of $\frac{x}{5}$?

A) 10

B) 5

C) 2

D) $\frac{1}{2}$

Rational Equations (One-variable cross multiply)

10 Test 4 Sec 3

If $\frac{t+5}{t-5} = 10$, what is the value of t ?

A) $\frac{45}{11}$

B) 5

C) $\frac{11}{2}$

D) $\frac{55}{9}$

17 Test 6 Sec 3

$$\frac{2}{3}t = \frac{5}{2}$$

What value of t is the solution of the equation above?

6 Test 6 Sec 3

If $x = \frac{2}{3}y$ and $y = 18$, what is the value of $2x - 3$?

A) 21

B) 15

C) 12

D) 10

Rational Equations (Two-variable cross multiply)

8 Test 1 Sec 3

If $\frac{a}{b} = 2$, what is the value of $\frac{4b}{a}$?

A) 0

B) 1

C) 2

D) 4

12 Test 8 Sec 3

If $\frac{2a}{b} = \frac{1}{2}$, what is the value of $\frac{b}{a}$?

A) $\frac{1}{8}$

B) $\frac{1}{4}$

C) 2

D) 4

6 Test 4 Sec 3

If $\frac{a-b}{b} = \frac{3}{7}$, which of the following must also be true?

A) $\frac{a}{b} = -\frac{4}{7}$

B) $\frac{a}{b} = \frac{10}{7}$

C) $\frac{a+b}{b} = \frac{10}{7}$

D) $\frac{a-2b}{b} = -\frac{11}{7}$

Rational Equations (Word problem variety)

12 Test 2 Sec 3

$$R = \frac{F}{N + F}$$

A website uses the formula above to calculate a seller's rating, R, based on the number of favorable reviews, F, and unfavorable reviews, N. Which of the following expresses the number of favorable reviews in terms of the other variables?

A) $F = \frac{RN}{R - 1}$

B) $F = \frac{RN}{1 - R}$

C) $F = \frac{N}{1 - R}$

D) $F = \frac{N}{R - 1}$

The formula below is often used by project managers to compute E, the estimated time to complete a job, where O is the shortest completion time, P is the longest completion time, and M is the most likely completion time.

$$E = \frac{O + 4M + P}{6}$$

Which of the following correctly gives P in terms of E, O, and M ?

A) $P = 6E - O - 4M$

B) $P = -6E + O + 4M$

C) $P = \frac{O + 4M + E}{6}$

D) $P = \frac{O + 4M - E}{6}$

Rational Equations (Word problem variety)

7 Test 1 Sec 3

$$m = \frac{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^{N}}{\left(1+\frac{r}{1{,}200}\right)^{N}-1} P$$

The formula above gives the monthly payment m needed to pay off a loan of P dollars at r percent annual interest over N months. Which of the following gives P in terms of m, r, and N ?

A) $P = \frac{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^{N}}{\left(1+\frac{r}{1{,}200}\right)^{N}-1} m$

B) $P = \frac{\left(1+\frac{r}{1{,}200}\right)^{N}-1}{\left(\frac{r}{1{,}200}\right)\left(1+\frac{r}{1{,}200}\right)^{N}} m$

C) $P = \left(\frac{r}{1{,}200}\right) m$

D) $P = \left(\frac{1{,}200}{r}\right) m$

Rational Equations (Common Denominator)

17 Test 3 Sec 3

If $\frac{7}{9}x - \frac{4}{9}x = \frac{1}{4} + \frac{5}{12}$, what is the value of x ?

19 Test 5 Sec 3

$$\frac{2x+6}{(x+2)^2} - \frac{2}{x+2}$$

The expression above is equivalent to $\frac{a}{(x+2)^2}$, where a is a positive constant and $x \neq -2$.

What is the value of a ?

13 Test 3 Sec 3

The equation $\frac{24x^2+25x-47}{ax-2} = -8x - 3 - \frac{53}{ax-2}$ is true for all values of $x \neq \frac{2}{a}$, where a is a constant.

What is the value of a ?

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

Manipulating Expressions (Equivalency Problems)

4 Test 2 Sec 3

$$9a^4 + 12a^2b^2 + 4b^4$$

Which of the following is equivalent to the expression shown above?

A) $(3a^2 + 2b^2)^2$

B) $(3a + 2b)^4$

C) $(9a^2 + 4b^2)^2$

D) $(9a + 4b)^4$

2 Test 7 Sec 3

Which of the following is equivalent to $3(x + 5) - 6$?

A) $3x - 3$

B) $3x - 1$

C) $3x + 9$

D) $15x - 6$

5 Test 4 Sec 3

$$3(2x + 1)(4x + 1)$$

Which of the following is equivalent to the expression above?

A) $45x$

B) $24x^2 + 3$

C) $24x^2 + 18x + 3$

D) $18x^2 + 6$

Manipulating Expressions (Equivalency Problems)

15 Test 2 Sec 3

The expression $\frac{5x-2}{x+3}$ is equivalent to which of the following?

A) $\frac{5-2}{3}$

B) $5-\frac{2}{3}$

C) $5-\frac{2}{x+3}$

D) $5-\frac{17}{x+3}$

$$x^2+6x+4$$

Which of the following is equivalent to the expression above?

A) $(x+3)^2+5$

B) $(x+3)^2-5$

C) $(x-3)^2+5$

D) $(x-3)^2-5$

13 Test 1 Sec 3

If $x>3$, which of the following is equivalent to $\frac{1}{\frac{1}{x+2}+\frac{1}{x+3}}$?

A) $\frac{2x+5}{x^2+5x+6}$

B) $\frac{x^2+5x+6}{2x+5}$

C) $2x+5$

D) x^2+5x+6

Manipulating Expressions (Equivalency Problems)

13 Test 7 Sec 3

Which of the following expressions is equivalent to

$\frac{x^2 - 2x - 5}{x - 3}$?

A) $x - 5 - \frac{20}{x - 3}$

B) $x - 5 - \frac{10}{x - 3}$

C) $x + 1 - \frac{8}{x - 3}$

D) $x + 1 - \frac{2}{x - 3}$

8 Test 8 Sec 3

$$f(x) = x^3 - 9x$$
$$g(x) = x^2 - 2x - 3$$

Which of the following expressions is equivalent to

$\frac{f(x)}{g(x)}$, for $x > 3$?

A) $\frac{1}{x + 1}$

B) $\frac{x + 3}{x + 1}$

C) $\frac{x(x - 3)}{x + 1}$

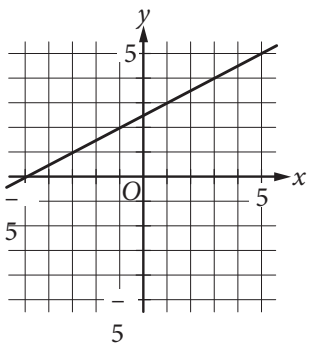
D) $\frac{x(x + 3)}{x + 1}$

Linear Functions (Using y = mx+b)

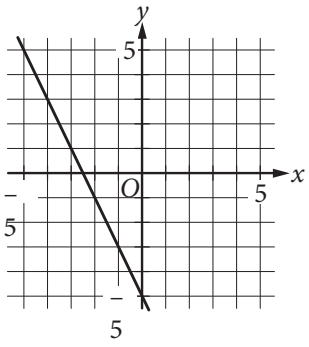
5 Test 6 Sec

Which of the following is the graph of the equation $y = 2x - 5$ in the xy-plane?

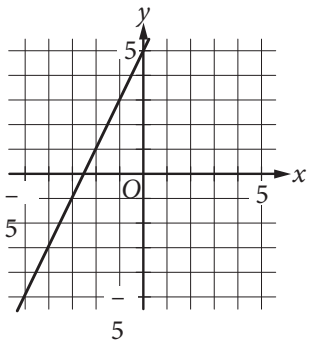
A



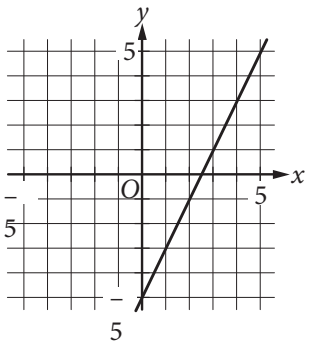
B



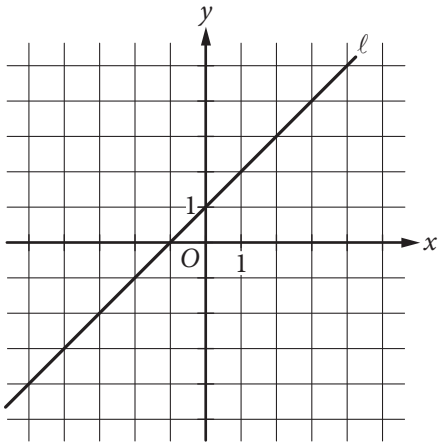
C



D



1 Test 5 Sec 3



Which of the following is an equation of line ℓ in the xy-plane above?

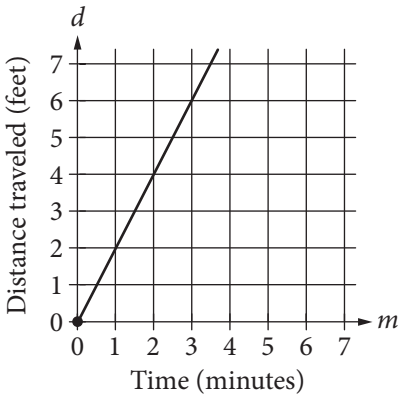
A) $x = 1$

B) $y = 1$

C) $y = x$

D) $y = x + 1$

2



The graph above shows the distance traveled d, in feet, by a product on a conveyor belt m minutes after the product is placed on the belt. Which of the following equations correctly relates d and m ?

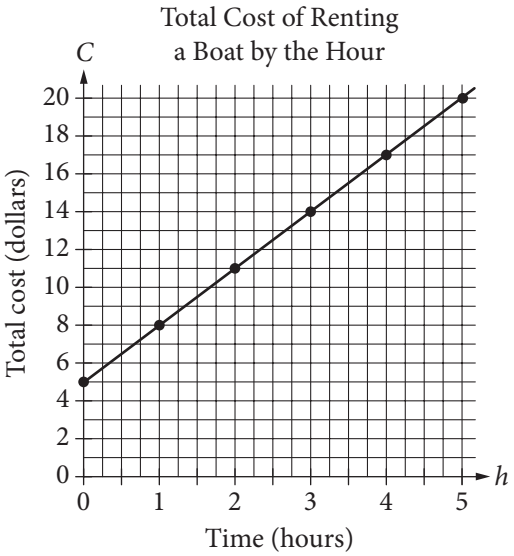
A) $d = 2m$

B) $d = \frac{1}{2}m$

C) $d = m + 2$

D) $d = 2m + 2$

Linear Functions (Using y = mx+b)



The graph above displays the total cost C, in dollars, of renting a boat for h hours.

16 Test 1 Sec 4

Which of the following represents the relationship between h and C ?

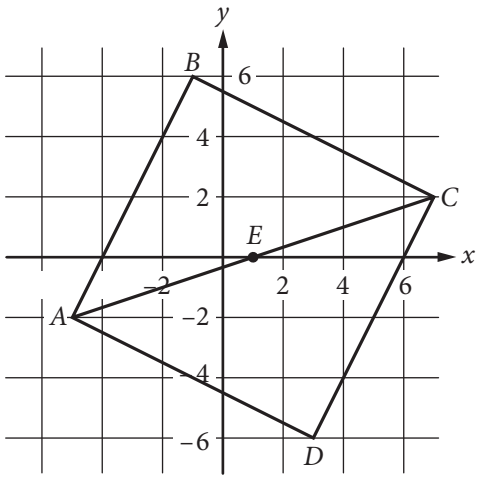
A) $C = 5h$

B) $C = \frac{3}{4}h + 5$

C) $C = 3h + 5$

D) $h = 3C$

28 Test 2 Sec 4



In the xy-plane above, $ABCD$ is a square and point E is the center of the square. The coordinates of points C and E are $(7, 2)$ and $(1, 0)$, respectively. Which of the following is an equation of the line that passes through points B and D ?

A) $y = -3x - 1$

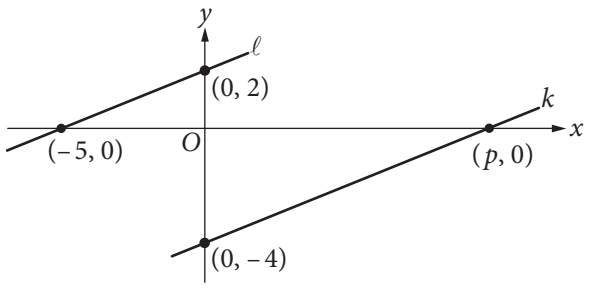
B) $y = -3(x - 1)$

C) $y = -\frac{1}{3}x + 4$

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

Linear Equations (Using y = mx+b)

6 Test 2 Sec 3



In the *xy*-plane above, line ℓ is parallel to line k. What is the value of p ?

A) 4

B) 5

C) 8

D) 10

8 Test 4 Sec 3

Which of the following equations represents a line that is parallel to the line with equation $y = -3x + 4$?

A) $6x + 2y = 15$

B) $3x - y = 7$

C) $2x - 3y = 6$

D) $x + 3y = 1$

Linear Equations (Using y = mx + b in Word Problem Variety)

6 Test 1 Sec 3

$$h = 3a + 28.6$$

A pediatrician uses the model above to estimate the height h of a boy, in inches, in terms of the boy's age a, in years, between the ages of 2 and 5. Based on the model, what is the estimated increase, in inches, of a boy's height each year?

A) 3

B) 5.7

C) 9.5

D) 14.3

4 Test 1 Sec 3

Kathy is a repair technician for a phone company. Each week, she receives a batch of phones that need repairs. The number of phones that she has left to fix at the end of each day can be estimated with the equation $P = 108 - 23d$, where P is the number of phones left and d is the number of days she has worked that week. What is the meaning of the value 108 in this equation?

A) Kathy will complete the repairs within 108 days.

B) Kathy starts each week with 108 phones to fix.

C) Kathy repairs phones at a rate of 108 per hour.

D) Kathy repairs phones at a rate of 108 per day.

8 Test 3 Sec 4

The average number of students per classroom at Central High School from 2000 to 2010 can be modeled by the equation $y = 0.56x + 27.2$, where x represents the number of years since 2000, and y represents the average number of students per classroom. Which of the following best describes the meaning of the number 0.56 in the equation?

A) The total number of students at the school in 2000

B) The average number of students per classroom in 2000

C) The estimated increase in the average number of students per classroom each year

D) The estimated difference between the average number of students per classroom in 2010 and in 2000

Linear Equations (Using y = mx + b in Word Problem Variety)

1 Test 6 Sec

Salim wants to purchase tickets from a vendor to watch a tennis match. The vendor charges a one-time service fee for processing the purchase of the tickets. The equation $T = 15n + 12$ represents the total amount T, in dollars, Salim will pay for n tickets. What does 12 represent in the equation?

A) The price of one ticket, in dollars

B) The amount of the service fee, in dollars

C) The total amount, in dollars, Salim will pay for one ticket

D) The total amount, in dollars, Salim will pay for any number of tickets

8 Test 5 Sec 3

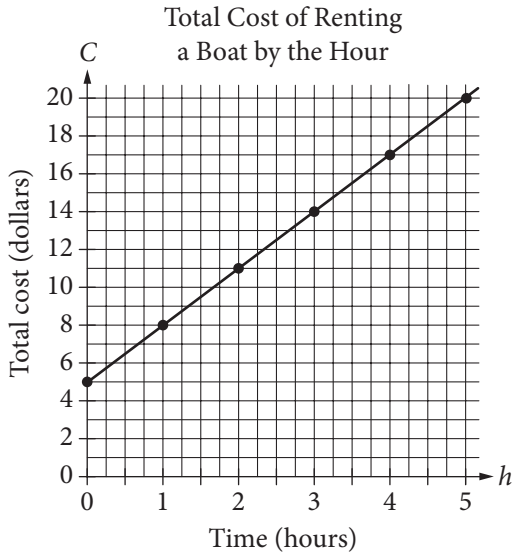
In air, the speed of sound S, in meters per second, is a linear function of the air temperature T, in degrees Celsius, and is given by $S(T) = 0.6T + 331.4$. Which of the following statements is the best interpretation of the number 331.4 in this context?

A) The speed of sound, in meters per second, at 0°C

B) The speed of sound, in meters per second, at 0.6°C

C) The increase in the speed of sound, in meters per second, that corresponds to an increase of 1°C

D) The increase in the speed of sound, in meters per second, that corresponds to an increase of 0.6°C



The graph above displays the total cost C, in dollars, of renting a boat for h hours.

15 Test 1 Sec 4

What does the C-intercept represent in the graph?

A) The initial cost of renting the boat

B) The total number of boats rented

C) The total number of hours the boat is rented

D) The increase in cost to rent the boat for each additional hour

Linear Equations (Using y = mx + b in Word Problem Variety)

19 Test 8 Sec 3

A start-up company opened with 8 employees. The company's growth plan assumes that 2 new employees will be hired each quarter (every 3 months) for the first 5 years. If an equation is written in the form $y = ax + b$ to represent the number of employees, y, employed by the company x quarters after the company opened, what is the value of b ?

35 Test 2 Sec 4

$$a = 18t + 15$$

Jane made an initial deposit to a savings account. Each week thereafter she deposited a fixed amount to the account. The equation above models the amount a, in dollars, that Jane has deposited after t weekly deposits. According to the model, how many dollars was Jane's initial deposit? (Disregard the $ sign when gridding your answer.)

32 Test 4 Sec 4

The normal systolic blood pressure P, in millimeters of mercury, for an adult male x years old can be modeled by the equation $P = \frac{x + 220}{2}$. According to the model, for every increase of 1 year in age, by how many millimeters of mercury will the normal systolic blood pressure for an adult male increase?

Linear Equations (Using y = mx + b in Word Problem Variety)

13 Test 5 Sec 3

At a restaurant, n cups of tea are made by adding t tea bags to hot water. If $t = n + 2$, how many additional tea bags are needed to make each additional cup of tea?

A) None
B) One
C) Two
D) Three

Questions 16 and 17 refer to the following information.

Mr. Martinson is building a concrete patio in his backyard and deciding where to buy the materials and rent the tools needed for the project. The table below shows the materials' cost and daily rental costs for three different stores.

Store	Materials' Cost, M (dollars)	Rental cost of wheelbarrow, W (dollars per day)	Rental cost of concrete mixer, K (dollars per day)
A	750	15	65
B	600	25	80
C	700	20	70

The total cost, y, for buying the materials and renting the tools in terms of the number of days, x, is given by $y = M + (W + K)x$.

17 Test 4 Sec 4

If the relationship between the total cost, y, of buying the materials and renting the tools at Store C and the number of days, x, for which the tools are rented is graphed in the xy-plane, what does the slope of the line represent?

A) The total cost of the project
B) The total cost of the materials
C) The total daily cost of the project
D) The total daily rental costs of the tools

Linear Equations (Using y = mx + b in Word Problem Variety)

15 Test 3 Sec 3

$$C = \frac{5}{9}(F - 32)$$

The equation above shows how a temperature F, measured in degrees Fahrenheit, relates to a temperature C, measured in degrees Celsius. Based on the equation, which of the following must be true?

I. A temperature increase of 1 degree Fahrenheit is equivalent to a temperature increase of $\frac{5}{9}$ degree Celsius.

II. A temperature increase of 1 degree Celsius is equivalent to a temperature increase of 1.8 degrees Fahrenheit.

III. A temperature increase of $\frac{5}{9}$ degree Fahrenheit is equivalent to a temperature increase of 1 degree Celsius.

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

Linear Equations (Word Problem Variety / Building the Line Equation)

16 Test 5 Sec 3

Maria plans to rent a boat. The boat rental costs $60 per hour, and she will also have to pay for a water safety course that costs $10. Maria wants to spend no more than $280 for the rental and the course. If the boat rental is available only for a whole number of hours, what is the maximum number of hours for which Maria can rent the boat?

8 Test 2 Sec 4

In a video game, each player starts the game with k points and loses 2 points each time a task is not completed. If a player who gains no additional points and fails to complete 100 tasks has a score of 200 points, what is the value of k ?

A) 0

B) 150

C) 250

D) 400

32 Test 1 Sec 4

The posted weight limit for a covered wooden bridge in Pennsylvania is 6000 pounds. A delivery truck that is carrying x identical boxes each weighing 14 pounds will pass over the bridge. If the combined weight of the empty delivery truck and its driver is 4500 pounds, what is the maximum possible value for x that will keep the combined weight of the truck, driver, and boxes below the bridge's posted weight limit?

Linear Equations (Word Problem Variety / Building the Line Equation)

12 Test 2 Sec 4

On January 1, 2000, there were 175,000 tons of trash in a landfill that had a capacity of 325,000 tons. Each year since then, the amount of trash in the landfill increased by 7,500 tons. If y represents the time, in years, after January 1, 2000, which of the following inequalities describes the set of years where the landfill is at or above capacity?

A) $325{,}000 - 7{,}500 \leq y$

B) $325{,}000 \leq 7{,}500y$

C) $150{,}000 \geq 7{,}500y$

D) $175{,}000 + 7{,}500y \geq 325{,}000$

14 Test 3 Sec 4

The cost of using a telephone in a hotel meeting room is \$0.20 per minute. Which of the following equations represents the total cost c, in dollars, for h hours of phone use?

A) $c = 0.20(60h)$

B) $c = 0.20h + 60$

C) $c = \dfrac{60h}{0.20}$

D) $c = \dfrac{0.20h}{60}$

Linear Equations (Slope formula)

12 Test 1 Sec 3

A line in the *xy*-plane passes through the origin and has a slope of $\frac{1}{7}$. Which of the following points lies on the line?

A) $(0, 7)$

B) $(1, 7)$

C) $(7, 7)$

D) $(14, 2)$

8 Test 3 Sec 3

The line $y = kx + 4$, where k is a constant, is graphed in the *xy*-plane. If the line contains the point (c, d), where $c \neq 0$ and $d \neq 0$, what is the slope of the line in terms of c and d ?

A) $\frac{d-4}{c}$

B) $\frac{c-4}{d}$

C) $\frac{4-d}{c}$

D) $\frac{4-c}{d}$

Linear Equations (Slope formula)

26 Test 3 Sec 4

In the xy-plane, the line determined by the points $(2, k)$ and $(k, 32)$ passes through the origin. Which of the following could be the value of k ?

A) 0
B) 4
C) 8
D) 16

19 Test 7 Sec 3

The graph of a line in the xy-plane passes through the point $(1, 4)$ and crosses the x-axis at the point $(2, 0)$. The line crosses the y-axis at the point $(0, b)$. What is the value of b ?

Linear Equations (Slope Formula - Word Problem Variety)

7 Test 4 Sec 3

While preparing to run a marathon, Amelia created a training schedule in which the distance of her longest run every week increased by a constant amount. If Amelia's training schedule requires that her longest run in week 4 is a distance of 8 miles and her longest run in week 16 is a distance of 26 miles, which of the following best describes how the distance Amelia runs changes between week 4 and week 16 of her training schedule?

A) Amelia increases the distance of her longest run by 0.5 miles each week.

B) Amelia increases the distance of her longest run by 2 miles each week.

C) Amelia increases the distance of her longest run by 2 miles every 3 weeks.

D) Amelia increases the distance of her longest run by 1.5 miles each week.

13 Test 8 Sec 3

Oil and gas production in a certain area dropped from 4 million barrels in 2000 to 1.9 million barrels in 2013. Assuming that the oil and gas production decreased at a constant rate, which of the following linear functions f best models the production, in millions of barrels, t years after the year 2000?

A) $f(t) = \frac{21}{130}t + 4$

B) $f(t) = \frac{19}{130}t + 4$

C) $f(t) = -\frac{21}{130}t + 4$

D) $f(t) = -\frac{19}{130}t + 4$

Linear Equations (Slope Formula - Word Problem Variety)

6 Test 7 Sec 3

A company that makes wildlife videos purchases camera equipment for $32,400. The equipment depreciates in value at a constant rate for 12 years, after which it is considered to have no monetary value. How much is the camera equipment worth 4 years after it is purchased?

A) $10,800

B) $16,200

C) $21,600

D) $29,700

20 Test 4 Sec 3

The mesosphere is the layer of Earth's atmosphere between 50 kilometers and 85 kilometers above Earth's surface. At a distance of 50 kilometers from Earth's surface, the temperature in the mesosphere is $-5°$ Celsius, and at a distance of 80 kilometers from Earth's surface, the temperature in the mesosphere is $-80°$ Celsius. For every additional 10 kilometers from Earth's surface, the temperature in the mesosphere decreases by $k°$ Celsius, where k is a constant. What is the value of k ?

Linear Equations (Slope Formula - Word Problem Variety)

$$S(P) = \frac{1}{2}P + 40$$
$$D(P) = 220 - P$$

The quantity of a product supplied and the quantity of the product demanded in an economic market are functions of the price of the product. The functions above are the estimated supply and demand functions for a certain product. The function $S(P)$ gives the quantity of the product supplied to the market when the price is P dollars, and the function $D(P)$ gives the quantity of the product demanded by the market when the price is P dollars.

17 Test 3 Sec 4

How will the quantity of the product supplied to the market change if the price of the product is increased by $10 ?

A) The quantity supplied will decrease by 5 units.

B) The quantity supplied will increase by 5 units.

C) The quantity supplied will increase by 10 units.

D) The quantity supplied will increase by 50 units.

Systems of Linear Equations

9 Test 1 Sec 3

$$3x + 4y = -23$$
$$2y - x = -19$$

What is the solution (x, y) to the system of equations above?

A) $(-5, -2)$

B) $(3, -8)$

C) $(4, -6)$

D) $(9, -6)$

2 Test 2 Sec 3

$$x + y = 0$$
$$3x - 2y = 10$$

Which of the following ordered pairs (x, y) satisfies the system of equations above?

A) $(3, -2)$

B) $(2, -2)$

C) $(-2, 2)$

D) $(-2, -2)$

18 Test 1 Sec 3

$$x + y = -9$$
$$x + 2y = -25$$

According to the system of equations above, what is the value of x ?

Systems of Linear Equations

19 Test 4 Sec 3

$$-3x + 4y = 20$$
$$6x + 3y = 15$$

If (x, y) is the solution to the system of equations above, what is the value of x ?

18 Test 8 Sec 3

$$-x + y = -3.5$$
$$x + 3y = 9.5$$

If (x, y) satisfies the system of equations above, what is the value of y ?

6 Test 3 Sec 3

$$2x - 3y = -14$$
$$3x - 2y = -6$$

If (x, y) is a solution to the system of equations above, what is the value of $x - y$?

A) -20

B) -8

C) -4

D) 8

Systems of Linear Equations

3 Test 4 Sec 3

$$\frac{x}{y} = 6$$
$$4(y + 1) = x$$

If (x, y) is the solution to the system of equations above, what is the value of y ?

A) 2
B) 4
C) 12
D) 24

18 Test 6 Sec 3

$$\frac{1}{2}(2x + y) = \frac{21}{2}$$
$$y = 2x$$

The system of equations above has solution (x, y). What is the value of x ?

3 Test 7 Sec 3

$$x = y - 3$$
$$\frac{x}{2} + 2y = 6$$

Which ordered pair (x, y) satisfies the system of equations shown above?

A) (-3, 0)
B) (0, 3)
C) (6, -3)
D) (36, 6-)

Systems of Linear Equations (No solutions or infinite solutions)

9 Test 3 Sec 3

$$kx - 3y = 4$$
$$4x - 5y = 7$$

In the system of equations above, k is a constant and x and y are variables. For what value of k will the system of equations have no solution?

A) $\frac{12}{5}$

B) $\frac{16}{7}$

C) $-\frac{16}{7}$

D) $-\frac{12}{5}$

20 Test 2 Sec 3

$$ax + by = 12$$
$$2x + 8y = 60$$

In the system of equations above, a and b are constants. If the system has infinitely many solutions, what is the value of $\frac{a}{b}$?

Systems of Linear Equations (Word Problem Variety)

$$S(P) = \frac{1}{2}P + 40$$
$$D(P) = 220 - P$$

The quantity of a product supplied and the quantity of the product demanded in an economic market are functions of the price of the product. The functions above are the estimated supply and demand functions for a certain product. The function $S(P)$ gives the quantity of the product supplied to the market when the price is P dollars, and the function $D(P)$ gives the quantity of the product demanded by the market when the price is P dollars.

18 Test 3 Sec 4

At what price will the quantity of the product supplied to the market equal the quantity of the product demanded by the market?

A) $90
B) $120
C) $133
D) $155

11 Test 1 Sec 3

$$b = 2.35 + 0.25x$$
$$c = 1.75 + 0.40x$$

In the equations above, b and c represent the price per pound, in dollars, of beef and chicken, respectively, x weeks after July 1 during last summer. What was the price per pound of beef when it was equal to the price per pound of chicken?

A) $2.60
B) $2.85
C) $2.95
D) $3.35

Systems of Linear Equations (Word Problem Variety / Building the System)

9 Test 2 Sec 3

The graph of a line in the xy-plane has slope 2 and contains the point $(1, 8)$. The graph of a second line passes through the points $(1, 2)$ and $(2, 1)$. If the two lines intersect at the point (a, b), what is the value of $a + b$?

A) 4

B) 3

C) -1

D) -4

19 Test 3 Sec 3

At a lunch stand, each hamburger has 50 more calories than each order of fries. If 2 hamburgers and 3 orders of fries have a total of 1700 calories, how many calories does a hamburger have?

10 Test 8 Sec 3

A group of 202 people went on an overnight camping trip, taking 60 tents with them. Some of the tents held 2 people each, and the rest held 4 people each. Assuming all the tents were filled to capacity and every person got to sleep in a tent, exactly how many of the tents were 2-person tents?

A) 30

B) 20

C) 19

D) 18

Systems of Linear Equations (Word Problem Variety / Building the System)

19 Test 1 Sec 4

A food truck sells salads for $6.50 each and drinks for $2.00 each. The food truck's revenue from selling a total of 209 salads and drinks in one day was $836.50. How many salads were sold that day?

A) 77

B) 93

C) 99

D) 105

34 Test 2 Sec 4

In one semester, Doug and Laura spent a combined 250 hours in the tutoring lab. If Doug spent 40 more hours in the lab than Laura did, how many hours did Laura spend in the lab?

24 Test 3 Sec 4

Mr. Kohl has a beaker containing n milliliters of solution to distribute to the students in his chemistry class. If he gives each student 3 milliliters of solution, he will have 5 milliliters left over. In order to give each student 4 milliliters of solution, he will need an additional 21 milliliters. How many students are in the class?

A) 16

B) 21

C) 23

D) 26

Systems of Linear Equations (Word Problem Variety / Building the System)

7 Test 5 Sec 3

Jackie has two summer jobs. She works as a tutor, which pays $12 per hour, and she works as a lifeguard, which pays $9.50 per hour. She can work no more than 20 hours per week, but she wants to earn at least $220 per week. Which of the following systems of inequalities represents this situation in terms of x and y, where x is the number of hours she tutors and y is the number of hours she works as a lifeguard?

A) $12x + 9.5y \leq 220$
$x + y \geq 20$

B) $12x + 9.5y \leq 220$
$x + y \leq 20$

C) $12x + 9.5y \geq 220$
$x + y \leq 20$

D) $12x + 9.5y \geq 220$
$x + y \geq 20$

9 Test 7 Sec 3

Marisa needs to hire at least 10 staff members for an upcoming project. The staff members will be made up of junior directors, who will be paid $640 per week, and senior directors, who will be paid $880 per week. Her budget for paying the staff members is no more than $9,700 per week. She must hire at least 3 junior directors and at least 1 senior director. Which of the following systems of inequalities represents the conditions described if x is the number of junior directors and y is the number of senior directors?

A) $640x + 880y \geq 9{,}700$
$x + y \leq 10$
$x \geq 3$
$y \geq 1$

B) $640x + 880y \leq 9{,}700$
$x + y \geq 10$
$x \geq 3$
$y \geq 1$

C) $640x + 880y \geq 9{,}700$
$x + y \geq 10$
$x \leq 3$
$y \leq 1$

D) $640x + 880y \leq 9{,}700$
$x + y \leq 10$
$x \leq 3$
$y \leq 1$

Systems of Linear Equations (Word Problem Variety / Building the System)

9 Test 2 Sec 4

A worker uses a forklift to move boxes that weigh either 40 pounds or 65 pounds each. Let x be the number of 40-pound boxes and y be the number of 65-pound boxes. The forklift can carry up to either 45 boxes or a weight of 2,400 pounds. Which of the following systems of inequalities represents this relationship?

A) $\begin{cases} 40x + 65y \le 2{,}400 \\ x + y \le 45 \end{cases}$

B) $\begin{cases} \dfrac{x}{40} + \dfrac{y}{65} \le 2{,}400 \\ x + y \le 45 \end{cases}$

C) $\begin{cases} 40x + 65y \le 45 \\ x + y \le 2{,}400 \end{cases}$

D) $\begin{cases} x + y \le 2{,}400 \\ 40x + 65y \le 2{,}400 \end{cases}$

14 Test 6 Sec 3

A laundry service is buying detergent and fabric softener from its supplier. The supplier will deliver no more than 300 pounds in a shipment. Each container of detergent weighs 7.35 pounds, and each container of fabric softener weighs 6.2 pounds. The service wants to buy at least twice as many containers of detergent as containers of fabric softener. Let d represent the number of containers of detergent, and let s represent the number of containers of fabric softener, where d and s are nonnegative integers. Which of the following systems of inequalities best represents this situation?

A) $7.35d + 6.2s \le 300$
$d \ge 2s$

B) $7.35d + 6.2s \le 300$
$2d \ge s$

C) $14.7d + 6.2s \le 300$
$d \ge 2s$

D) $14.7d + 6.2s \le 300$
$2d \ge s$

Building Other Algebraic Expressions

1 Test 2 Sec 4

A musician has a new song available for downloading or streaming. The musician earns \$0.09 each time the song is downloaded and \$0.002 each time the song is streamed. Which of the following expressions represents the amount, in dollars, that the musician earns if the song is downloaded d times and streamed s times?

A) $0.002d + 0.09s$

B) $0.002d - 0.09s$

C) $0.09d + 0.002s$

D) $0.09d - 0.002s$

3 Test 1 Sec 3

On Saturday afternoon, Armand sent m text messages each hour for 5 hours, and Tyrone sent p text messages each hour for 4 hours. Which of the following represents the total number of messages sent by Armand and Tyrone on Saturday afternoon?

A) $9mp$

B) $20mp$

C) $5m + 4p$

D) $4m + 5p$

4 Test 3 Sec 3

The number of states that joined the United States between 1776 and 1849 is twice the number of states that joined between 1850 and 1900. If 30 states joined the United States between 1776 and 1849 and x states joined between 1850 and 1900, which of the following equations is true?

A) $30x = 2$

B) $2x = 30$

C) $\frac{x}{2} = 30$

D) $x + 30 = 2$

Building Other Algebraic Expressions

6 Test 2 Sec 4

When 4 times the number x is added to 12, the result is 8. What number results when 2 times x is added to 7 ?

A) -1

B) 5

C) 8

D) 9

6 Test 4 Sec 4

Last week Raul worked 11 more hours than Angelica. If they worked a combined total of 59 hours, how many hours did Angelica work last week?

A) 24

B) 35

C) 40

D) 48

10 Test 6 Sec 3

Jaime is preparing for a bicycle race. His goal is to bicycle an average of at least 280 miles per week for 4 weeks. He bicycled 240 miles the first week, 310 miles the second week, and 320 miles the third week. Which inequality can be used to represent the number of miles, x, Jaime could bicycle on the 4th week to meet his goal?

A) $\frac{240 + 310 + 320}{3} + x \geq 280$

B) $240 + 310 + 320 \geq x(280)$

C) $\frac{240}{4} + \frac{310}{4} + \frac{320}{4} + x \geq 280$

D) $240 + 310 + 320 + x \geq 4(280)$

Building Other Algebraic Expressions

29 Test 4 Sec 4

If x is the average (arithmetic mean) of m and 9, y is the average of $2m$ and 15, and z is the average of $3m$ and 18, what is the average of x, y, and z in terms of m ?

A) $m + 6$

B) $m + 7$

C) $2m + 14$

D) $3m + 21$

15 Test 5 Sec 3

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by $5. Assuming gasoline costs $4 per gallon, which equation can Alan use to determine how many fewer average miles, m, he should drive each week?

A) $\frac{25}{4}m = 95$

B) $\frac{25}{4}m = 5$

C) $\frac{4}{25}m = 95$

D) $\frac{4}{25}m = 5$

Percents (Percent Of)

2 Test 6 Sec 3

A gardener buys two kinds of fertilizer. Fertilizer A contains 60% filler materials by weight and Fertilizer B contains 40% filler materials by weight. Together, the fertilizers bought by the gardener contain a total of 240 pounds of filler materials. Which equation models this relationship, where x is the number of pounds of Fertilizer A and y is the number of pounds of Fertilizer B?

A) $0.4x + 0.6y = 240$

B) $0.6x + 0.4y = 240$

C) $40x + 60y = 240$

D) $60x + 40y = 240$

5 Test 2 Sec 4

The amount of money a performer earns is directly proportional to the number of people attending the performance. The performer earns $120 at a performance where 8 people attend.

The performer uses 43% of the money earned to pay the costs involved in putting on each performance. The rest of the money earned is the performer's profit. What is the profit the performer makes at a performance where 8 people attend?

A) $51.60

B) $57.00

C) $68.40

D) $77.00

8 Test 7 Sec 3

Ken is working this summer as part of a crew on a farm. He earned $8 per hour for the first 10 hours he worked this week. Because of his performance, his crew leader raised his salary to $10 per hour for the rest of the week. Ken saves 90% of his earnings from each week. What is the least number of hours he must work the rest of the week to save at least $270 for the week?

A) 38

B) 33

C) 22

D) 16

Percents (Percent Change)

17 Test 2 Sec 4

The atomic weight of an unknown element, in atomic mass units (amu), is approximately 20% less than that of calcium. The atomic weight of calcium is 40 amu. Which of the following best approximates the atomic weight, in amu, of the unknown element?

A) 8

B) 20

C) 32

D) 48

26 Test 1 Sec 4

Katarina is a botanist studying the production of pears by two types of pear trees. She noticed that Type A trees produced 20 percent more pears than Type B trees did. Based on Katarina's observation, if the Type A trees produced 144 pears, how many pears did the Type B trees produce?

A) 115

B) 120

C) 124

D) 173

12 Test 4 Sec 3

Ken and Paul each ordered a sandwich at a restaurant. The price of Ken's sandwich was x dollars, and the price of Paul's sandwich was \$1 more than the price of Ken's sandwich. If Ken and Paul split the cost of the sandwiches evenly and each paid a 20% tip, which of the following expressions represents the amount, in dollars, each of them paid? (Assume there is no sales tax.)

A) $0.2x + 0.2$

B) $0.5x + 0.1$

C) $1.2x + 0.6$

D) $2.4x + 1.2$

Percents (Percent Change)

22 Test 3 Sec 4

The sum of three numbers is 855. One of the numbers, x, is 50% more than the sum of the other two numbers. What is the value of x ?

A) 570

B) 513

C) 214

D) 155

20 test 1 Sec 4

Alma bought a laptop computer at a store that gave a 20 percent discount off its original price. The total amount she paid to the cashier was p dollars, including an 8 percent sales tax on the discounted price. Which of the following represents the original price of the computer in terms of p ?

A) $0.88p$

B) $\frac{p}{0.88}$

C) $(0.8)(1.08)p$

D) $\frac{p}{(0.8)(1.08)}$

Quadratics (Factorable)

3 Test 5 Sec 3

What are the solutions of the quadratic equation $4x^2 - 8x - 12 = 0$?

A) $x = -1$ and $x = -3$

B) $x = -1$ and $x = 3$

C) $x = 1$ and $x = -3$

D) $x = 1$ and $x = 3$

16 Test 8 Sec 3

$$x^2 + x - 12 = 0$$

If a is a solution of the equation above and $a > 0$, what is the value of a ?

36 Test 1 Sec 4

$$h(x) = \frac{1}{(x-5)^2 + 4(x-5) + 4}$$

For what value of x is the function h above undefined?

Quadratics (Factorable)

16 Test 3 Sec 3

$$x^3(x^2 - 5) = -4x$$

If $x > 0$, what is one possible solution to the equation above?

9 Test 4 Sec 3

$$\sqrt{x - a} = x - 4$$

If $a = 2$, what is the solution set of the equation above?

A) $\{3, 6\}$

B) $\{2\}$

C) $\{3\}$

D) $\{6\}$

7 Test 8 Sec 3

$$\sqrt{2x + 6} + 4 = x + 3$$

What is the solution set of the equation above?

A) $\{-1\}$

B) $\{5\}$

C) $\{-1, 5\}$

D) $\{0, -1, 5\}$

Quadratics (Factorable)

4 Test 6 Sec 3

$$4x^2 - 9 = (px + t)(px - t)$$

In the equation above, p and t are constants.
Which of the following could be the value of p ?

A) 2

B) 3

C) 4

D) 9

15 Test 7 Sec 3

The expression $\frac{1}{3}x^2 - 2$ can be rewritten as $\frac{1}{3}(x - k)(x + k)$, where k is a positive constant.

What is the value of k ?

A) 2

B) 6

C) $\sqrt{2}$

D) $\sqrt{6}$

Quadratics (Not Factorable)

14 Test 3 Sec 3

What are the solutions to $3x^2 + 12x + 6 = 0$?

A) $x = -2 \pm \sqrt{2}$

B) $x = -2 \pm \frac{\sqrt{30}}{3}$

C) $x = -6 \pm \sqrt{2}$

D) $x = -6 \pm 6\sqrt{2}$

13 Test 2 Sec 3

What is the sum of all values of m that satisfy $2m^2 - 16m + 8 = 0$?

A) -8

B) $-4\sqrt{3}$

C) $4\sqrt{3}$

D) 8

15 Test 4 Sec 3

$$x^2 - \frac{k}{2}x = 2p$$

In the quadratic equation above, k and p are constants. What are the solutions for x ?

A) $x = \frac{k}{4} \pm \frac{\sqrt{k^2 + 2p}}{4}$

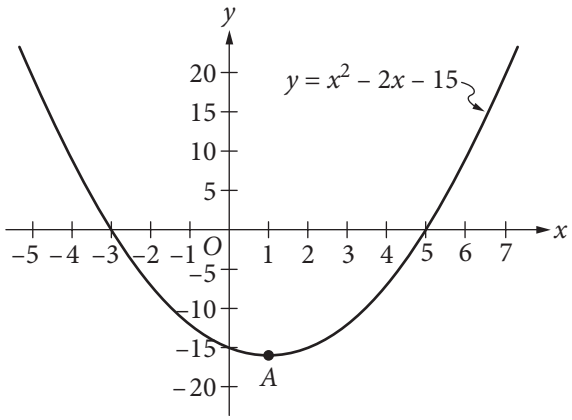
B) $x = \frac{k}{4} \pm \frac{\sqrt{k^2 + 32p}}{4}$

C) $x = \frac{k}{2} \pm \frac{\sqrt{k^2 + 2p}}{2}$

D) $x = \frac{k}{2} \pm \frac{\sqrt{k^2 + 32p}}{4}$

Quadratics (Different forms of the equation)

30 Test 1 Sec 4



Which of the following is an equivalent form of the equation of the graph shown in the xy-plane above, from which the coordinates of vertex A can be identified as constants in the equation?

A) $y = (x + 3)(x - 5)$

B) $y = (x - 3)(x + 5)$

C) $y = x(x - 2) - 15$

D) $y = (x - 1)^2 - 16$

7 Test 2 Sec 4

$$y = x^2 - 6x + 8$$

The equation above represents a parabola in the xy-plane. Which of the following equivalent forms of the equation displays the x-intercepts of the parabola as constants or coefficients?

A) $y - 8 = x^2 - 6x$

B) $y + 1 = (x - 3)^2$

C) $y = x(x - 6) + 8$

D) $y = (x - 2)(x - 4)$

Quadratics (Different forms of the equation)

10 Test 2 Sec 3

Which of the following equations has a graph in the xy-plane for which y is always greater than or equal to -1 ?

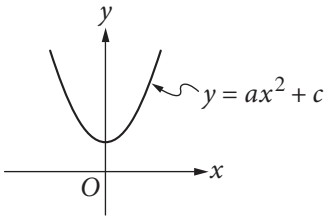
A) $y = |x| - 2$

B) $y = x^2 - 2$

C) $y = (x-2)^2$

D) $y = x^3 - 2$

11 Test 6 Sec 3



The vertex of the parabola in the xy-plane above is $(0, c)$. Which of the following is true about the parabola with the equation $y = -a(x-b)^2 + c$?

A) The vertex is (b, c) and the graph opens upward.

B) The vertex is (b, c) and the graph opens downward.

C) The vertex is $(-b, c)$ and the graph opens upward.

D) The vertex is $(-b, c)$ and the graph opens downward.

28 Test 4 Sec 4

$$f(x) = (x+6)(x-4)$$

Which of the following is an equivalent form of the function f above in which the minimum value of f appears as a constant or coefficient?

A) $f(x) = x^2 - 24$

B) $f(x) = x^2 + 2x - 24$

C) $f(x) = (x-1)^2 - 21$

D) $f(x) = (x+1)^2 - 25$

Quadratics (Different forms of the equation)

12 Test 7 Sec 3

The function f is defined by $f(x) = (x + 3)(x + 1)$. The graph of f in the xy-plane is a parabola. Which of the following intervals contains the x-coordinate of the vertex of the graph of f ?

A) $-4 < x < -3$

B) $-3 < x < 1$

C) $1 < x < 3$

D) $3 < x < 4$

12 Test 3 Sec 3

$$y = a(x - 2)(x + 4)$$

In the quadratic equation above, a is a nonzero constant. The graph of the equation in the xy-plane is a parabola with vertex (c, d). Which of the following is equal to d ?

A) $-9a$

B) $-8a$

C) $-5a$

D) $-2a$

Quadratics (Zeros of a Function)

10 Test 7 Sec 3

$$ax^3 + bx^2 + cx + d = 0$$

In the equation above, a, b, c, and d are constants. If the equation has roots -1, -3, and 5, which of the following is a factor of $ax^3 + bx^2 + cx + d$?

A) $x - 1$

B) $x + 1$

C) $x - 3$

D) $x + 5$

12 Test 4 Sec 4

In the xy-plane, the graph of function f has x-intercepts at -3, -1, and 1. Which of the following could define f ?

A) $f(x) = (x - 3)(x - 1)(x + 1)$

B) $f(x) = (x - 3)(x - 1)^2$

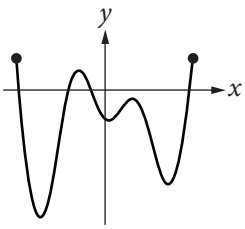
C) $f(x) = (x - 1)(x + 1)(x + 3)$

D) $f(x) = (x + 1)^2(x + 3)$

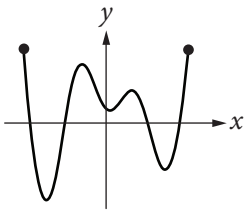
12 Test 3 Sec 4

If the function f has five distinct zeros, which of the following could represent the complete graph of f in the xy-plane?

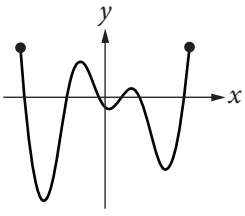
A)



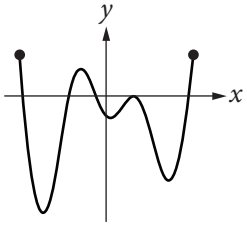
B)



C)

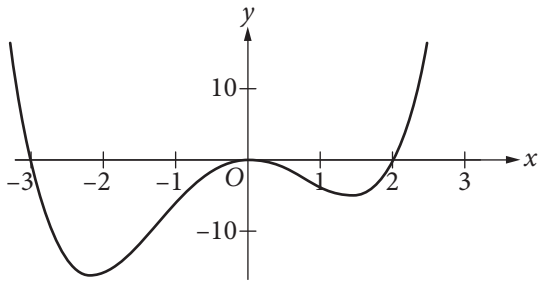


D)



Quadratics (Zeros of a Function)

11 Test 8 Sec 3



Which of the following could be the equation of the graph above?

A) $y = x(x-2)(x+3)$

B) $y = x^2(x-2)(x+3)$

C) $y = x(x+2)(x-3)$

D) $y = x^2(x+2)(x-3)$

25 Test 4 Sec 4

$$f(x) = 2x^3 + 6x^2 + 4x$$
$$g(x) = x^2 + 3x + 2$$

The polynomials $f(x)$ and $g(x)$ are defined above. Which of the following polynomials is divisible by $2x + 3$?

A) $h(x) = f(x) + g(x)$

B) $p(x) = f(x) + 3g(x)$

C) $r(x) = 2f(x) + 3g(x)$

D) $s(x) = 3f(x) + 2g(x)$

Quadratics (abc Matching game)

17 Test 8 Sec 3

The sum of $-2x^2 + x + 31$ and $3x^2 + 7x - 8$ can be written in the form $ax^2 + bx + c$, where a, b, and c are constants. What is the value of $a + b + c$?

33 Test 3 Sec 4

$$(-3x^2 + 5x - 2) - 2(x^2 - 2x - 1)$$

If the expression above is rewritten in the form $ax^2 + bx + c$, where a, b, and c are constants, what is the value of b ?

17 Test 2 Sec 3

$$2x(3x + 5) + 3(3x + 5) = ax^2 + bx + c$$

In the equation above, a, b, and c are constants. If the equation is true for all values of x, what is the value of b ?

Quadratics (abc Matching game)

20 Test 7 Sec 3

$$(7532 + 100y^2) + 10(10y^2 - 110)$$

The expression above can be written in the form $ay^2 + b$, where a and b are constants. What is the value of $a + b$?

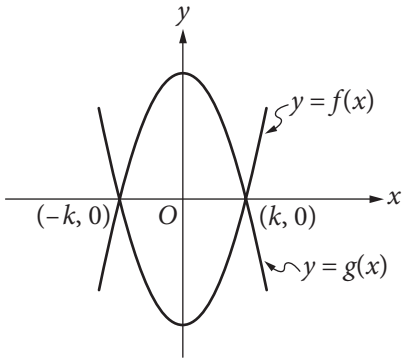
15 Test 1 Sec 3

If $(ax + 2)(bx + 7) = 15x^2 + cx + 14$ for all values of x, and $a + b = 8$, what are the two possible values for c ?

A) 3 and 5
B) 6 and 35
C) 10 and 21
D) 31 and 41

Systems With Quadratic Equations

13 Test 4 Sec 3



The functions f and g, defined by $f(x) = 8x^2 - 2$ and $g(x) = -8x^2 + 2$, are graphed in the xy-plane above. The graphs of f and g intersect at the points $(k, 0)$ and $(-k, 0)$. What is the value of k ?

A) $\frac{1}{4}$

B) $\frac{1}{2}$

C) 1

D) 2

9 Test 5 Sec 3

$$y = x^2$$
$$2y + 6 = 2(x + 3)$$

If (x, y) is a solution of the system of equations above and $x > 0$, what is the value of xy ?

A) 1
B) 2
C) 3
D) 9

Systems With Quadratic Equations

14 Test 8 Sec 3

$$y = x^2 + 3x - 7$$
$$y - 5x + 8 = 0$$

How many solutions are there to the system of equations above?

A) There are exactly 4 solutions.

B) There are exactly 2 solutions.

C) There is exactly 1 solution.

D) There are no solutions.

10 Test 3 Sec 3

In the xy-plane, the parabola with equation $y = (x - 11)^2$ intersects the line with equation $y = 25$ at two points, A and B. What is the length of $\overline{AB}$?

A) 10

B) 12

C) 14

D) 16

11 Test 4 Sec 3

$$x = 2y + 5$$
$$y = (2x - 3)(x + 9)$$

How many ordered pairs (x, y) satisfy the system of equations shown above?

A) 0

B) 1

C) 2

D) Infinitely many

Systems With Quadratic Equations

29 Test 2 Sec 4

$$y = 3$$
$$y = ax^2 + b$$

In the system of equations above, a and b are constants. For which of the following values of a and b does the system of equations have exactly two real solutions?

A) $a = -2,\ b = 2$

B) $a = -2,\ b = 4$

C) $a = 2,\ b = 4$

D) $a = 4,\ b = 3$

Working with f(x) (Plugging in x values)

5 Test 7 Sec 3

If $f(x) = \dfrac{x^2 - 6x + 3}{x - 1}$, what is $f(-1)$?

A) -5

B) -2

C) 2

D) 5

4 Test 4 Sec 3

If $f(x) = -2x + 5$, what is $f(-3x)$ equal to?

A) $-6x - 5$

B) $6x + 5$

C) $6x - 5$

D) $6x^2 - 15x$

2 Test 4 Sec 3

$$f(x) = \frac{3}{2}x + b$$

In the function above, b is a constant. If $f(6) = 7$, what is the value of $f(-2)$?

A) -5

B) -2

C) 1

D) 7

Working with f(x) (Plugging in x values)

10 Test 2 Sec 4

A function f satisfies $f(2) = 3$ and $f(3) = 5$. A function g satisfies $g(3) = 2$ and $g(5) = 6$. What is the value of $f(g(3))$?

A) 2

B) 3

C) 5

D) 6

15 Test 8 Sec 3

$$g(x) = 2x - 1$$
$$h(x) = 1 - g(x)$$

The functions g and h are defined above. What is the value of $h(0)$?

A) -2

B) 0

C) 1

D) 2

Working with f(x) (Plugging in points)

33 Test 2 Sec 4

In the xy-plane, the point $(3, 6)$ lies on the graph of the function $f(x) = 3x^2 - bx + 12$. What is the value of b ?

4 Test 3 Sec 4

n	1	2	3	4
$f(n)$	−2	1	4	7

The table above shows some values of the linear function f. Which of the following defines f ?

A) $f(n) = n - 3$

B) $f(n) = 2n - 4$

C) $f(n) = 3n - 5$

D) $f(n) = 4n - 6$

7

x	$f(x)$
0	3
2	1
4	0
5	−2

The function f is defined by a polynomial. Some values of x and $f(x)$ are shown in the table above. Which of the following must be a factor of $f(x)$?

A) $x - 2$

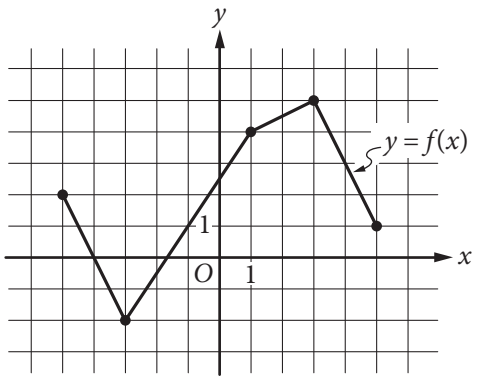
B) $x - 3$

C) $x - 4$

D) $x - 5$

Working with f(x) (Reading Graphs)

17 Test 1 Sec 4



The complete graph of the function f is shown in the xy-plane above. For what value of x is the value of $f(x)$ at its minimum?

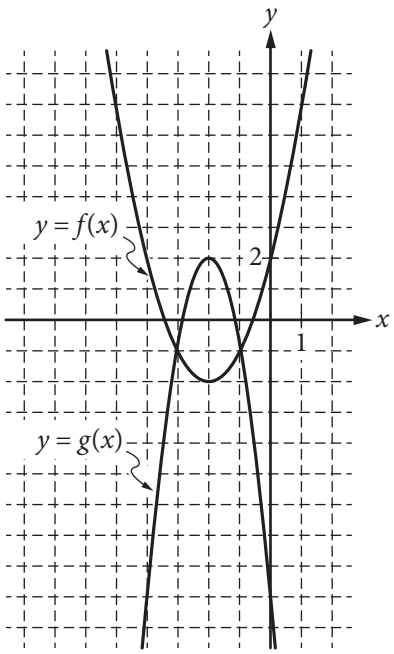
A) -5

B) -3

C) -2

D) 3

16 Test 3 Sec 4



Graphs of the functions f and g are shown in the xy-plane above. For which of the following values of x does $f(x) + g(x) = 0$?

A) -3

B) -2

C) -1

D) 0

Exponential Functions (Growth and Decay)

14 Test 2 Sec 3

A radioactive substance decays at an annual rate of 13 percent. If the initial amount of the substance is 325 grams, which of the following functions f models the remaining amount of the substance, in grams, t years later?

A) $f(t) = 325(0.87)^t$

B) $f(t) = 325(0.13)^t$

C) $f(t) = 0.87(325)^t$

D) $f(t) = 0.13(325)^t$

Questions 37 and 38 refer to the following information.

Jessica opened a bank account that earns 2 percent interest compounded annually. Her initial deposit was \$100, and she uses the expression $\$100(x)^t$ to find the value of the account after t years.

37 test 1 Sec 4

What is the value of x in the expression?

38 Test 1 Sec 4

Jessica's friend Tyshaun found an account that earns 2.5 percent interest compounded annually. Tyshaun made an initial deposit of \$100 into this account at the same time Jessica made a deposit of \$100 into her account. After 10 years, how much more money will Tyshaun's initial deposit have earned than Jessica's initial deposit? (Round your answer to the nearest cent and ignore the dollar sign when gridding your response.)

Exponential Functions (Growth and Decay)

Questions 37 and 38 refer to the following information.

The stock price of one share in a certain company is worth $360 today. A stock analyst believes that the stock will lose 28 percent of its value each week for the next three weeks. The analyst uses the equation $V = 360(r)^t$ to model the value, V, of the stock after t weeks.

37 Test 4 Sec 4

What value should the analyst use for r ?

38 Test 4 Sec 4

To the nearest dollar, what does the analyst believe the value of the stock will be at the end of three weeks? (Note: Disregard the $ sign when gridding your answer.)

28 Test 3 Sec 4

In planning maintenance for a city's infrastructure, a civil engineer estimates that, starting from the present, the population of the city will decrease by 10 percent every 20 years. If the present population of the city is 50,000, which of the following expressions represents the engineer's estimate of the population of the city t years from now?

A) $50{,}000(0.1)^{20t}$

B) $50{,}000(0.1)^{\frac{t}{20}}$

C) $50{,}000(0.9)^{20t}$

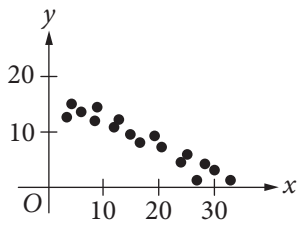
D) $50{,}000(0.9)^{\frac{t}{20}}$

Exponential Functions (Shape of the graph)

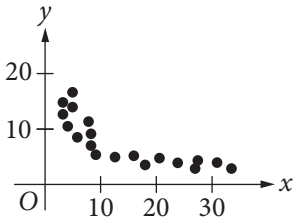
15 Test 4 Sec 4

Which of the following scatterplots shows a relationship that is appropriately modeled with the equation $y = ax^b$, where a is positive and b is negative?

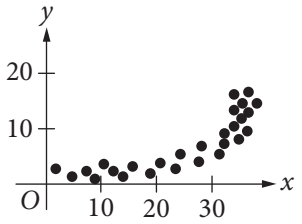
A)



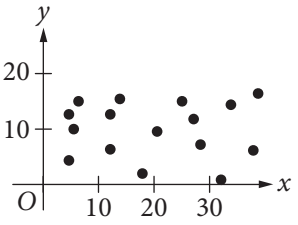
B)



C)



D)



13 Test 4 Sec 4

The population of mosquitoes in a swamp is estimated over the course of twenty weeks, as shown in the table.

Time (weeks)	Population
0	100
5	1,000
10	10,000
15	100,000
20	1,000,000

Which of the following best describes the relationship between time and the estimated population of mosquitoes during the twenty weeks?

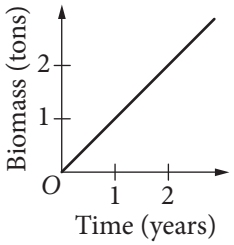
A) Increasing linear
B) Decreasing linear
C) Exponential growth
D) Exponential decay

Exponential Functions (Shape of the graph)

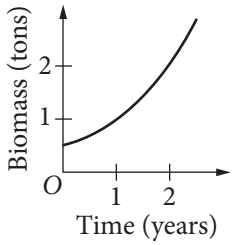
20 Test 4 Sec 4

The mass of living organisms in a lake is defined to be the biomass of the lake. If the biomass in a lake doubles each year, which of the following graphs could model the biomass in the lake as a function of time? (Note: In each graph below, O represents $(0, 0)$.)

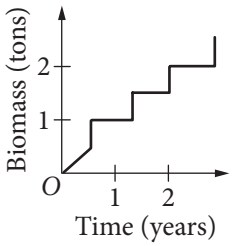
A)



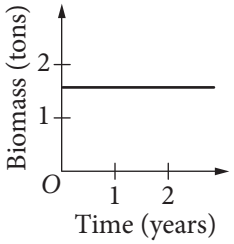
C)



B)



D)



21 Test 3 Sec 4

Of the following four types of savings account plans, which option would yield exponential growth of the money in the account?

A) Each successive year, 2% of the initial savings is added to the value of the account.

B) Each successive year, 1.5% of the initial savings and $100 is added to the value of the account.

C) Each successive year, 1% of the current value is added to the value of the account.

D) Each successive year, $100 is added to the value of the account.

Exponents and Roots (Rules of Exponents)

16 Test 6 Sec 3

If $a^{\frac{b}{4}} = 16$ for positive integers a and b, what is one possible value of b ?

14 Test 1 Sec 3

If $3x - y = 12$, what is the value of $\frac{8^x}{2^y}$?

A) 2^{12}

B) 4^4

C) 8^2

D) The value cannot be determined from the information given.

7 Test 2 Sec 3

If $\frac{x^{a^2}}{x^{b^2}} = x^{16}$, $x > 1$, and $a + b = 2$, what is the value of $a - b$?

A) 8

B) 14

C) 16

D) 18

Exponents and Roots (Rules of Roots)

3 Test 3 Sec 3

Which of the following is equal to $a^{\frac{2}{3}}$, for all values of a ?

A) $\sqrt{a^{\frac{1}{3}}}$

B) $\sqrt{a^3}$

C) $\sqrt[3]{a^{\frac{1}{2}}}$

D) $\sqrt[3]{a^2}$

12 Test 5 Sec 3

Which of the following is equivalent to $9^{\frac{3}{4}}$?

A) $\sqrt[3]{9}$

B) $\sqrt[4]{9}$

C) $\sqrt{3}$

D) $3\sqrt{3}$

11 Test 7 Sec 3

The expression $\frac{x^{-2}y^{\frac{1}{2}}}{x^{\frac{1}{3}}y^{-1}}$, where $x > 1$ and $y > 1$, is equivalent to which of the following?

A) $\frac{\sqrt{y}}{\sqrt[3]{x^2}}$

B) $\frac{y\sqrt{y}}{\sqrt[3]{x^2}}$

C) $\frac{y\sqrt{y}}{x\sqrt{x}}$

D) $\frac{y\sqrt{y}}{x^2\sqrt[3]{x}}$

Complex Numbers

4 Test 7 Sec 3

Which of the following complex numbers is equal to $(5 + 12i) - (9i^2 - 6i)$, for $i = \sqrt{-1}$?

A) $-14 - 18i$

B) $-4 - 6i$

C) $4 + 6i$

D) $14 + 18i$

11 Test 2 Sec 3

Which of the following complex numbers is equivalent to $\frac{3 - 5i}{8 + 2i}$? (Note: $i = \sqrt{-1}$)

A) $\frac{3}{8} - \frac{5i}{2}$

B) $\frac{3}{8} + \frac{5i}{2}$

C) $\frac{7}{34} - \frac{23i}{34}$

D) $\frac{7}{34} + \frac{23i}{34}$

14 Test 4 Sec 3

$$\frac{8 - i}{3 - 2i}$$

If the expression above is rewritten in the form $a + bi$, where a and b are real numbers, what is the value of a ? (Note: $i = \sqrt{-1}$)

A) 2

B) $\frac{8}{3}$

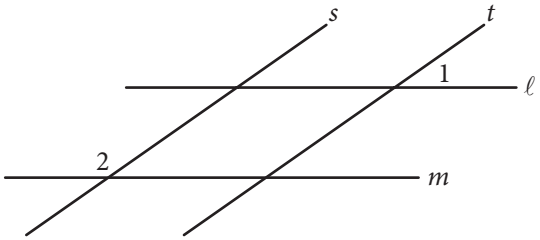
C) 3

D) $\frac{11}{3}$

Geometry

Lines and Angles

3 Test 1 Sec 4



In the figure above, lines ℓ and m are parallel and lines s and t are parallel. If the measure of $\angle 1$ is 35°, what is the measure of $\angle 2$?

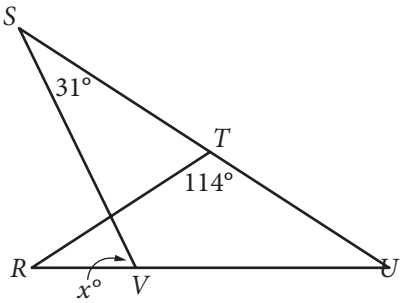
A) 35°

B) 55°

C) 70°

D) 145°

4 Test 8 Sec 3



In the figure above, $RT = TU$. What is the value of x ?

A) 72

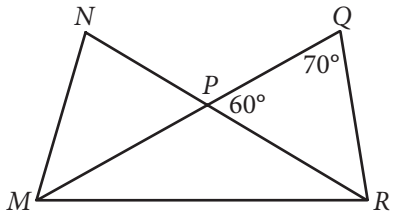
B) 66

C) 64

D) 58

Lines and Angles

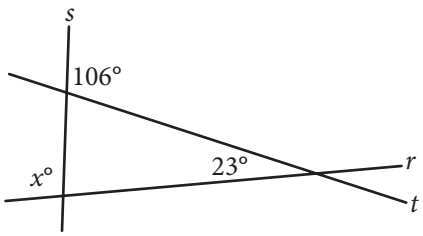
17 Test 7 Sec 3



In the figure above, $\overline{MQ}$ and $\overline{NR}$ intersect at point P, $NP = QP$, and $MP = PR$. What is the measure, in degrees, of $\angle QMR$? (Disregard the degree symbol when gridding your answer.)

20 Test 5 Sec 3

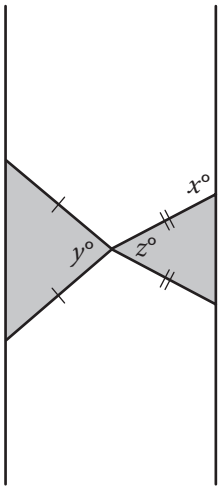
Intersecting lines r, s, and t are shown below.



What is the value of x ?

Lines and Angles

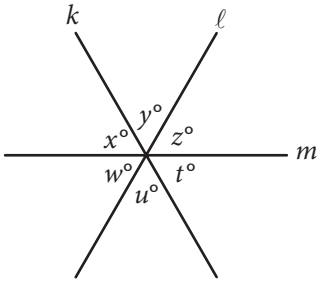
18 Test 3 Sec 3



Note: Figure not drawn to scale.

Two isosceles triangles are shown above. If $180 - z = 2y$ and $y = 75$, what is the value of x ?

11 Test 3 Sec 3



Note: Figure not drawn to scale.

In the figure above, lines k, ℓ, and m intersect at a point. If $x + y = u + w$, which of the following must be true?

I. $x = z$

II. $y = w$

III. $z = t$

A) I and II only

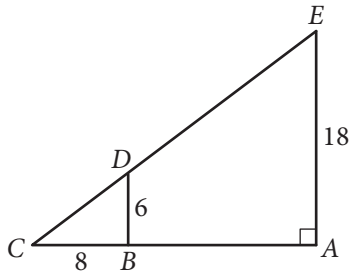
B) I and III only

C) II and III only

D) I, II, and III

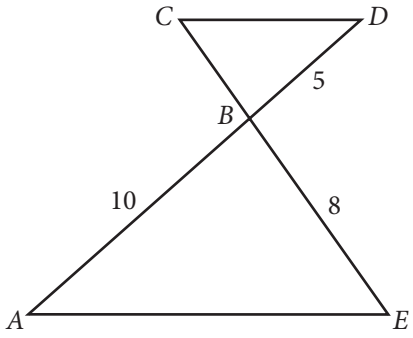
Triangles (Similar Triangles)

18 Test 6 Sec 3



In the figure above, $\overline{BD}$ is parallel to $\overline{AE}$. What is the length of $\overline{CE}$?

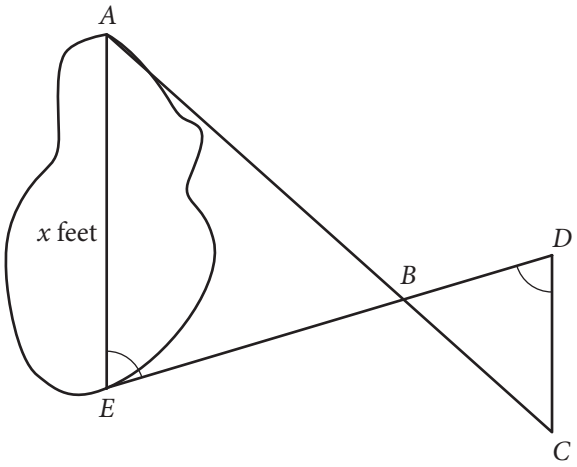
18 Test 2 Sec 3



In the figure above, $\overline{AE} \parallel \overline{CD}$ and segment AD intersects segment CE at B. What is the length of segment CE ?

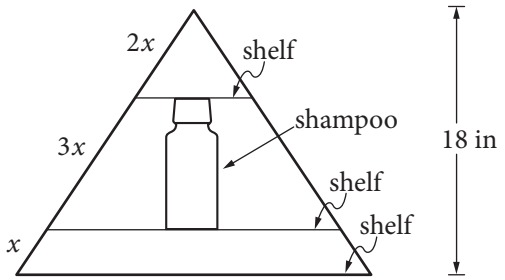
Triangles (Similar Triangles)

17 Test 2 Sec 3



A summer camp counselor wants to find a length, x, in feet, across a lake as represented in the sketch above. The lengths represented by AB, EB, BD, and CD on the sketch were determined to be 1800 feet, 1400 feet, 700 feet, and 800 feet, respectively. Segments AC and DE intersect at B, and $\angle AEB$ and $\angle CDB$ have the same measure. What is the value of x ?

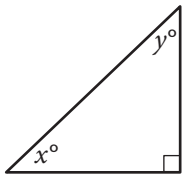
16 Test 4 Sec 3



Jim has a triangular shelf system that attaches to his showerhead. The total height of the system is 18 inches, and there are three parallel shelves as shown above. What is the maximum height, in inches, of a shampoo bottle that can stand upright on the middle shelf?

Triangles (Trigonometry)

17 Test 4 Sec 3



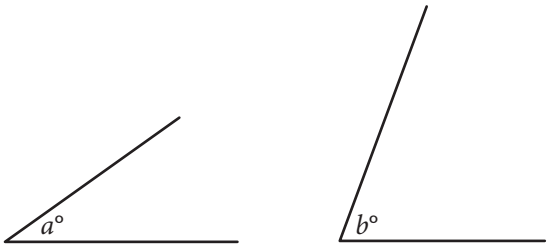
In the triangle above, the sine of $x°$ is 0.6. What is the cosine of $y°$?

19 Test 1 Sec 3

In a right triangle, one angle measures $x°$, where $\sin x° = \frac{4}{5}$. What is $\cos(90° - x°)$?

Triangles (Trigonometry)

23 Test 3 Sec 4



Note: Figures not drawn to scale.

The angles shown above are acute and $\sin(a°) = \cos(b°)$. If $a = 4k - 22$ and $b = 6k - 13$, what is the value of k ?

A) 4.5

B) 5.5

C) 12.5

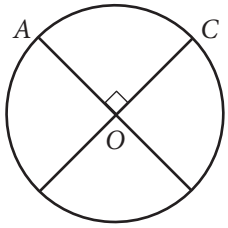
D) 21.5

20 Test 3 Sec 3

In triangle ABC, the measure of $\angle B$ is $90°$, $BC = 16$, and $AC = 20$. Triangle DEF is similar to triangle ABC, where vertices D, E, and F correspond to vertices A, B, and C, respectively, and each side of triangle DEF is $\frac{1}{3}$ the length of the corresponding side of triangle ABC. What is the value of $\sin F$?

Circles (Arc Length in Degrees)

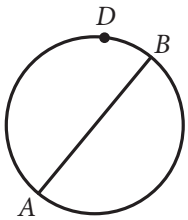
2 Test 5 Sec 3



The circle above with center O has a circumference of 36. What is the length of minor arc $\overset{\frown}{AC}$?

A) 9
B) 12
C) 18
D) 36

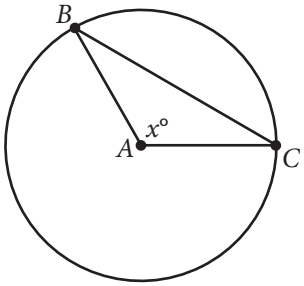
24 Test 4 Sec 4



In the circle above, segment AB is a diameter. If the length of arc $\overset{\frown}{ADB}$ is 8π, what is the length of the radius of the circle?

A) 2
B) 4
C) 8
D) 16

20 Test 8 Sec 3

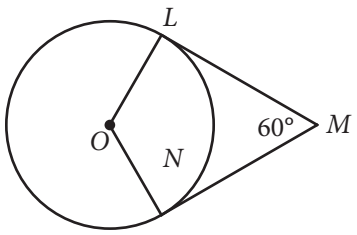


Note: Figure not drawn to scale.

In the circle above, point A is the center and the length of arc $\overset{\frown}{BC}$ is $\frac{2}{5}$ of the circumference of the circle. What is the value of x ?

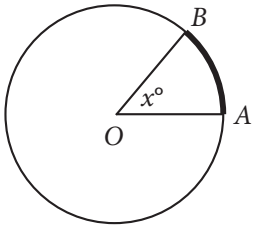
Circles (Arc Length in Degrees)

36 Test 2 Sec 4



In the figure above, point O is the center of the circle, line segments LM and MN are tangent to the circle at points L and N, respectively, and the segments intersect at point M as shown. If the circumference of the circle is 96, what is the length of minor arc $\overset{\frown}{LN}$?

36 Test 4 Sec 4



Note: Figure not drawn to scale.

In the figure above, the circle has center O and has radius 10. If the length of arc $\overset{\frown}{AB}$ (shown in bold) is between 5 and 6, what is one possible integer value of x ?

Circles (Arc Length in Radians)

20 Test 6 Sec 3

Points A and B lie on a circle with radius 1, and arc $\overset{\frown}{AB}$ has length $\frac{\pi}{3}$. What fraction of the circumference of the circle is the length of arc $\overset{\frown}{AB}$?

34 Test 3 Sec 4

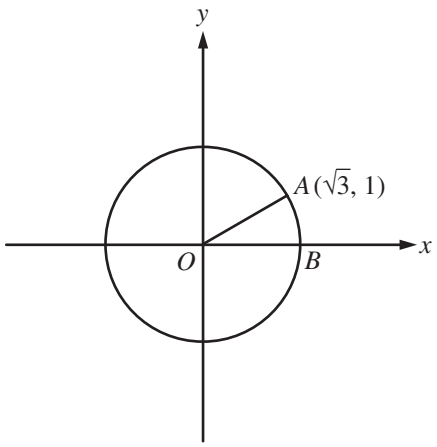
In a circle with center O, central angle AOB has a measure of $\frac{5\pi}{4}$ radians. The area of the sector formed by central angle AOB is what fraction of the area of the circle?

18 Test 7 Sec 3

The number of radians in a 720-degree angle can be written as $a\pi$, where a is a constant. What is the value of a ?

Circles (Arc Length in Radians)

19 Test 2 Sec 3



In the *xy*-plane above, O is the center of the circle, and the measure of $\angle AOB$ is $\frac{\pi}{a}$ radians. What is the value of a ?

Circles (Equation of)

9 Test 8 Sec 3

$$(x-6)^2+(y+5)^2=16$$

In the *xy*-plane, the graph of the equation above is a circle. Point P is on the circle and has coordinates $(10,-5)$. If $\overline{PQ}$ is a diameter of the circle, what are the coordinates of point Q ?

A) $(2,-5)$

B) $(6,-1)$

C) $(6,-5)$

D) $(6,-9)$

24 Test 1 Sec 4

Which of the following is an equation of a circle in the *xy*-plane with center $(0,4)$ and a radius with endpoint $\left(\frac{4}{3},5\right)$?

A) $x^2+(y-4)^2=\frac{25}{9}$

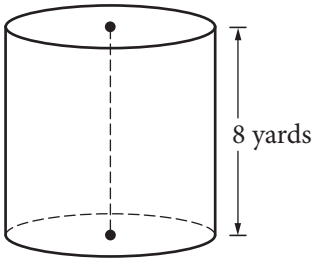
B) $x^2+(y+4)^2=\frac{25}{9}$

C) $x^2+(y-4)^2=\frac{5}{3}$

D) $x^2+(y+4)^2=\frac{3}{5}$

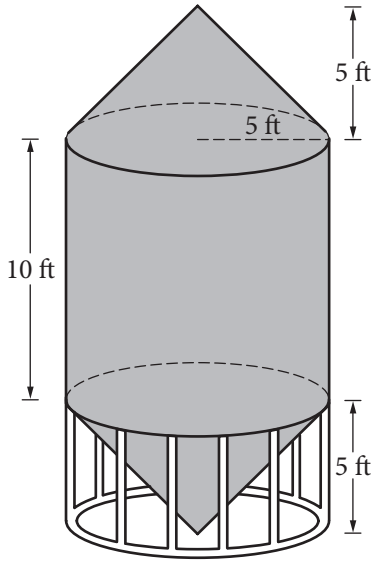
Cylinders

35 Test 1 Sec 4



A dairy farmer uses a storage silo that is in the shape of the right circular cylinder above. If the volume of the silo is 72π cubic yards, what is the diameter of the base of the cylinder, in yards?

25 Test 3 Sec 4



A grain silo is built from two right circular cones and a right circular cylinder with internal measurements represented by the figure above. Of the following, which is closest to the volume of the grain silo, in cubic feet?

A) 261.8
B) 785.4
C) 916.3
D) 1,047.2

Cylinders

18 Test 4 Sec 4

Jim has identical drinking glasses each in the shape of a right circular cylinder with internal diameter of 3 inches. He pours milk from a gallon jug into each glass until it is full. If the height of milk in each glass is about 6 inches, what is the largest number of full milk glasses that he can pour from one gallon of milk? (Note: There are 231 cubic inches in 1 gallon.)

A) 2

B) 4

C) 5

D) 6

11 Test 5 Sec 3

The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

A) 11

B) 22

C) 44

D) 66

Rectangles / Rectangular Prisms

5 Test 8 Sec 3

The width of a rectangular dance floor is w feet. The length of the floor is 6 feet longer than its width. Which of the following expresses the perimeter, in feet, of the dance floor in terms of w ?

A) $2w + 6$

B) $4w + 12$

C) $w^2 + 6$

D) $w^2 + 6w$

14 Test 7 Sec 3

A shipping service restricts the dimensions of the boxes it will ship for a certain type of service. The restriction states that for boxes shaped like rectangular prisms, the sum of the perimeter of the base of the box and the height of the box cannot exceed 130 inches. The perimeter of the base is determined using the width and length of the box. If a box has a height of 60 inches and its length is 2.5 times the width, which inequality shows the allowable width x, in inches, of the box?

A) $0 < x \leq 10$

B) $0 < x \leq 11\frac{2}{3}$

C) $0 < x \leq 17\frac{1}{2}$

D) $0 < x \leq 20$

27 Test 3 Sec 4

A rectangle was altered by increasing its length by 10 percent and decreasing its width by p percent. If these alterations decreased the area of the rectangle by 12 percent, what is the value of p ?

A) 12

B) 15

C) 20

D) 22

Statistics

Proportions (Simple)

2 Test 2 Sec 4

A quality control manager at a factory selects 7 lightbulbs at random for inspection out of every 400 lightbulbs produced. At this rate, how many lightbulbs will be inspected if the factory produces 20,000 lightbulbs?

A) 300

B) 350

C) 400

D) 450

31 Test 2 Sec 4

A coastal geologist estimates that a certain country's beaches are eroding at a rate of 1.5 feet per year. According to the geologist's estimate, how long will it take, in years, for the country's beaches to erode by 21 feet?

4 Test 2 Sec 4

The amount of money a performer earns is directly proportional to the number of people attending the performance. The performer earns $120 at a performance where 8 people attend.

How much money will the performer earn when 20 people attend a performance?

A) $960

B) $480

C) $300

D) $240

31 Test 1 Sec 4

Wyatt can husk at least 12 dozen ears of corn per hour and at most 18 dozen ears of corn per hour. Based on this information, what is a possible amount of time, in hours, that it could take Wyatt to husk 72 dozen ears of corn?

Proportions (Simple)

Questions 10 and 11 refer to the following information.

Planet	Acceleration due to gravity $\left(\frac{m}{sec^2}\right)$
Mercury	3.6
Venus	8.9
Earth	9.8
Mars	3.8
Jupiter	26.0
Saturn	11.1
Uranus	10.7
Neptune	14.1

The chart above shows approximations of the acceleration due to gravity in meters per second squared $\left(\frac{m}{sec^2}\right)$ for the eight planets in our solar system. The weight of an object on a given planet can be found by using the formula $W = mg$, where W is the weight of the object measured in newtons, m is the mass of the object measured in kilograms, and g is the acceleration due to gravity on the planet measured in $\frac{m}{sec^2}$.

10 Test 3 Sec 4

What is the weight, in newtons, of an object on Mercury with a mass of 90 kilograms?

A) 25
B) 86
C) 101
D) 324

11 Test 3 Sec 4

An object on Earth has a weight of 150 newtons. On which planet would the same object have an approximate weight of 170 newtons?

A) Venus
B) Saturn
C) Uranus
D) Neptune

Proportions (Simple)

3 Test 4 Section 4

If a 3-pound pizza is sliced in half and each half is sliced into thirds, what is the weight, in ounces, of each of the slices? (1 pound = 16 ounces)

A) 4

B) 6

C) 8

D) 16

34 Test 1 Sec 4

A local television station sells time slots for programs in 30-minute intervals. If the station operates 24 hours per day, every day of the week, what is the total number of 30-minute time slots the station can sell for Tuesday and Wednesday?

6 Test 1 Sec 4

1 decagram = 10 grams

1,000 milligrams = 1 gram

A hospital stores one type of medicine in 2-decagram containers. Based on the information given in the box above, how many 1-milligram doses are there in one 2-decagram container?

A) 0.002

B) 200

C) 2,000

D) 20,000

Proportions (Complex)

9 Test 3 Sec 4

Nate walks 25 meters in 13.7 seconds. If he walks at this same rate, which of the following is closest to the distance he will walk in 4 minutes?

A) 150 meters

B) 450 meters

C) 700 meters

D) 1,400 meters

15 Test 2 Sec 4

The distance traveled by Earth in one orbit around the Sun is about 580,000,000 miles. Earth makes one complete orbit around the Sun in one year. Of the following, which is closest to the average speed of Earth, in miles per hour, as it orbits the Sun?

A) 66,000

B) 93,000

C) 210,000

D) 420,000

11 Test 2 Sec 4

Number of hours Tony plans to read the novel per day	3
Number of parts in the novel	8
Number of chapters in the novel	239
Number of words Tony reads per minute	250
Number of pages in the novel	1,078
Number of words in the novel	349,168

Tony is planning to read a novel. The table above shows information about the novel, Tony's reading speed, and the amount of time he plans to spend reading the novel each day. If Tony reads at the rates given in the table, which of the following is closest to the number of days it would take Tony to read the entire novel?

A) 6

B) 8

C) 23

D) 324

Proportions (Complex)

33 Test 4 Section 4

The *pes*, a Roman measure of length, is approximately equal to 11.65 inches. It is also equivalent to 16 smaller Roman units called digits. Based on these relationships, 75 Roman digits is equivalent to how many feet, to the nearest hundredth? (12 inches = 1 foot)

19 Test 3 Sec 4

Graphene, which is used in the manufacture of integrated circuits, is so thin that a sheet weighing one ounce can cover up to 7 football fields. If a football field has an area of approximately $1\frac{1}{3}$ acres, about how many acres could 48 ounces of graphene cover?

A) 250
B) 350
C) 450
D) 1,350

Proportions (Complex)

34 Test 4 Section 4

In a study of bat migration habits, 240 male bats and 160 female bats have been tagged. If 100 more female bats are tagged, how many more male bats must be tagged so that $\frac{3}{5}$ of the total number of bats in the study are male?

27 Test 1 Sec 4

A square field measures 10 meters by 10 meters. Ten students each mark off a randomly selected region of the field; each region is square and has side lengths of 1 meter, and no two regions overlap. The students count the earthworms contained in the soil to a depth of 5 centimeters beneath the ground's surface in each region. The results are shown in the table below.

Region	Number of earthworms	Region	Number of earthworms
A	107	F	141
B	147	G	150
C	146	H	154
D	135	I	176
E	149	J	166

Which of the following is a reasonable approximation of the number of earthworms to a depth of 5 centimeters beneath the ground's surface in the entire field?

A) 150

B) 1,500

C) 15,000

D) 150,000

Proportions (Complex)

A sociologist chose 300 students at random from each of two schools and asked each student how many siblings he or she has. The results are shown in the table below.

Students' Sibling Survey

Number of siblings	Lincoln School	Washington School
0	120	140
1	80	110
2	60	30
3	30	10
4	10	10

There are a total of 2,400 students at Lincoln School and 3,300 students at Washington School.

20 Test 2 Sec 4

Based on the survey data, which of the following most accurately compares the expected total number of students with 4 siblings at the two schools?

A) The total number of students with 4 siblings is expected to be equal at the two schools.

B) The total number of students with 4 siblings at Lincoln School is expected to be 30 more than at Washington School.

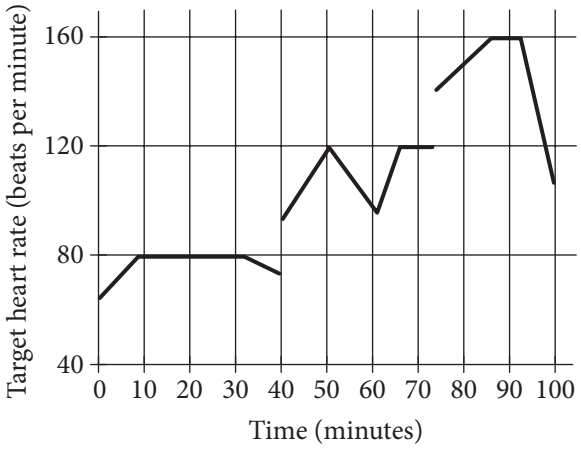
C) The total number of students with 4 siblings at Washington School is expected to be 30 more than at Lincoln School.

D) The total number of students with 4 siblings at Washington School is expected to be 900 more than at Lincoln School.

Reading Plots

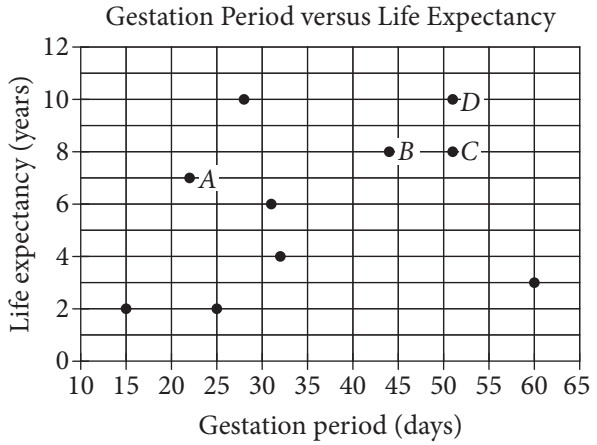
1 Test 1 Sec 4

John runs at different speeds as part of his training program. The graph shows his target heart rate at different times during his workout. On which interval is the target heart rate strictly increasing then strictly decreasing?



A) Between 0 and 30 minutes
B) Between 40 and 60 minutes
C) Between 50 and 65 minutes
D) Between 70 and 90 minutes

10 Test 4 Section 4

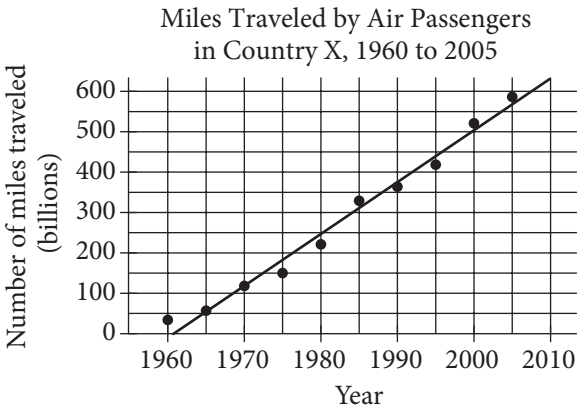


A curator at a wildlife society created the scatterplot above to examine the relationship between the gestation period and life expectancy of 10 species of animals.

What is the life expectancy, in years, of the animal that has the longest gestation period?

A) 3
B) 4
C) 8
D) 10

14 Test 2 Sec 4

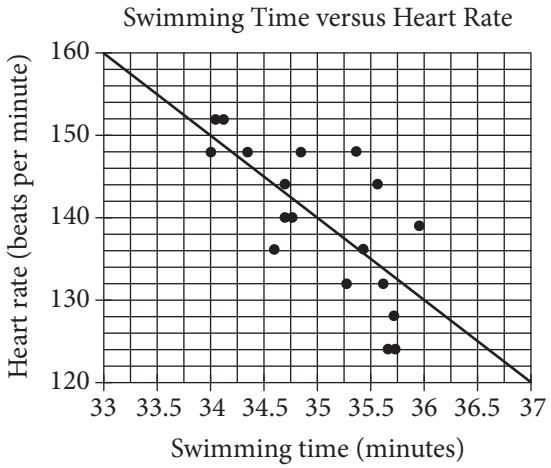


According to the line of best fit in the scatterplot above, which of the following best approximates the year in which the number of miles traveled by air passengers in Country X was estimated to be 550 billion?

A) 1997
B) 2000
C) 2003
D) 2008

Reading Plots

20 Test 3 Sec 4



Michael swam 2,000 yards on each of eighteen days. The scatterplot above shows his swim time for and corresponding heart rate after each swim. The line of best fit for the data is also shown. For the swim that took 34 minutes, Michael's actual heart rate was about how many beats per minutes less than the rate predicted by the line of best fit?

A) 1

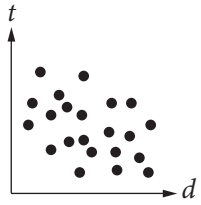
B) 2

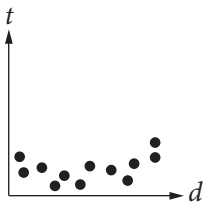
C) 3

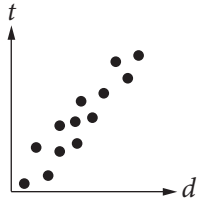
D) 4

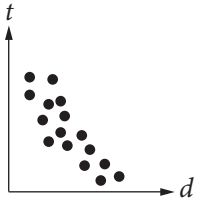
5 Test 1 Sec 4

Which of the following graphs best shows a strong negative association between d and t ?

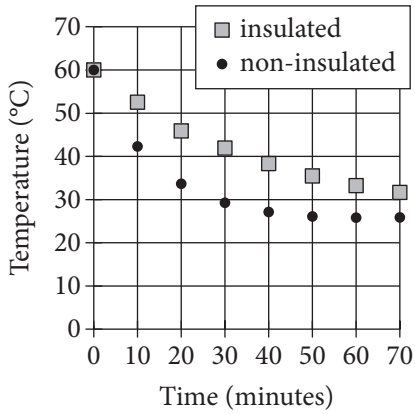
A) 

B) 

C) 

D) 

27 Test 2 Sec 4



Two samples of water of equal mass are heated to 60 degrees Celsius (°C). One sample is poured into an insulated container, and the other sample is poured into a non-insulated container. The samples are then left for 70 minutes to cool in a room having a temperature of 25°C. The graph above shows the temperature of each sample at 10-minute intervals. Which of the following statements correctly compares the average rates at which the temperatures of the two samples change?

A) In every 10-minute interval, the magnitude of the rate of change of temperature of the insulated sample is greater than that of the non-insulated sample.

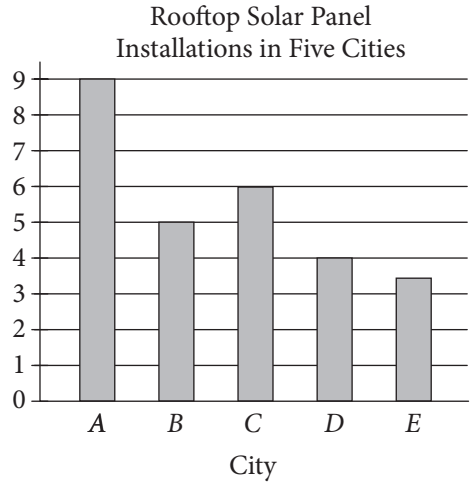
B) In every 10-minute interval, the magnitude of the rate of change of temperature of the non-insulated sample is greater than that of the insulated sample.

C) In the intervals from 0 to 10 minutes and from 10 to 20 minutes, the rates of change of temperature of the insulated sample are of greater magnitude, whereas in the intervals from 40 to 50 minutes and from 50 to 60 minutes, the rates of change of temperature of the non-insulated sample are of greater magnitude.

D) In the intervals from 0 to 10 minutes and from 10 to 20 minutes, the rates of change of temperature of the non-insulated sample are of greater magnitude, whereas in the intervals from 40 to 50 minutes and from 50 to 60 minutes, the rates of change of temperature of the insulated sample are of greater magnitude.

Reading Plots

7 Test 1 Sec 4



The number of rooftops with solar panel installations in 5 cities is shown in the graph above. If the total number of installations is 27,500, what is an appropriate label for the vertical axis of the graph?

A) Number of installations (in tens)

B) Number of installations (in hundreds)

C) Number of installations (in thousands)

D) Number of installations (in tens of thousands)

32 Test 3 Sec 4

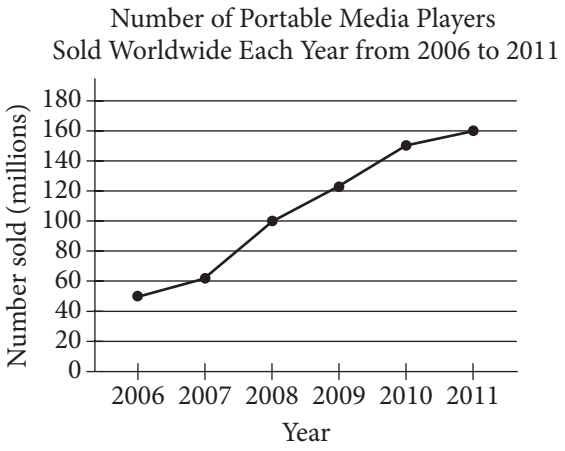
Ages of the First 12 United States Presidents at the Beginning of Their Terms in Office

President	Age (years)	President	Age (years)
Washington	57	Jackson	62
Adams	62	Van Buren	55
Jefferson	58	Harrison	68
Madison	58	Tyler	51
Monroe	59	Polk	50
Adams	58	Taylor	65

The table above lists the ages of the first 12 United States presidents when they began their terms in office. According to the table, what was the mean age, in years, of these presidents at the beginning of their terms? (Round your answer to the nearest tenth.)

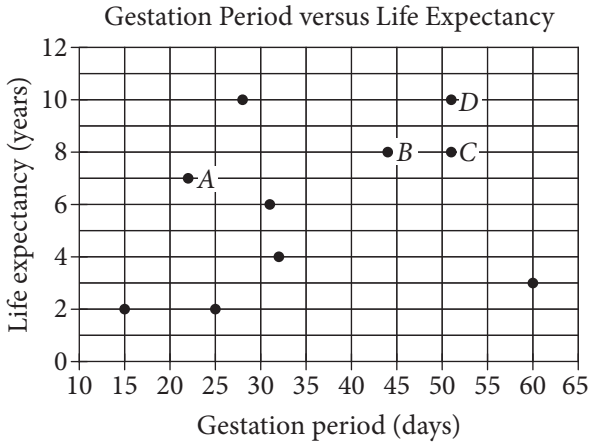
Reading Plots

33 Test 2 Sec 4



According to the line graph above, the number of portable media players sold in 2008 is what fraction of the number sold in 2011 ?

11 Test 4 Section 4



A curator at a wildlife society created the scatterplot above to examine the relationship between the gestation period and life expectancy of 10 species of animals.

Of the labeled points, which represents the animal for which the ratio of life expectancy to gestation period is greatest?

A) *A*

B) *B*

C) *C*

D) *D*

Reading Plots

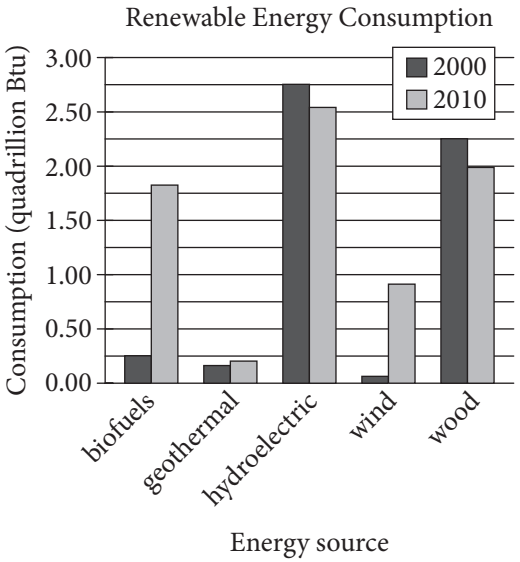
13 Test 1 Sec 4

		Course			
		Algebra I	Geometry	Algebra II	Total
Gender	Female	35	53	62	150
	Male	44	59	57	160
	Total	79	112	119	310

A group of tenth-grade students responded to a survey that asked which math course they were currently enrolled in. The survey data were broken down as shown in the table above. Which of the following categories accounts for approximately 19 percent of all the survey respondents?

A) Females taking Geometry
B) Females taking Algebra II
C) Males taking Geometry
D) Males taking Algebra I

22 Test 4 Sec 4



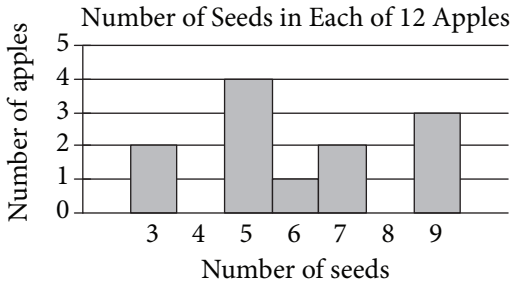
The bar graph above shows renewable energy consumption in quadrillions of British thermal units (Btu) in the United States, by energy source, for several energy sources in the years 2000 and 2010.

Of the following, which best approximates the percent decrease in consumption of wood power in the United States from 2000 to 2010 ?

A) 6%
B) 11%
C) 21%
D) 26%

Reading Plots

12 Test 1 Sec 4



Based on the histogram above, of the following, which is closest to the average (arithmetic mean) number of seeds per apple?

A) 4

B) 5

C) 6

D) 7

19 Test 2 Sec 4

A sociologist chose 300 students at random from each of two schools and asked each student how many siblings he or she has. The results are shown in the table below.

Students' Sibling Survey

Number of siblings	Lincoln School	Washington School
0	120	140
1	80	110
2	60	30
3	30	10
4	10	10

There are a total of 2,400 students at Lincoln School and 3,300 students at Washington School.

What is the median number of siblings for all the students surveyed?

A) 0

B) 1

C) 2

D) 3

Reading Plots

14 Test 1 Sec 4

Lengths of Fish (in inches)						
8	9	10	10	10	10	11
11	12	12	12	12	13	13
13	14	14	15	15	16	24

The table above lists the lengths, to the nearest inch, of a random sample of 21 brown bullhead fish. The outlier measurement of 24 inches is an error. Of the mean, median, and range of the values listed, which will change the most if the 24-inch measurement is removed from the data?

A) Mean

B) Median

C) Range

D) They will all change by the same amount.

Probability (Simple)

7 Test 4 Section 4

Movies with Greatest Ticket Sales in 2012

MPAA rating	Type of movie				
	Action	Animated	Comedy	Drama	Total
PG	2	7	0	2	11
PG-13	10	0	4	8	22
R	6	0	5	6	17
Total	18	7	9	16	50

The table above represents the 50 movies that had the greatest ticket sales in 2012, categorized by movie type and Motion Picture Association of America (MPAA) rating. What proportion of the movies are comedies with a PG-13 rating?

A) $\frac{2}{25}$

B) $\frac{9}{50}$

C) $\frac{2}{11}$

D) $\frac{11}{25}$

2 Test 3 Sec 4

	Age		Total
Gender	Under 40	40 or older	
Male	12	2	14
Female	8	3	11
Total	20	5	25

The table above shows the distribution of age and gender for 25 people who entered a contest. If the contest winner will be selected at random, what is the probability that the winner will be either a female under age 40 or a male age 40 or older?

A) $\frac{4}{25}$

B) $\frac{10}{25}$

C) $\frac{11}{25}$

D) $\frac{16}{25}$

Probability (Conditional)

9 Test 4 Section 4

Number of Registered Voters
in the United States in 2012, in Thousands

	Age, in years					
Region	18 to 24	25 to 44	45 to 64	65 to 74	75 and older	Total
Northeast	2,713	8,159	10,986	3,342	2,775	27,975
Midwest	3,453	11,237	13,865	4,221	3,350	36,126
South	5,210	18,072	21,346	7,272	4,969	56,869
West	3,390	10,428	11,598	3,785	2,986	32,187
Total	14,766	47,896	57,795	18,620	14,080	153,157

The table above shows the number of registered voters in 2012, in thousands, in four geographic regions and five age groups. Based on the table, if a registered voter who was 18 to 44 years old in 2012 is chosen at random, which of the following is closest to the probability that the registered voter was from the Midwest region?

A) 0.10
B) 0.25
C) 0.40
D) 0.75

16 Test 2 Sec 4

Results on the Bar Exam of Law School Graduates

	Passed bar exam	Did not pass bar exam
Took review course	18	82
Did not take review course	7	93

The table above summarizes the results of 200 law school graduates who took the bar exam. If one of the surveyed graduates who passed the bar exam is chosen at random for an interview, what is the probability that the person chosen did not take the review course?

A) $\frac{18}{25}$
B) $\frac{7}{25}$
C) $\frac{25}{200}$
D) $\frac{7}{200}$

Probability (Conditional)

21 Test 1 Sec 4

Dreams Recalled during One Week

	None	1 to 4	5 or more	Total
Group X	15	28	57	100
Group Y	21	11	68	100
Total	36	39	125	200

The data in the table above were produced by a sleep researcher studying the number of dreams people recall when asked to record their dreams for one week. Group X consisted of 100 people who observed early bedtimes, and Group Y consisted of 100 people who observed later bedtimes. If a person is chosen at random from those who recalled at least 1 dream, what is the probability that the person belonged to Group Y ?

A) $\frac{68}{100}$

B) $\frac{79}{100}$

C) $\frac{79}{164}$

D) $\frac{164}{200}$

29 Test 3 Sec 4

	Handedness	
Gender	Left	Right
Female		
Male		
Total	18	122

The incomplete table above summarizes the number of left-handed students and right-handed students by gender for the eighth-grade students at Keisel Middle School. There are 5 times as many right-handed female students as there are left-handed female students, and there are 9 times as many right-handed male students as there are left-handed male students. If there is a total of 18 left-handed students and 122 right-handed students in the school, which of the following is closest to the probability that a right-handed student selected at random is female? (Note: Assume that none of the eighth-grade students are both right-handed and left-handed.)

A) 0.410

B) 0.357

C) 0.333

D) 0.250

Samples of a Population

13 Test 2 Sec 4

A researcher conducted a survey to determine whether people in a certain large town prefer watching sports on television to attending the sporting event. The researcher asked 117 people who visited a local restaurant on a Saturday, and 7 people refused to respond. Which of the following factors makes it least likely that a reliable conclusion can be drawn about the sports-watching preferences of all people in the town?

A) Sample size

B) Population size

C) The number of people who refused to respond

D) Where the survey was given

15 Test 3 Sec 4

In order to determine if treatment X is successful in improving eyesight, a research study was conducted. From a large population of people with poor eyesight, 300 participants were selected at random. Half of the participants were randomly assigned to receive treatment X, and the other half did not receive treatment X. The resulting data showed that participants who received treatment X had significantly improved eyesight as compared to those who did not receive treatment X. Based on the design and results of the study, which of the following is an appropriate conclusion?

A) Treatment X is likely to improve the eyesight of people who have poor eyesight.

B) Treatment X improves eyesight better than all other available treatments.

C) Treatment X will improve the eyesight of anyone who takes it.

D) Treatment X will cause a substantial improvement in eyesight.

Rare Problems

1 Test 4 Sec 3

Which of the following expressions is equal to 0 for some value of x ?

A) $|x-1|-1$

B) $|x+1|+1$

C) $|1-x|+1$

D) $|x-1|+1$

16 Test 2 Sec 3

The sales manager of a company awarded a total of $3000 in bonuses to the most productive salespeople. The bonuses were awarded in amounts of $250 or $750. If at least one $250 bonus and at least one $750 bonus were awarded, what is one possible number of $250 bonuses awarded?

6 Test 8 Sec 3

$$y > 2x - 1$$
$$2x > 5$$

Which of the following consists of the y-coordinates of all the points that satisfy the system of inequalities above?

A) $y > 6$

B) $y > 4$

C) $y > \frac{5}{2}$

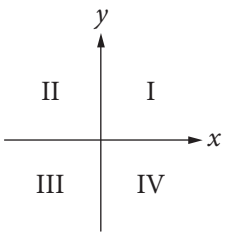
D) $y > \frac{3}{2}$

36 Test 3 Sec 4

$$y \le -15x + 3000$$
$$y \le 5x$$

In the xy-plane, if a point with coordinates (a, b) lies in the solution set of the system of inequalities above, what is the maximum possible value of b ?

28 Test 1 Sec 4



If the system of inequalities $y \ge 2x + 1$ and $y > \frac{1}{2}x - 1$ is graphed in the xy-plane above, which quadrant contains no solutions to the system?

A) Quadrant II

B) Quadrant III

C) Quadrant IV

D) There are solutions in all four quadrants.

Rare Problems

8 Test 2 Sec 3

$$nA = 360$$

The measure A, in degrees, of an exterior angle of a regular polygon is related to the number of sides, n, of the polygon by the formula above. If the measure of an exterior angle of a regular polygon is greater than $50°$, what is the greatest number of sides it can have?

A) 5
B) 6
C) 7
D) 8

18 Test 4 Sec 3

$$x^3 - 5x^2 + 2x - 10 = 0$$

For what real value of x is the equation above true?

8 Test 6 Sec 3

x	$w(x)$	$t(x)$
1	–1	–3
2	3	–1
3	4	1
4	3	3
5	–1	5

The table above shows some values of the functions w and t. For which value of x is $w(x) + t(x) = x$?

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

4 Test 5 Sec 3

Which of the following is an example of a function whose graph in the xy-plane has no x-intercepts?

A) A linear function whose rate of change is not zero
B) A quadratic function with real zeros
C) A quadratic function with no real zeros
D) A cubic polynomial with at least one real zero

3 Test 2 Sec 3

A landscaping company estimates the price of a job, in dollars, using the expression $60 + 12nh$, where n is the number of landscapers who will be working and h is the total number of hours the job will take using n landscapers. Which of the following is the best interpretation of the number 12 in the expression?

A) The company charges $12 per hour for each landscaper.
B) A minimum of 12 landscapers will work on each job.
C) The price of every job increases by $12 every hour.
D) Each landscaper works 12 hours a day.

10 Test 5 Sec 3

If $a^2 + b^2 = z$ and $ab = y$, which of the following is equivalent to $4z + 8y$?

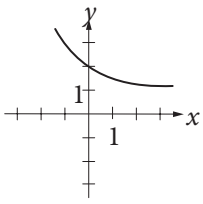
A) $(a + 2b)^2$
B) $(2a + 2b)^2$
C) $(4a + 4b)^2$
D) $(4a + 8b)^2$

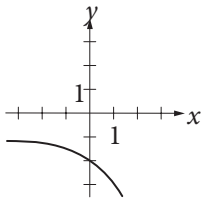
Rare Problems

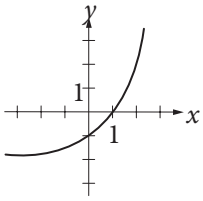
14 Test 5 Sec 3

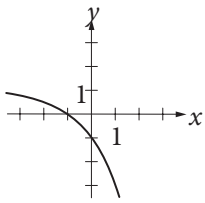
$$f(x) = 2^x + 1$$

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 

C 

B 

D 

19 Test 6 Sec 3

How many liters of a 25% saline solution must be added to 3 liters of a 10% saline solution to obtain a 15% saline solution?

25 Test 1 Sec 4

$$h = -4.9t^2 + 25t$$

The equation above expresses the approximate height h, in meters, of a ball t seconds after it is launched vertically upward from the ground with an initial velocity of 25 meters per second. After approximately how many seconds will the ball hit the ground?

A) 3.5

B) 4.0

C) 4.5

D) 5.0

8 Test 1 Sec 4

For what value of n is $|n-1|+1$ equal to 0 ?

A) 0

B) 1

C) 2

D) There is no such value of n.

11 Test 1 Sec 4

Which of the following numbers is NOT a solution of the inequality $3x - 5 \geq 4x - 3$?

A) -1

B) -2

C) -3

D) -5

18 Test 1 Sec 4

$$y < -x + a$$
$$y > x + b$$

In the xy-plane, if $(0, 0)$ is a solution to the system of inequalities above, which of the following relationships between a and b must be true?

A) $a > b$

B) $b > a$

C) $|a| > |b|$

D) $a = -b$

8 Test 4 Sec 4

Line ℓ in the xy-plane contains points from each of Quadrants II, III, and IV, but no points from Quadrant I. Which of the following must be true?

A) The slope of line ℓ is undefined.

B) The slope of line ℓ is zero.

C) The slope of line ℓ is positive.

D) The slope of line ℓ is negative.

Questions 16 and 17 refer to the following information.

Mr. Martinson is building a concrete patio in his backyard and deciding where to buy the materials and rent the tools needed for the project. The table below shows the materials' cost and daily rental costs for three different stores.

Store	Materials' Cost, M (dollars)	Rental cost of wheelbarrow, W (dollars per day)	Rental cost of concrete mixer, K (dollars per day)
A	750	15	65
B	600	25	80
C	700	20	70

The total cost, y, for buying the materials and renting the tools in terms of the number of days, x, is given by $y = M + (W + K)x$.

16 Test 4 Sec 4

For what number of days, x, will the total cost of buying the materials and renting the tools from Store B be less than or equal to the total cost of buying the materials and renting the tools from Store A ?

A) $x \leq 6$

B) $x \geq 6$

C) $x \leq 7.3$

D) $x \geq 7.3$

30 Test 3 Sec 4

$$3x + b = 5x - 7$$
$$3y + c = 5y - 7$$

In the equations above, b and c are constants.

If b is c minus $\frac{1}{2}$, which of the following is true?

A) x is y minus $\frac{1}{4}$.

B) x is y minus $\frac{1}{2}$.

C) x is y minus 1.

D) x is y plus $\frac{1}{2}$.

19 Test 4 Sec 4

If $3p - 2 \geq 1$, what is the least possible value of $3p + 2$?

A) 5

B) 3

C) 2

D) 1

26 Test 4 Sec 4

Let x and y be numbers such that $-y < x < y$. Which of the following must be true?

I. $|x| < y$

II. $x > 0$

III. $y > 0$

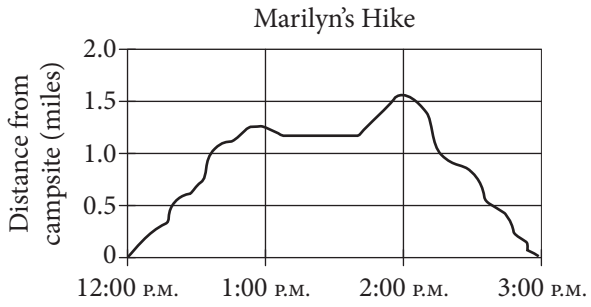
A) I only

B) I and II only

C) I and III only

D) I, II, and III

1 Test 3 Sec 4



The graph above shows Marilyn's distance from her campsite during a 3-hour hike. She stopped for 30 minutes during her hike to have lunch. Based on the graph, which of the following is closest to the time she finished lunch and continued her hike?

A) 12:40 P.M.

B) 1:10 P.M.

C) 1:40 P.M.

D) 2:00 P.M.

4 Test 4 Sec 4

Nick surveyed a random sample of the freshman class of his high school to determine whether the Fall Festival should be held in October or November. Of the 90 students surveyed, 25.6% preferred October. Based on this information, about how many students in the entire 225-person class would be expected to prefer having the Fall Festival in October?

A) 50

B) 60

C) 75

D) 80

35 Test 4 Sec 4

$$q = \frac{1}{2}nv^2$$

The dynamic pressure q generated by a fluid moving with velocity v can be found using the formula above, where n is the constant density of the fluid. An aeronautical engineer uses the formula to find the dynamic pressure of a fluid moving with velocity v and the same fluid moving with velocity $1.5v$. What is the ratio of the dynamic pressure of the faster fluid to the dynamic pressure of the slower fluid?

If shoppers enter a store at an average rate of r shoppers per minute and each stays in the store for an average time of T minutes, the average number of shoppers in the store, N, at any one time is given by the formula $N = rT$. This relationship is known as Little's law.

The owner of the Good Deals Store estimates that during business hours, an average of 3 shoppers per minute enter the store and that each of them stays an average of 15 minutes. The store owner uses Little's law to estimate that there are 45 shoppers in the store at any time.

38 Test 3 Sec 4

The owner of the Good Deals Store opens a new store across town. For the new store, the owner estimates that, during business hours, an average of 90 shoppers per hour enter the store and each of them stays an average of 12 minutes. The average number of shoppers in the new store at any time is what percent less than the average number of shoppers in the original store at any time? (Note: Ignore the percent symbol when entering your answer. For example, if the answer is 42.1%, enter 42.1)

18 Test 2 Sec 4

A survey was taken of the value of homes in a county, and it was found that the mean home value was $165,000 and the median home value was $125,000. Which of the following situations could explain the difference between the mean and median home values in the county?

A) The homes have values that are close to each other.

B) There are a few homes that are valued much less than the rest.

C) There are a few homes that are valued much more than the rest.

D) Many of the homes have values between $125,000 and $165,000.