

2025 SAT Summer Class

Week 2

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SAT/DSAT/SSAT

Hans edu LLC (Columbia Academy)

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SCHOLASTIC APTITUDE TEST (SAT)

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Drill Problems: Week 2.1

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C O L U M B I A A C A D E M Y

enrichment beyond the classroom

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1. Total Lease Cost

The total cost $f(x)$, in dollars, to lease a car for 36 months from a particular car dealership is given by $f(x) = 36x + 1,000$, where x is the monthly payment, in dollars. What is the total cost to lease a car when the monthly payment is \$400?

- (A) \$13,400
- (B) \$13,000
- (C) \$15,400
- (D) \$37,400

Answer:**2. Window Repair Cost Function**

A window repair specialist charges \$220 for the first two hours of repair plus an hourly fee for each additional hour. The total cost for 5 hours of repair is \$400. Which function f gives the total cost, in dollars, for x hours of repair, where $x \geq 2$?

- (A) $f(x) = 60x + 100$
- (B) $f(x) = 60x + 220$
- (C) $f(x) = 80x$
- (D) $f(x) = 80x + 220$

Answer:**3. Intercepts of a Linear Function**

The function h is defined by $h(x) = 4x + 28$. The graph of $y = h(x)$ in the xy -plane has an x -intercept at $(a, 0)$ and a y -intercept at $(0, b)$, where a and b are constants. What is the value of $a + b$?

- (A) 21
- (B) 28
- (C) 32
- (D) 35

Answer:

4. Demand Function

An economist modeled the demand Q for a certain product as a linear function of the selling price P . The demand was 20,000 units when the selling price was \$40 per unit, and the demand was 15,000 units when the selling price was \$60 per unit. Based on the model, what is the demand, in units, when the selling price is \$55 per unit?

- (A) 16,250
- (B) 16,500
- (C) 16,750
- (D) 17,500

Answer:

**5. Backhoe Rental Cost**

The cost of renting a backhoe for up to 10 days is \$270 for the first day and \$135 for each additional day. Which of the following equations gives the cost y , in dollars, of renting the backhoe for x days, where x is a positive integer and $x \leq 10$?

- (A) $y = 270x - 135$
- (B) $y = 270x + 135$
- (C) $y = 135x + 270$
- (D) $y = 135x + 135$

Answer:

**6. Roller-coaster Height Function**

The front of a roller-coaster car is at the bottom of a hill and is 15 feet above the ground. If the front of the roller-coaster car rises at a constant rate of 8 feet per second, which of the following equations gives the height h , in feet, of the front of the roller-coaster car s seconds after it starts up the hill?

- (A) $h = 8s + 15$
- (B) $h = 15s + \frac{335}{8}$
- (C) $h = 8s + \frac{335}{15}$
- (D) $h = 15s + 8$

Answer:

**7. Bee Head Width Model**

According to a model, the head width, in millimeters, of a worker bumblebee can be estimated by adding 0.6 to four times the body weight of the bee, in grams. According to the model, what would be the head width, in millimeters, of a worker bumblebee that has a body weight of 0.5 grams?

Answer:



8. Function Value

If f is the function defined by $f(x) = \frac{2x-1}{3}$, what is the value of $f(5)$?

- (A) $\frac{4}{3}$
- (B) $\frac{7}{3}$
- (C) 3
- (D) 9

Answer:

**9. Distance Equation**

$$d = 16t$$

The given equation represents the distance d , in inches, where t represents the number of seconds since an object started moving. Which of the following is the best interpretation of 16 in this context?

- (A) The object moved a total of 16 inches.
- (B) The object moved a total of $16t$ inches.
- (C) The object is moving at a rate of 16 inches per second.
- (D) The object is moving at a rate of $\frac{1}{16}$ inches per second.

Answer:

**10. Linear Function Table**

For the given linear function f , which table gives three values of x and their corresponding values of $f(x)$?

(A)	
x	$f(x)$
0	0
1	0
2	0

(B)	
x	$f(x)$
0	39
1	39
2	39

(C)	
x	$f(x)$
0	0
1	39
2	78

(D)	
x	$f(x)$
0	39
1	0
2	-39

Answer:



11. Corn Removal Time

Hector used a tool called an auger to remove corn from a storage bin at a constant rate. The bin contained 24,000 bushels of corn when Hector began to use the auger. After 5 hours of using the auger, 19,350 bushels of corn remained in the bin. If the auger continues to remove corn at this rate, what is the total number of hours Hector will have been using the auger when 12,840 bushels of corn remain in the bin?

- (A) 3
- (B) 7
- (C) 8
- (D) 12

Answer:**12. Bus Wait Inequality**

What value of p satisfies the equation $5p + 180 = 250$?

- (A) 14
- (B) 65
- (C) 86
- (D) 250

Answer:**13. Beads Equation**

$$4x + 5 = 165$$

What is the solution to the given equation?

Answer:**14. Beads Equation**

John paid a total of \$165 for a microscope by making a down payment of \$37 plus p monthly payments of \$16 each. Which of the following equations represents this situation?

- (A) $16p - 37 = 165$
- (B) $37p - 16 = 165$
- (C) $16p + 37 = 165$
- (D) $37p + 16 = 165$

Answer:

15. Infinitely Many Solutions

$$3x + 21 = 3x + k$$

In the given equation, k is a constant. The equation has infinitely many solutions. What is the value of k ?

Answer:

**16. Solution to Equation**

$$3(2x - 6) - 11 = 4(x - 3) + 6$$

If x is the solution to the equation above, what is the value of $x - 3$?

- (A) $\frac{23}{2}$
- (B) $\frac{17}{2}$
- (C) $\frac{15}{2}$
- (D) $-\frac{15}{2}$

Answer:

**17. Gasoline Cost Reduction**

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

Answer:

**18. Tree Growth Interpretation**

$$2n + 6 = 14$$

A tree had a height of 6 feet when it was planted. The equation above can be used to find how many years n it took the tree to reach a height of 14 feet. Which of the following is the best interpretation of the number 2 in this context?

- (A) The number of years it took the tree to double its height
- (B) The average number of feet that the tree grew per year
- (C) The height, in feet, of the tree when the tree was 1 year old
- (D) The average number of years it takes similar trees to grow 14 feet

Answer:



19. Infinitely Many Solutions

$$2x + 16 = a(x + 8)$$

In the given equation, a is a constant. If the equation has infinitely many solutions, what is the value of a ? □

Answer:

20. Reciprocal of a Fraction

If $\frac{x}{8} = 5$, what is the value of $\frac{8}{x}$? □

Answer:

21. Perpendicular Slope

Line k is defined by $y = -\frac{17}{3}x + 5$. Line j is perpendicular to line k in the xy -plane. What is the slope of line j ? □

Answer:

22. Table of Points

x	y
k	13
$k + 7$	-15

The table gives the coordinates of two points on a line in the xy -plane. The y -intercept of the line is $(k - 5, b)$, where k and b are constants. What is the value of b ? □

Answer:

23. Line Equation

The graph of the equation $ax + ky = 6$ is a line in the xy -plane, where a and k are constants. If the line contains the points $(-2, -6)$ and $(0, -3)$, what is the value of k ? □

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

Answer:

24. Line Intercept

x	y
18	130
23	160
26	178

For line h , the table shows three values of x and their corresponding values of y . Line k is the result of translating line h down 5 units in the xy -plane. What is the x -intercept of line k ?

- (A) $\left(-\frac{26}{3}, 0\right)$
- (B) $\left(-\frac{9}{2}, 0\right)$
- (C) $\left(-\frac{11}{3}, 0\right)$
- (D) $\left(-\frac{17}{6}, 0\right)$

Answer:



25. Training Course Hours

A certain apprentice has enrolled in 85 hours of training courses. The equation $10x + 15y = 85$ represents this situation, where x is the number of on-site training courses and y is the number of online training courses this apprentice has enrolled in. How many more hours does each online training course take than each on-site training course?

Answer:



26. Greek Yogurt Price

A store sells two different-sized containers of a certain Greek yogurt. The store's sales of this Greek yogurt totaled 1,277.94 dollars last month. The equation $5.48x + 7.30y = 1,277.94$ represents this situation, where x is the number of smaller containers sold and y is the number of larger containers sold. According to the equation, which of the following represents the price, in dollars, of each smaller container?

- (A) 5.48
- (B) $7.30y$
- (C) 7.30
- (D) $5.48x$

Answer:



27. Perpendicular Slope

Line k is defined by $y = 3x + 15$. Line j is perpendicular to line k in the xy -plane. What is the slope of line j ?

- (A) $-\frac{1}{3}$
- (B) $-\frac{1}{12}$
- (C) $-\frac{1}{18}$
- (D) $-\frac{1}{45}$

Answer:

**28. Perpendicular Slope**

Line p is defined by $4y + 8x = 6$. Line r is perpendicular to line p in the xy -plane. What is the slope of line r ?

Answer:

**29. Perpendicular Slope**

Line p is defined by $2y + 18x = 9$. Line r is perpendicular to line p in the xy -plane. What is the slope of line r ?

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

Answer:

**30. Table of Points**

$$y = x + 4$$

Which table gives three values of x and their corresponding values of y for the given equation?

(A)	(B)	(C)	(D)
x y	x y	x y	x y
0 4	0 6	0 2	0 0
1 5	1 5	1 1	1 1
2 6	2 4	2 0	2 2

Answer:



31. Package Weight Constraint

A cargo helicopter delivers only 100-pound packages and 120-pound packages. For each delivery trip, the helicopter must carry at least 10 packages, and the total weight of the packages can be at most 1,100 pounds. What is the maximum number of 120-pound packages that the helicopter can carry per trip?

- (A) 2
- (B) 4
- (C) 5
- (D) 6

Answer:**32. Solution to Inequality**

The point $(8, 2)$ in the xy -plane is a solution to which of the following systems of inequalities?

- (A) $x > 0, y > 0$
- (B) $x > 0, y < 0$
- (C) $x < 0, y > 0$
- (D) $x < 0, y < 0$

Answer:**33. Bus Wait Inequality**

Adam's school is a 20-minute walk or a 5-minute bus ride away from his house. The bus runs once every 30 minutes, and the number of minutes, w , that Adam waits for the bus varies between 0 and 30. Which of the following inequalities gives the values of w for which it would be faster for Adam to walk to school?

- (A) $w - 5 < 20$
- (B) $w - 5 > 20$
- (C) $w + 5 < 20$
- (D) $w + 5 > 20$

Answer:

34. Staff Member Constraints

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

Answer:**35. Beads Equation**

Valentina bought two containers of beads. In the first container 30% of the beads are red, and in the second container 70% of the beads are red. Together, the containers have at least 400 red beads. Which inequality shows this relationship, where x is the total number of beads in the first container and y is the total number of beads in the second container?

- (A) $0.3x + 0.7y \geq 400$
- (B) $0.7x + 0.3y \leq 400$
- (C) $\frac{x}{3} + \frac{y}{7} \leq 400$
- (D) $30x + 70y \geq 400$

Answer:**36. Surfboard Rental Cost**

The total cost, in dollars, to rent a surfboard consists of a \$25 service fee and a \$10 per hour rental fee. A person rents a surfboard for t hours and intends to spend a maximum of \$75 to rent the surfboard. Which inequality represents this situation?

- (A) $10t \leq 75$
- (B) $10 + 25t \leq 75$
- (C) $25t \leq 75$
- (D) $25 + 10t \leq 75$

Answer:

37. Parking Space Constraint

In North America, the standard width of a parking space is at least 7.5 feet and no more than 9.0 feet. A restaurant owner recently resurfaced the restaurant's parking lot and wants to determine the number of parking spaces, n , in the parking lot that could be placed perpendicular to a curb that is 135 feet long, based on the standard width of a parking space. Which of the following describes all the possible values of n ?

- (A) $18 \leq n \leq 135$
- (B) $7.5 \leq n \leq 9$
- (C) $15 \leq n \leq 135$
- (D) $15 \leq n \leq 18$

Answer:**38. Beads Constraint**

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) $7.35d + 6.2s \leq 300$
- (B) $d \geq 2s$
- (C) $7.35d + 6.2s \leq 300$
- (D) $2d \geq s$

Answer:**39. Solution to Inequality**

$$y \leq x$$

$$y \leq -x$$

Which of the following ordered pairs (x, y) is a solution to the system of inequalities above?

- (A) $(1, 0)$
- (B) $(-1, 0)$
- (C) $(0, 1)$
- (D) $(0, -1)$

Answer:

40. Speed Inequality

On a car trip, Rhett and Jessica each drove for part of the trip, and the total distance they drove was under 220 miles. Rhett drove at an average speed of 35 miles per hour (mph), and Jessica drove at an average speed of 40 mph. Which of the following inequalities represents this situation, where r is the number of hours Rhett drove and j is the number of hours Jessica drove?

- (A) $35r + 40j > 220$
- (B) $35r + 40j < 220$
- (C) $40r + 35j > 220$
- (D) $40r + 35j < 220$

Answer:**41. System of Equations**

$$\begin{aligned}-x + y &= -3.5 \\ x + 3y &= 9.5\end{aligned}$$

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

Answer:**42. System of Equations**

$$\begin{aligned}\frac{1}{2}y &= 4 \\ x - \frac{1}{2}y &= 2\end{aligned}$$

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

- (A) 3
- (B) $\frac{7}{2}$
- (C) 4
- (D) 6

Answer:

43. System of Equations

$$\begin{aligned}\frac{3}{2}y - \frac{1}{4}x &= \frac{2}{3} - \frac{3}{2}y \\ \frac{1}{2}x + \frac{3}{2} &= py + \frac{9}{2}\end{aligned}$$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p ?

Answer:



44. Shirt and Pants Prices

Hiro and Sofia purchased shirts and pants from a store. The price of each shirt purchased was the same and the price of each pair of pants purchased was the same. Hiro purchased 4 shirts and 2 pairs of pants for \$86, and Sofia purchased 3 shirts and 5 pairs of pants for \$166. Which of the following systems of linear equations represents the situation, if x represents the price, in dollars, of each shirt and y represents the price, in dollars, of each pair of pants?

- (A) $4x + 2y = 86$, $3x + 5y = 166$
- (B) $4x + 3y = 86$, $2x + 5y = 166$
- (C) $4x + 2y = 166$, $3x + 5y = 86$
- (D) $4x + 3y = 166$, $2x + 5y = 86$

Answer:



45. System of Equations

$$\begin{aligned}5x &= 15 \\ -4x + y &= -2\end{aligned}$$

The solution to the given system of equations is (x, y) . What is the value of $x + y$?

- (A) -17
- (B) -13
- (C) 13
- (D) 17

Answer:



46. Graph of System

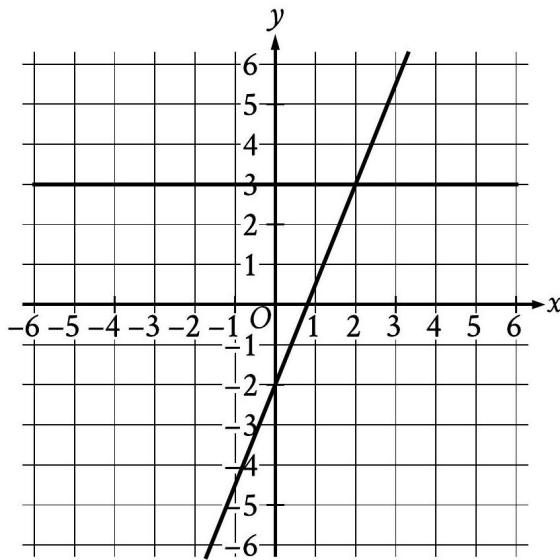


Figure 1: reference attached

The graph of a system of linear equations is shown. What is the solution (x, y) to the system?

- (A) $(0, 3)$
- (B) $(1, 3)$
- (C) $(2, 3)$
- (D) $(3, 3)$

Answer:



47. Whale-watching Tour

A company that provides whale-watching tours takes groups of 21 people at a time. The company's revenue is 80 dollars per adult and 60 dollars per child. If the company's revenue for one group consisting of adults and children was 1,440 dollars, how many people in the group were children?

- (A) 3
- (B) 9
- (C) 12
- (D) 18

Answer:



48. Intersection Points

At how many points do the graphs of the equations $y = x + 20$ and $y = 8x$ intersect in the xy -plane?

- (A) 0
- (B) 1
- (C) 2
- (D) 8

Answer:**49. System of Equations**

$$\begin{aligned}y &= 3x \\2x + y &= 12\end{aligned}$$

The solution to the given system of equations is (x, y) . What is the value of $5x$?

- (A) 24
- (B) 15
- (C) 12
- (D) 5

Answer:**50. Camping Trip**

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

Answer:

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Section 2, Module 1: Math

SAT Prep Test 2—Math

Module 1

Turn to Section 2 of your answer sheet (p. 664) to answer the questions in this section.

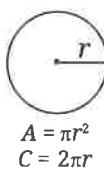
DIRECTIONS

The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

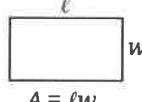
Unless otherwise indicated:

- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

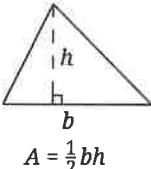
REFERENCE

$$A = \pi r^2$$

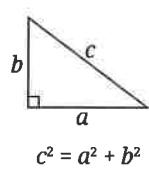
$$C = 2\pi r$$



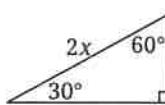
$$A = lw$$



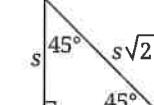
$$A = \frac{1}{2}bh$$



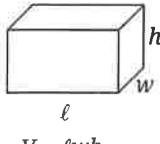
$$c^2 = a^2 + b^2$$



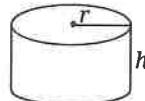
$$x, x\sqrt{3}, 2x$$



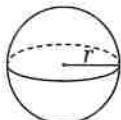
$$s, s\sqrt{2}, s$$

Special Right Triangles


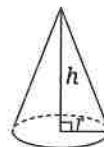
$$V = lwh$$



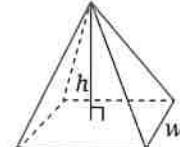
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}lwh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

Section 2, Module 1: Math

For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled or for questions with no answers circled.

For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle or for any questions with more than one circled answer.
- If you find **more than one correct answer**, write and circle only one answer.
- Your answer can be up to 5 characters for a **positive** answer and up to 6 characters (including the negative sign) for a **negative** answer, but no more.
- If your answer is a **fraction** that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a **decimal** that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a **mixed number** (such as $3\frac{1}{2}$), write it as an improper fraction ($\frac{7}{2}$) or its decimal equivalent (3.5).
- Don't enter **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

CONTINUE 

Section 2, Module 1: Math

1 Mark for Review

A data set containing only the values 2, 2, 9, 9, 9, 16, 16, 16, 16, 26, 26, and 26 is represented by a frequency table. Which of the following is the correct representation of this data set?

(A)	Number	Frequency
2	4	
9	27	
16	64	
26	78	

(B)	Number	Frequency
2	2	
9	3	
16	4	
26	3	

(C)	Number	Frequency
2	2	
3	9	
4	16	
3	26	

(D)	Number	Frequency
4	2	
27	9	
64	16	
78	26	

2 Mark for Review

The expression $x^2 - x - 56$ is equivalent to which of the following?

(A) $(x - 14)(x + 4)$

(B) $(x - 7)(x + 8)$

(C) $(x - 8)(x + 7)$

(D) $(x - 4)(x + 14)$

3 Mark for Review

A carpenter hammers 10 nails per minute and installs 7 screws per minute during a project. Which of the following equations represents the scenario if the carpenter hammers nails for x minutes, installs screws for y minutes, and uses a combined total of 200 nails and screws?

(A) $\frac{1}{10}x + \frac{1}{7}y = 200$

(B) $\frac{1}{10}x + \frac{1}{7}y = 3,420$

(C) $10x + 7y = 200$

(D) $10x + 7y = 3,420$

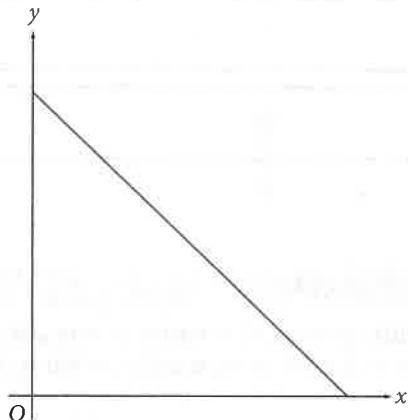
Section 2, Module 1: Math

4 Mark for Review

What is the measure of angle F in the triangle DEF , where angle D is 73° and angle E is 35° ?

- (A) 38°
- (B) 72°
- (C) 108°
- (D) 126°

5 Mark for Review



The total amount of plastic remaining to be recycled in a facility over x shifts is represented by the graph above. Which of the following represents the y -intercept of the graph?

- (A) The total amount of plastic remaining at any given time
- (B) The number of shifts it will take to finish recycling the plastic
- (C) The amount of plastic that is recycled per shift
- (D) The initial amount of plastic to be recycled

6 Mark for Review

The table below shows the condition and subject type for 200 textbooks at a bookstore.

	Biology	Chemistry	Physics	Anatomy	Total
Used	10	25	30	15	80
New	30	25	10	55	120
Total	40	50	40	70	200

What is the probability that a textbook chosen at random will be a new textbook? (Express your answer as a decimal or fraction, not as a percent.)

7 Mark for Review

A random sample of 5,000 students out of 60,000 undergraduate students at a university were surveyed about a potential change to the registration system. According to the survey results, 75% of the respondents did not support the existing registration system, with a 4% margin of error. Which of the following represents a reasonable total number of students who did not support the existing registration system?

- (A) 1,250
- (B) 3,750
- (C) 13,800
- (D) 43,800

CONTINUE

Section 2, Module 1: Math

8 **Mark for Review**

What is the negative solution to the equation $\frac{32}{a} = a - 4$?

9 **Mark for Review**

After a hot air balloon is launched from a plateau 1,000 meters above sea level, it rises at a constant rate of 750 meters per minute. Which of the following best describes the function used to model the balloon's distance above sea level over time?

(A) Increasing linear

(B) Increasing exponential

(C) Decreasing linear

(D) Decreasing exponential

10 **Mark for Review**

What is the x -intercept of the function $f(x) = (22)^x - 1$ when it is graphed in the xy -plane, where $y = f(x)$?

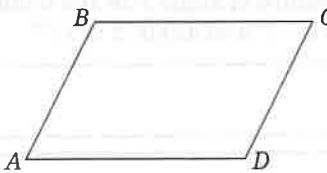
(A) $(-1, 0)$

(B) $(0, 0)$

(C) $(21, 0)$

(D) $(22, 0)$

11 **Mark for Review**



Note: Figure not drawn to scale.

In parallelogram $ABCD$ shown above, the length of \overline{AB} is one-third the length of \overline{AD} . The perimeter of the parallelogram is 64. What is the length of \overline{AB} ?

(A) 8

(B) 16

(C) 24

(D) 32

12 **Mark for Review**

A triangle with an area of 18 square units has a base of $(m + 5)$ units and a height of m units. What is the value of m ?

(A) 4

(B) 9

(C) 13

(D) 36

Section 2, Module 1: Math

13 Mark for Review

Time (seconds)	Number of colonies of yeast
0	5
1	20
2	80
3	320

The table above shows the exponential growth of a type of yeast over time s , in seconds. There are c total yeast colonies on the count plate. What is the equation that represents this relationship, assuming that no yeast was added or removed after counting began?

(A) $c = (1 + 3)^s$

(B) $c = (1 + 5)^s$

(C) $c = 3(1 + 5)^s$

(D) $c = 5(1 + 3)^s$

14 Mark for Review

The equations $12x = y$ and $24x + 7 = 2y$ intersect at how many points when graphed in the xy -plane?

(A) 0

(B) 1

(C) 2

(D) 7

15 Mark for Review

Several tiles labeled with either an A or a B are placed in a bag, and tiles are worth a different point value depending on the label. The equation $15a + 10b = 100$ represents the situation when a of the A tiles and b of the B tiles are drawn from the bag for a total of 100 points. How many points would be earned by drawing one A tile and one B tile from the bag?

16 Mark for Review

The amount of money remaining in a scholarship fund is reduced by one-fourth every year. The amount of money in the fund is represented by d and the number of years by y . If the fund starts with \$10,000, which equation below represents this situation after y years?

(A) $d = \frac{1}{4}(10,000)^y$

(B) $d = \frac{3}{4}(10,000)^y$

(C) $d = 10,000\left(\frac{1}{4}\right)^y$

(D) $d = 10,000\left(\frac{3}{4}\right)^y$

CONTINUE

Section 2, Module 1: Math

17 **Mark for Review**

What is the diameter, in millimeters (mm), of a cylinder with a volume of $144\pi \text{ mm}^3$ and a height of 4 mm?

- A 6
- B 9
- C 12
- D 36

19 **Mark for Review**

The longest side of right triangle ABC is opposite angle B . If $\sin(A) = \frac{9}{41}$, what is the value of $\sin(C)$?

18 **Mark for Review**

$$4x + 2y = 4$$

$$19x + 10y = 14$$

When graphed in the xy -plane, the linear equations shown above intersect at (a, b) . What is the value of a ?

- A -20
- B -10
- C 6
- D 14

20 **Mark for Review**

Function g reaches its maximum value when $x = a$. If $g(x) = -6x^2 - 30x - 24$, what is the value of a ?

CONTINUE

Section 2, Module 1: Math

21 Mark for Review

$$f(x) = -\frac{1}{5}x - 3$$

The linear function $f(x)$, given above, is perpendicular to $g(x)$ when graphed in the xy -plane. If $g(0) = 0$, what is the value of $g(2)$?

22 Mark for Review

$$y = 5kx^2 + 2x + 3$$

$$\frac{y}{10} = -x$$

The given system of equations has exactly one solution. If k is a positive constant, what is the value of k ?

YIELD

Once you've finished (or run out of time for) this section, use the answer key to determine how many questions you got right. If you got fewer than 14 questions right, move on to Module 2—Easier, otherwise move on to Module 2—Harder.

Section 2, Module 2—Easier: Math

SAT Prep Test 2—Math

Module 2—Easier

Turn to Section 2 of your answer sheet (p. 664) to answer the questions in this section.

DIRECTIONS

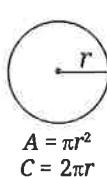
The questions in this section address a number of important math skills. Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

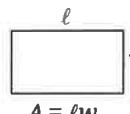
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

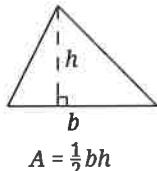


$$A = \pi r^2$$

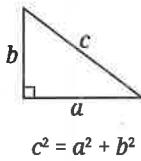
$$C = 2\pi r$$



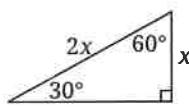
$$A = lw$$



$$A = \frac{1}{2}bh$$



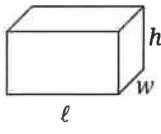
$$c^2 = a^2 + b^2$$



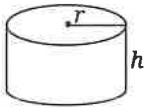
$$30^\circ \quad x\sqrt{3} \quad 60^\circ \quad x$$



Special Right Triangles



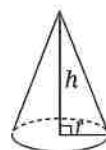
$$V = lwh$$



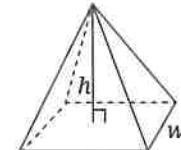
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}lwh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

Section 2, Module 2—Easier: Math

For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled or for questions with no answers circled.

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- Don't enter **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

CONTINUE 

Section 2, Module 2—Easier: Math

1 **Mark for Review**

33, 34, 38, 41, 43, 44, 47

Which of the following is the median of the given data?

- (A) 38
- (B) 40
- (C) 41
- (D) 42

2 **Mark for Review**

What is the value of the solution to the equation
 $22 = y - 10$?

3 **Mark for Review**

A rectangle has a height of 23 inches (in) and a width of 9 in. What is its perimeter, in inches?

- (A) 32
- (B) 64
- (C) 207
- (D) 1,024

4 **Mark for Review**

$15a - (6a - 2a)$

Which of the following expressions is equivalent to the given expression?

- (A) $5a$
- (B) $7a$
- (C) $11a$
- (D) $23a$

5 **Mark for Review**

Which equation represents the relationship between the numbers a and b if a is half of b ?

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

Section 2, Module 2—Easier: Math

6 Mark for Review

For all positive values of y , the expression $\frac{3}{y+c}$ is equivalent to $\frac{15}{5y+30}$. What is the value of constant c ?

- (A) 3
- (B) 6
- (C) 8
- (D) 150

7 Mark for Review

A total of 200 pets were adopted at an event. If 70% of the adopted pets were dogs, how many of the pets were dogs?

8 Mark for Review

James must drive 100 miles before he can take his driver's license test. He knows that when he drives around town running errands, he drives at an average speed of 20 miles per hour. If James maintains this average speed, how many hours must he drive to meet the requirement for his driver's license test?

- (A) 5
- (B) 20
- (C) 80
- (D) 100

9 Mark for Review

What is the value of $4y - 16$ if $y - 4 = 11$?

CONTINUE

Section 2, Module 2—Easier: Math

10 **Mark for Review**

The function g is defined as $g(x) = x^2 - 1$. What is the value of $g(x)$ when $x = 3$?

- (A) 4
- (B) 5
- (C) 7
- (D) 8

11 **Mark for Review**

The production cost $p(x)$, in dollars, to produce x units of an item when materials cost \$2 per item is given by $p(x) = 2x + 150$. What is the total cost to produce 2,000 units of this item?

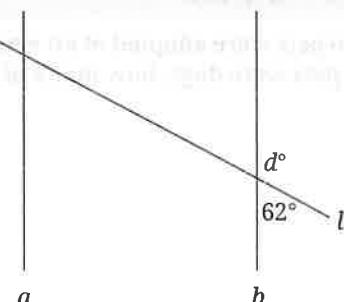
- (A) \$1,850
- (B) \$2,300
- (C) \$3,850
- (D) \$4,150

12 **Mark for Review**

The function f is given as $f(x) = \frac{2}{3}x$. When $x = 6$, what is the value of $f(x)$?

- (A) 2
- (B) 4
- (C) 6
- (D) 9

13 **Mark for Review**



Note: Figure not drawn to scale.

In the given figure, what is the value of d if line a is parallel to line b ?

CONTINUE

Section 2, Module 2—Easier: Math

14

Mark for Review

$$3x - 4y = 17$$

In the xy -plane, the graph of a line with an x -intercept of $(c, 0)$ and a y -intercept of $(0, k)$, where c and k are constants, can be represented by the given equation. What is the value of $\frac{c}{k}$?

(A) $-\frac{4}{3}$

(B) $-\frac{3}{4}$

(C) $\frac{3}{4}$

(D) $\frac{4}{3}$

15

Mark for Review

A postal machine processes mail at a constant rate of 21 pieces of mail per minute. At this rate, how many pieces of mail would the machine process in 7 minutes?

(A) 3

(B) 14

(C) 28

(D) 147

16

Mark for Review

Stella had 211 invitations to send for an event. She has already sent 43 invitations and will send them all if she sends 24 each day for the next d days. Which of the following equations represents this situation?

(A) $24d - 43 = 211$

(B) $24d + 43 = 211$

(C) $43d - 24 = 211$

(D) $43d + 24 = 211$

17

Mark for Review

x	-1	0	1	2
$f(x)$	12	15	18	21

When the linear function $y = f(x)$ is graphed in the xy -plane, the graph contains the corresponding values of x and $f(x)$ shown in the table above. Which of the following could represent the function?

(A) $f(x) = 3x + 12$

(B) $f(x) = 3x + 15$

(C) $f(x) = 15x + 12$

(D) $f(x) = 15x + 15$

CONTINUE

Section 2, Module 2—Easier: Math

18 **Mark for Review**

The height of a rocket launched from a rooftop can be modeled by the equation $h = -16s^2 + 64s + 21$, where h is the height of the rocket above the ground, in feet, and s is the number of seconds since the rocket was launched. Which of the following represents the height, in feet, of the rooftop from which the rocket was launched?

- (A) 0
- (B) 16
- (C) 21
- (D) 64

19 **Mark for Review**

Function f is defined by $f(x) = x^3 + 1$. Which of the following tables gives three values of x and their corresponding values of y ?

- (A)

x	2	3	4
y	3	4	5
- (B)

x	2	3	4
y	3	28	64
- (C)

x	2	3	4
y	9	10	65
- (D)

x	2	3	4
y	9	28	65

20 **Mark for Review**

If $b(-1) = 3$ and $b(0) = 5$ in linear function b , which of the following is the equation of function b ?

- (A) $b(x) = 2x + 5$
- (B) $b(x) = 2x + 3$
- (C) $b(x) = 2x$
- (D) $b(x) = 3x + 5$

Section 2, Module 2—Easier: Math

21 Mark for Review

Which of the following equations correctly expresses r in terms of p and s if the relationship between the numbers p , r , and s can be expressed as $p = 13r - 6s$?

(A) $r = \frac{-6s - p}{13}$

(B) $r = 13p + 6s$

(C) $r = \frac{1}{13}p + 6s$

(D) $r = \frac{p + 6s}{13}$

22 Mark for Review

Right triangle ABC has sides of the following lengths: $AB = 165$, $BC = 280$, and $AC = 325$. Another triangle, LMN , is similar to ABC such that A corresponds to L and B corresponds to M . What is the value of $\cos(L)$?

(A) $\frac{33}{65}$

(B) $\frac{33}{56}$

(C) $\frac{56}{65}$

(D) $\frac{65}{33}$

S T O P

If you finish before time is called, you may check your work on this module only.
Do not turn to any other module in the test.

Section 2, Module 2—Harder: Math

SAT Prep Test 2—Math

Module 2—Harder

Turn to Section 2 of your answer sheet (p. 664) to answer the questions in this section.

DIRECTIONS

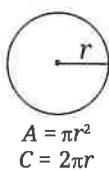
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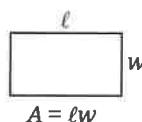
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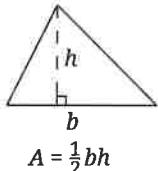


$$A = \pi r^2$$

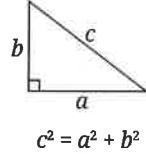
$$C = 2\pi r$$



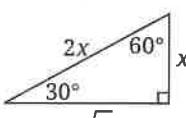
$$A = lw$$



$$A = \frac{1}{2}bh$$



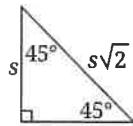
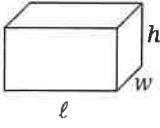
$$c^2 = a^2 + b^2$$



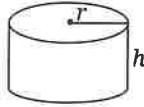
$$2x \quad 60^\circ$$

$$x \quad 30^\circ$$

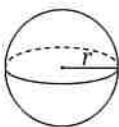
$$x\sqrt{3}$$


Special Right Triangles


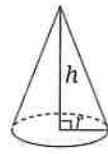
$$V = lwh$$



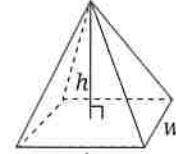
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}lwh$$

The number of degrees of arc in a circle is 360.

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CONTINUE

Section 2, Module 2—Harder: Math

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- Don't enter **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

CONTINUE 

Section 2, Module 2—Harder: Math

1 Mark for Review

Which of the following is equivalent to $3a^3 - 5a^3 + 6a$?

- (A) $-2a^3 + 6a$
- (B) $3a^3 + a$
- (C) $4a$
- (D) $-15a^9 + 6a$

2 Mark for Review

In a shipment of 45,000,000 shirts, 4,950,000 are white. What percentage of the shirts are white shirts?

- (A) 11%
- (B) 22%
- (C) 78%
- (D) 89%

3 Mark for Review

If $3(x - 8) - 16 = 8(x + 10) + x$, what is the value of $6x$?

4 Mark for Review

$$8(a - 3) - 17 = 9(a - 3)$$

In the given equation, what is the value of $a - 3$?

- (A) -20
- (B) -17
- (C) -14
- (D) 3

5 Mark for Review

A school classroom with a total of 4,200 floor tiles is divided into a 30 square-foot lab area and an 80 square-foot seating area. The number of tiles on the entire classroom floor can be represented by the equation $30a + 80b = 4,200$. In this context, which of the following does b represent?

- (A) The average number of tiles per square foot in the lab area
- (B) The total number of tiles in the lab area
- (C) The average number of tiles per square foot in the seating area
- (D) The total number of tiles in the seating area

CONTINUE

Section 2, Module 2—Harder: Math

6 Mark for Review

A triangle has a base that is 65% of its height. If the base were decreased by 13 inches, how would the height need to change to keep the same proportions?

- (A) It must increase by 13 inches.
- (B) It must increase by 20 inches.
- (C) It must decrease by 13 inches.
- (D) It must decrease by 20 inches.

7 Mark for Review

If $\frac{a}{3} = 10 - 7b$ and $a \neq 0$, which of the following correctly expresses b in terms of a ?

- (A) $b = \frac{a-21}{30}$
- (B) $b = \frac{30-a}{21}$
- (C) $b = 10 + \frac{a}{3}$
- (D) $b = 10 + \frac{3}{a}$

8 Mark for Review

For all positive values of y , the expression $\frac{3}{y+c}$ is equivalent to $\frac{15}{5y+30}$. What is the value of constant c ?

- (A) 3
- (B) 6
- (C) 8
- (D) 150

9 Mark for Review

In the xy -plane, the equation $(x - 7)^2 + (y + 7)^2 = 64$ defines circle O, and the equation $(x - 7)^2 + (y + 7)^2 = c$ defines circle P. If the two circles have the same center, and the radius of circle P is three less than the radius of circle O, what is the value of constant c ?

CONTINUE

Section 2, Module 2—Harder: Math

10

Mark for Review

A school has received a donation of \$20,000 for the purchase of new laptops. If each laptop costs \$149, no tax is charged, and the laptop manufacturer offers a 7.5% discount on orders of at least 100 laptops, what is the maximum number of laptops the school can purchase with the donation?

(A) 124

(B) 134

(C) 145

(D) 146

11

Mark for Review

$$3x^2 - y - 26 = 0$$

$$y = -3x + 10$$

The point (a, b) is an intersection of the system of equations above when graphed in the xy -plane. What is a possible value of a ?

(A) -4

(B) 6

(C) 20

(D) 26

12

Mark for Review

How many values for y satisfy the equation $-6(4y + 2) = 3(4 - 8y)$?

(A) Zero

(B) Exactly one

(C) Exactly two

(D) Infinitely many

13

Mark for Review

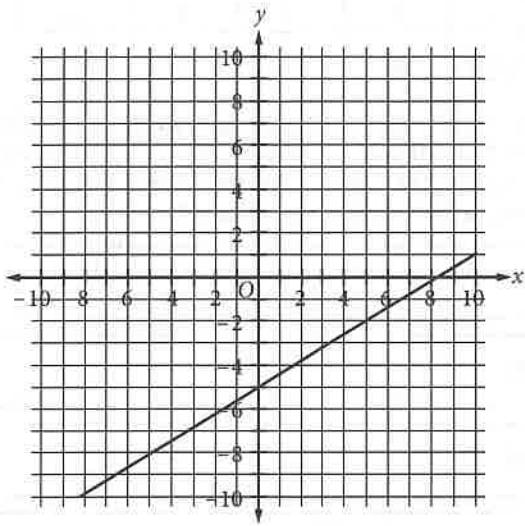
A parabola represents the graph of the function f in the xy -plane, where $y = f(x)$. If the vertex of the parabola is $(5, -4)$ and one of the x -intercepts is $(-1.5, 0)$, what is the other x -intercept?

(A) $(-6.5, 0)$ (B) $(1.5, 0)$ (C) $(3.5, 0)$ (D) $(11.5, 0)$

Section 2, Module 2—Harder: Math

14

Mark for Review



Which equation defines function g , if the graph of $y = g(x) - 10$ is shown above?

- (A) $y = \frac{3}{5}x - 15$
- (B) $y = \frac{3}{5}x - 5$
- (C) $y = \frac{3}{5}x + 5$
- (D) $y = \frac{3}{5}x + 10$

15

Mark for Review

If c is a constant in the equation $10x^2 + c = -5x$, and the equation has no real solutions, what is the value of c ?

- (A) -20
- (B) -5
- (C) 0
- (D) 1

16

Mark for Review

$$3x - 4y = 17$$

In the xy -plane, the graph of a line with an x -intercept of $(c, 0)$ and a y -intercept of $(0, k)$, where c and k are constants, can be represented by the equation above. What is the value of $\frac{c}{k}$?

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

CONTINUE

Section 2, Module 2—Harder: Math

17

 Mark for Review

$$\begin{aligned}-7 + 2f &= cg \\ 21g + 21 &= 6f - 15g\end{aligned}$$

If c is a constant, and the system of equations shown above has infinitely many solutions, what is the value of c ?

18

 Mark for Review

Triangle A has angles measuring 30° , 60° , and 90° . What is the perimeter, in centimeters, of this triangle if the smallest side has a length of 15 centimeters?

(A) $15\sqrt{3}$ (B) $15 + 15\sqrt{3}$ (C) $45 + 15\sqrt{3}$ (D) $45\sqrt{3}$

19

 Mark for Review

x	2	4	6	8
$g(x)$	46	0	-46	-92

Four values of x and their corresponding values of $g(x)$ are shown in the table above for the linear function g . The equation $g(x) = cx + d$ defines function g , and c and d are constants. What is the value of $c + d$?

(A) -23

(B) 69

(C) 92

(D) 115

20

 Mark for Review

114, 109, 106, 111

A data set consists of 5 positive integers greater than 101. What is the value of the smallest integer in the data set if the mean of the entire data set is an integer that is less than the mean of the four integers from the data set shown above?

Section 2, Module 2—Harder: Math

21 Mark for Review

A teacher awards points to a class based on completed assignments. He gives 5 points per assignment for the first 50 completed assignments and 3 points for each additional completed assignment beyond 50. When $a \geq 50$, which function g gives the total number of points earned by the class for a completed assignments?

(A) $g(a) = 3a + 5$

(B) $g(a) = 3a + 100$

(C) $g(a) = 3a + 250$

(D) $g(a) = 8a - 150$

22 Mark for Review

In triangles ABC and XYZ , $AB = 22$, $XY = 11$, and angles A and X both measure 77° . Which of the following pieces of information, if any, would be enough to prove that the two triangles are similar to each other?

I. Angle B measures 40° II. Angle Y measures 50° III. Angle Z measures 63°

(A) No additional information is necessary.

(B) Angle measures alone do not provide enough information.

(C) I and II together provide enough information.

(D) I and III together provide enough information.

S T O P

If you finish before time is called, you may check your work on this module only.
Do not turn to any other module in the test.

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SCHOLASTIC APTITUDE TEST (SAT)

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Drill Problems: Week 2.3

Author: Jaehoon Song (Lecturer)

Release: 2025-06-20 00:34:11-04:00

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C O L U M B I A A C A D E M Y

enrichment beyond the classroom

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Written by Jaehoon Song (Lecturer)

1. Arc Length Calculation (10 points)

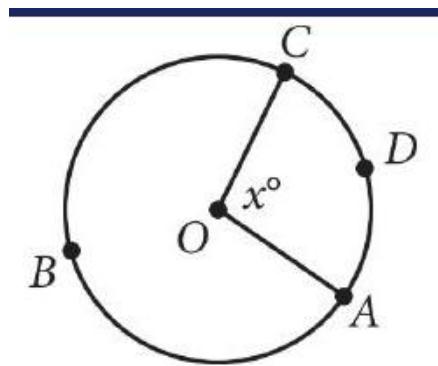


Figure 1: Circle with center O and arcs

The circle above has center O , the length of arc \overarc{ADC} is 5π , and $x = 100$. What is the length of arc \overarc{ABC} ?

- (A) 9π
- (B) 13π
- (C) 18π
- (D) $\frac{13}{2}\pi$

Answer:

□

2. Circle Radius from Equation (10 points)

The graph of $x^2 + x + y^2 + y = \frac{199}{2}$ in the xy -plane is a circle. What is the length of the circle's radius?

Answer:

□

3. Circle Center Coordinates (10 points)

The equation above defines a circle in the xy -plane. What are the coordinates of the center of the circle?

- (A) $(-20, -16)$
- (B) $(-10, -8)$
- (C) $(10, 8)$
- (D) $(20, 16)$

Answer:

□

4. Arc Length with Angle (10 points)

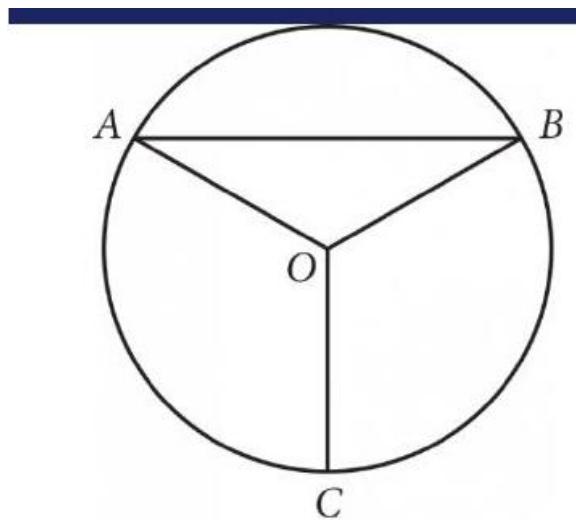


Figure 2: reference attached

Point O is the center of the circle above, and the measure of $\angle OAB$ is 30° . If the length of \overline{OC} is 18, what is the length of arc \overline{AB} ?

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

Answer:

□

5. Circle Radius from Diameter (10 points)

A circle in the xy -plane has a diameter with endpoints $(2, 4)$ and $(2, 14)$. An equation of this circle is $(x - 2)^2 + (y - 9)^2 = r^2$, where r is a positive constant. What is the value of r ?

Answer:

□

6. Angle Calculation in Triangle (10 points)

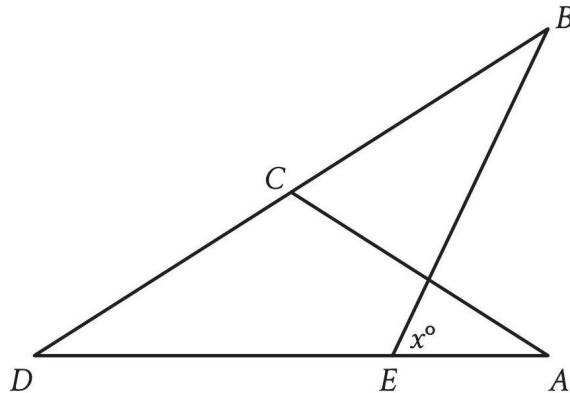


Figure 3: reference attached

In the figure, $AC = CD$. The measure of angle EBC is 45° , and the measure of angle ACD is 104° . What is the value of x ?

Answer:

□

7. Complex Angle Calculation (10 points)

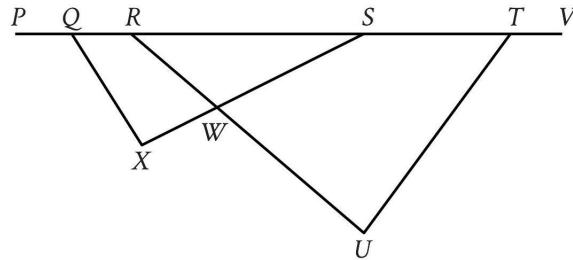


Figure 4: reference attached

In the figure shown, points Q , R , S , and T lie on line segment PV , and line segment RU intersects line segment SX at point W . The measure of $\angle SQX$ is 48° , the measure of $\angle SXQ$ is 86° , the measure of $\angle SWU$ is 85° , and the measure of $\angle VTU$ is 162° . What is the measure, in degrees, of $\angle TUR$?

Answer:

□

8. Intersecting Lines Angle (10 points)

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

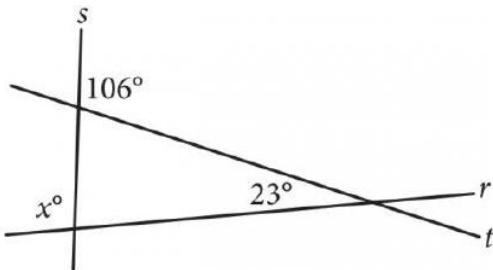


Figure 5: reference attached

What is the value of x ?

Answer:

□

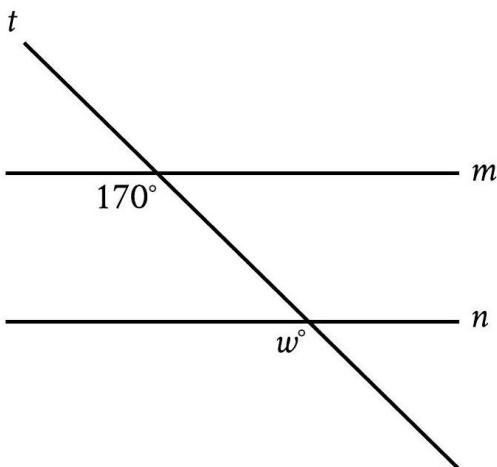
9. Parallel Lines Angle (10 points)

Figure 6: reference attached

In the figure, line m is parallel to line n . What is the value of w ?

- (A) 17
- (B) 30
- (C) 70
- (D) 170

Answer:

□

10. Isosceles Triangle Angle (10 points)

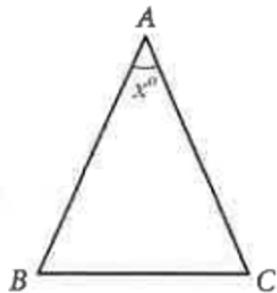


Figure 7: reference attached

In the given triangle, $AB = AC$ and $\angle ABC$ has a measure of 67° . What is the value of x ?

- (A) 36
- (B) 46
- (C) 58
- (D) 70

Answer:

□

11. Intersecting Segments Angle (10 points)

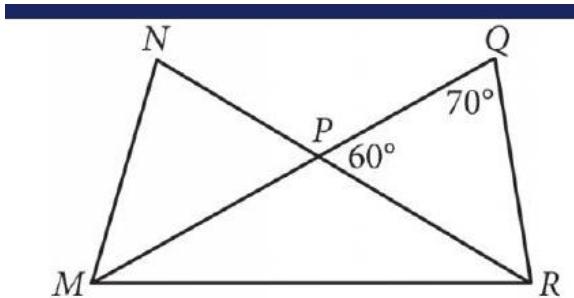


Figure 8: reference attached

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.)

Answer:

□

12. Similar Triangles Angle (10 points)

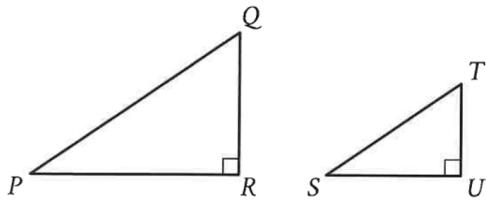


Figure 9: reference attached

Right triangles PQR and STU are similar, where P corresponds to S . If the measure of angle Q is 18° , what is the measure of angle S' ?

- (A) 18°
- (B) 72°
- (C) 82°
- (D) 162°

Answer:

□

13. Parallel Lines with Transversal (10 points)

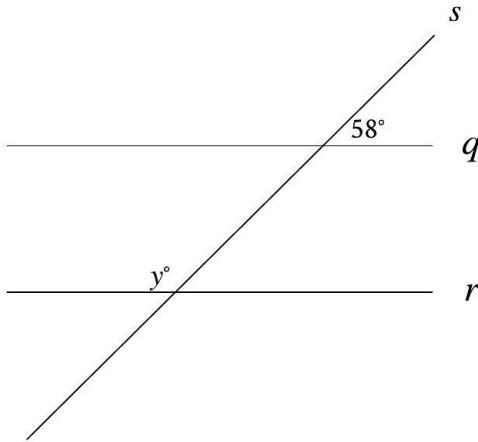


Figure 10: reference attached

In the figure, line q is parallel to line r , and both lines are intersected by line s . If $y = 2x + 8$, what is the value of x ?

Answer:

□

14. Parallel Lines Angle Relationship (10 points)

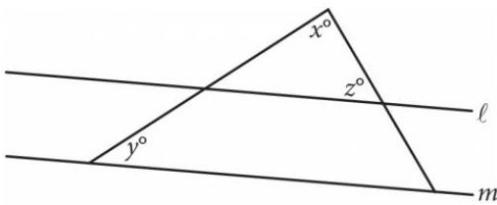


Figure 11: reference attached

In the figure above, lines ℓ and m are parallel, $y = 20$, and $z = 60$. What is the value of x ?

- (A) 120
- (B) 100
- (C) 90
- (D) 80

Answer:

□

15. Parallel Lines Proportionality (10 points)

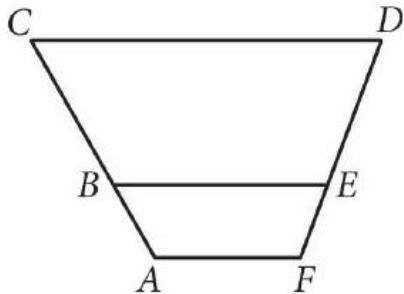


Figure 12: reference attached

In the figure above, \overline{AF} , \overline{BE} , and \overline{CD} are parallel. Points B and E lie on \overline{AC} and \overline{FD} , respectively. If $AB = 9$, $BC = 18.5$, and $FE = 8.5$, what is the length of ED , to the nearest tenth?

- (A) 16.8
- (B) 17.5
- (C) 18.4
- (D) 19.6

Answer:

□

16. Similar Triangles Sine Value (10 points)

Triangle FGH is similar to triangle JKL , where angle F corresponds to angle J and angles G and K are right angles. If $\sin(F) = \frac{308}{317}$, what is the value of $\sin(J)$?

- (A) $\frac{75}{317}$
- (B) $\frac{308}{317}$
- (C) $\frac{317}{308}$
- (D) $\frac{317}{75}$

Answer:

**17. Right Triangle Trigonometric Relationship (10 points)**

In right triangle RST , the sum of the measures of angle R and angle S is 90 degrees. The value of $\sin(R)$ is $\frac{\sqrt{15}}{4}$. What is the value of $\cos(S)$?

- (A) $\frac{\sqrt{15}}{15}$
- (B) $\frac{\sqrt{15}}{4}$
- (C) $\frac{4\sqrt{15}}{15}$
- (D) $\sqrt{15}$

Answer:



18. Tangent Value Calculation (10 points)

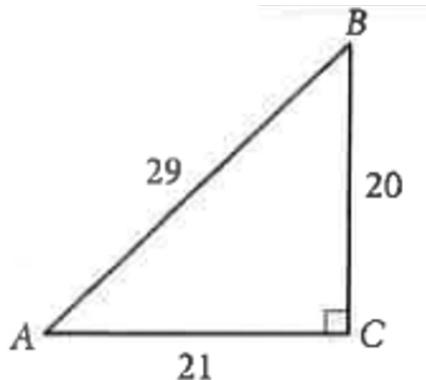


Figure 13: reference attached

In the figure above, what is the value of $\tan(A)$?

- (A) $\frac{20}{29}$
- (B) $\frac{21}{29}$
- (C) $\frac{20}{21}$
- (D) $\frac{21}{20}$

Answer:



19. Right Triangle Side Length (10 points)

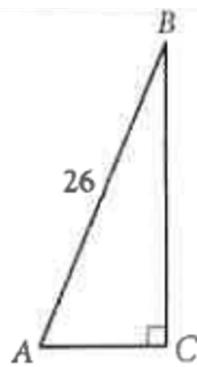


Figure 14: reference attached

Triangle ABC above is a right triangle, and $\sin(B) = \frac{5}{13}$. What is the length of side \overline{BC} ?

Answer:



20. Pythagorean Theorem Application (10 points)

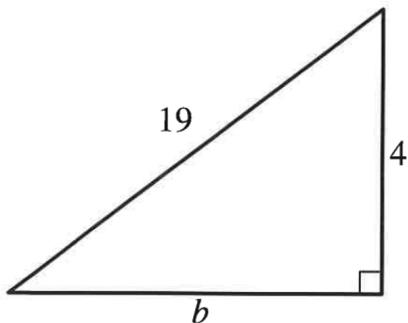


Figure 15: reference attached

Which equation shows the relationship between the side lengths of the given triangle?

- (A) $4b = 19$
- (B) $4 + b = 19$
- (C) $4^2 + b^2 = 19^2$
- (D) $4^2 - b^2 = 19^2$

Answer:

□

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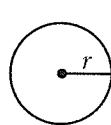
Math**22 QUESTIONS | 35 MINUTES****DIRECTIONS**

The questions in this section address a number of important math skills. Use of a calculator is permitted for all questions.

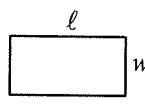
NOTES

Unless otherwise indicated:

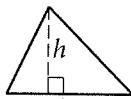
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

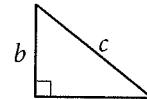
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



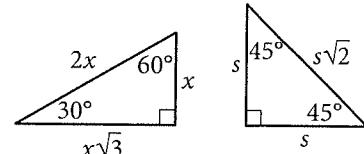
$$A = \ell w$$



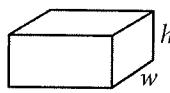
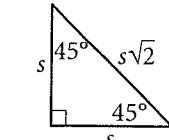
$$A = \frac{1}{2} bh$$



$$c^2 = a^2 + b^2$$



Special Right Triangles



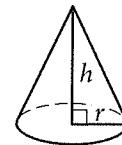
$$V = \ell wh$$



$$V = \pi r^2 h$$



$$V = \frac{4}{3} \pi r^3$$



$$V = \frac{1}{3} \pi r^2 h$$



$$V = \frac{1}{3} \ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.



2

Module

1

2

For **multiple-choice questions**, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For **student-produced response questions**, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- If you find more than one correct answer, write and circle only one answer.
- Your answer can be up to 5 characters for a positive answer and up to 6 characters (including the negative sign) for a negative answer, but no more.
- If your answer is a fraction that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a decimal that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a mixed number (such as $3\frac{1}{2}$), write it as an improper fraction ($\frac{7}{2}$) or its decimal equivalent (3.5).
- Don't include symbols such as a percent sign, comma, or dollar sign in your circled answer.

CONTINUE

1

If $4x + 16 = 24$, what is the value of $x + 4$?

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

3

If a is a solution to this equation below and $a > 0$, what is the value of a ?

$$|2x - 3| = 11$$

4

Line k is a line perpendicular to line m . Given that the equation for line m is $5y = 4x + 15$, which of the following could be the equation for line k ?

- A) $y = \frac{4}{5}x - 12$
- B) $y = \frac{5}{4}x + 6$
- C) $y = -\frac{5}{4}x - 2$
- D) $y = \frac{5}{4}x + 10$

2

Cocopine high school conducts annual surveys at its school to find out the number of teachers and students by gender. The results of the survey showed that there were 35 teachers and 245 students in the school.

	Students	Teacher
Male	131	
Female		16

Using the table above, if a person is chosen at random, what is the probability that the person is a male teacher?

- A) $\frac{19}{280}$
- B) $\frac{19}{150}$
- C) $\frac{19}{35}$
- D) $\frac{19}{131}$

5

What is the center of the circle, given that its equation is $x^2 + y^2 - 6x + 4y = 36$?

- A) $(-3, 2)$
- B) $(2, -3)$
- C) $(3, -2)$
- D) $(-2, 3)$

6

If $(8^x)^x \times 4^{2x}$ is equivalent to $\left(\frac{2^{ax}}{2^{-b}}\right)^x$, what is the value of a ?

7

If (x, y) is a solution to the following system of inequalities, which of the following could be (x, y) ?

$$\begin{aligned} -6x + 3 &< y \\ y &< x + 6 \end{aligned}$$

- A) $(-2, -4)$
- B) $(4, 7)$
- C) $(-2, 1)$
- D) $(-4, -2)$

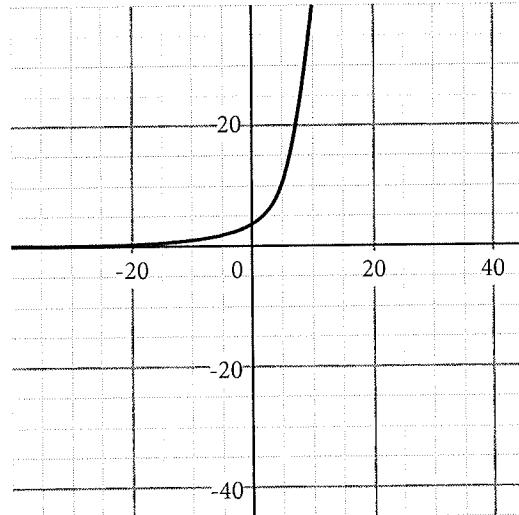
8

If $f(x) = 2(x - 3)^2 + 8$ is transformed to $g(x) = 2(x - 5)^2 + 5$, which of the following describes the transformation?

- A) The x coordinate moves to the right 2 units and the y coordinate moves 3 units down.
- B) The x coordinate moves to the left 2 units and the y coordinate moves 3 units down.
- C) The x coordinate moves to the right 2 units and the y coordinate moves 3 units up.
- D) The x coordinate moves to the left 2 units and the y coordinate moves 3 units up.

9

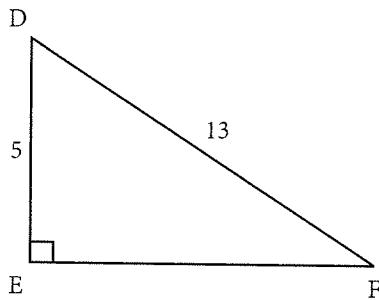
Which of the following equation best represents the graph below?



- A) $y = 5(0.7)^x$
- B) $y = 5(1.3)^x$
- C) $y = 3(0.7)^x$
- D) $y = 3(1.3)^x$

10

If triangle PQR (not shown) is similar to triangle DEF shown below and $DE = 2PQ$, what is the value of $\sin R$?



12

A researcher studies bacteria in a pond and models a function that shows how the bacteria populate in the pond. Let t be the number of days since the bacteria began to populate the pond. Which of the following is the best interpretation of $(3)^{\frac{t}{14}}$ in the equation: $p(t) = 2,034(3)^{\frac{t}{14}}$?

- A) The number of bacteria at the beginning of the study
- B) The number of bacteria triples every two weeks
- C) The number of bacteria increases by 3 every two weeks
- D) The number of bacteria in the pond after two weeks

11

The average SAT score of 7 students in a class is 1,320. If a student with an SAT score of 1,460 joins the class, what will be the new average SAT score (rounded off to the nearest 10)?

- A) 1,390
- B) 1,340
- C) 1,300
- D) 1,460

13

What is the value of p , if the equation below has no solutions?

$$5(x + 3) - 3(2 - x) = px + 7$$

14

How many solutions does the following system of equations have?

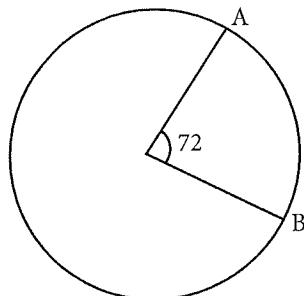
$$3x - 4y = 16$$

$$-6x = -8y + 32$$

- A) One solution
- B) Two solutions
- C) Infinitely many solutions
- D) No solution

15

What is the length of the minor arc AB, given that the diameter of the circle is 12 cm and the measure of the angle of sector AOB is 72° ?



- A) 2.4π
- B) 28.8π
- C) 12π
- D) $\frac{\pi}{6}$

16

The expression $y = -2(x + 3)^2 + 6$ is equivalent to $ax^2 + bx + c$, where $a < 0$ and $b < 0$. What is the value of c ?

17

If the coordinates of the midpoint of line segment AB are (8, 10) and the coordinates of point A are (6, 11), which of the following would represent the coordinates of point B?

- A) (7, 10.5)
- B) (2, 0.5)
- C) (10, 9)
- D) (7, 11)

18

How many solutions does the equation $|x + 3| = 0$ have?

- A) 1
- B) 2
- C) 0
- D) There is not enough information to answer the question.

CONTINUE



2

Module

1

2

19

What is the value of $|f(2)|$ where
 $f(x) = x^2 - 20x + 9$?

- A) 27
- B) -27
- C) 53
- D) 35

20

The price of oil increased by 20% at the beginning of May. Some policies were then put in place which reduced the price of oil by 14% two weeks after the initial increase. What is the overall percentage increase or decrease in the oil?

21

A circle is inscribed in a square. If the length of one side of the square is $4\sqrt{2}$ and the area of the circle is $p\pi$, what is the value of p ?

- A) 32
- B) 16
- C) 8
- D) 64

22

Which of the following is not a solution to the inequality below?

$$-3x + 6 \leq 2 - x$$

- A) 2
- B) 0
- C) 3
- D) 4



No Test Material On This Page

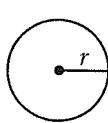
Math**22 QUESTIONS | 35 MINUTES****DIRECTIONS**

The questions in this section address a number of important math skills. Use of a calculator is permitted for all questions.

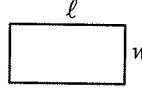
NOTES

Unless otherwise indicated:

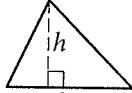
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

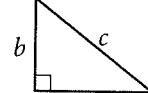
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



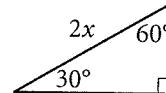
$$A = \ell w$$



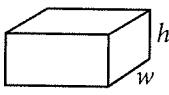
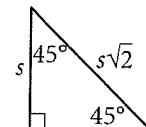
$$A = \frac{1}{2} bh$$



$$c^2 = a^2 + b^2$$



Special Right Triangles



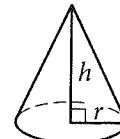
$$V = \ell wh$$



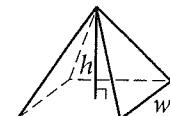
$$V = \pi r^2 h$$



$$V = \frac{4}{3} \pi r^3$$



$$V = \frac{1}{3} \pi r^2 h$$



$$V = \frac{1}{3} \ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.



2

Module
2

2

For **multiple-choice questions**, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For **student-produced response questions**, solve each problem and write your answer next to or under the question in the test book as described below.

- Once you've written your answer, circle it clearly. You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- If you find more than one correct answer, write and circle only one answer.
- Your answer can be up to 5 characters for a positive answer and up to 6 characters (including the negative sign) for a negative answer, but no more.
- If your answer is a fraction that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.
- If your answer is a decimal that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round at the fourth digit.
- If your answer is a mixed number (such as $3\frac{1}{2}$), write it as an improper fraction ($\frac{7}{2}$) or its decimal equivalent (3.5).
- Don't include symbols such as a percent sign, comma, or dollar sign in your circled answer.

CONTINUE

1

If m and n are solutions to the equation $f(x) = 3x^2 + 9x - 27$, what is the value of $m + n$?

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

2

Which of the following is equivalent to $3x^2y + 5x - (3x^2y^2 - 2x^2y)$?

- A) $6x^2y - 3x^2y^2 + 5x$
- B) $x^2y - 3x^2y^2 + 5x$
- C) $6x^2y - 2x^2y^2 + 5x$
- D) $-3x^2y^2 + 5x^2y + 5x$

3

What is the least integer value of y that satisfies the inequality below?

$$-2y + 2 < 6$$

4

How many solutions does the following system of equations have?

$$\begin{aligned}y &= 2x - 5 \\y &= 2x^2 - 18x + 45\end{aligned}$$

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

5

If $3x - y = 11$ and $2x - 2y = 2$, what is the value of $x + y$?

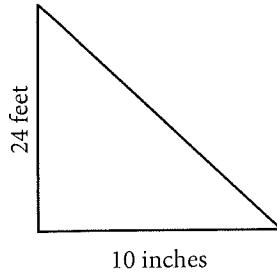
- A) 9
- B) 5
- C) 3
- D) 13

6

If $\sin 32^\circ = 0.551$, what is the value of $\cos 58^\circ$?

7

If 1 foot = 12 inches, what is the area of the triangle (not drawn to scale) below in ft^2 ?



- A) 120
- B) 20
- C) 1,440
- D) 10

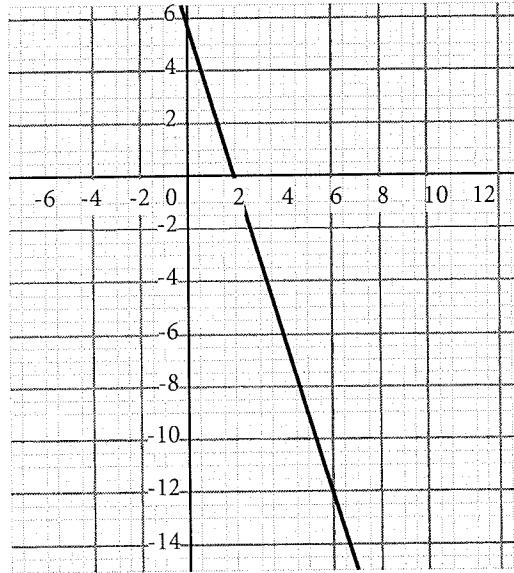
8

For all values of $x > 0$, which of the following is equivalent to the following equation $\frac{-5}{x} - \frac{x}{x-4}$?

- A) -6
- B) $\frac{x^2 + -20}{4}$
- C) $\frac{-x^2 - 5x + 20}{x^2 - 4x}$
- D) $\frac{-9 - x}{x - 4}$

9

Which of the following equations best represents the equation of the following graph?



- A) $3y - 9x = 18$
- B) $3y + 9x = 18$
- C) $6y - 12x = 36$
- D) $5y + 20x = 30$

10

What is the y -intercept for the equation below?

$$y - 7 = 3^x - 5$$

CONTINUE

11

For what value of x does the function

$$h(x) = \frac{3x - 5}{x^2 - 2x - 15}$$
 become undefined if $x < 0$?

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

12

If $f(3) = -1$ and $f(4) = -3$, what is the x -intercept for the line represented by the function $f(x)$?

- A) 2.5
- B) 5
- C) -2
- D) $\frac{2}{5}$

13

If $f(x+3) = 5x - 17$, what is the value of $f(2)$?

14

Amber travels from her home to the mall in

$1\frac{1}{2}$ hours. She completes her errands in one hour

and she then travels back home in $2\frac{1}{2}$ hours.

If the distance from the mall to her home is x miles, find the average speed of her trip in terms of x .

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

15

Given that the length of a rectangle is 3 meters more than its width, what is the perimeter of the rectangle given that the area is 28 square meters?

- A) 11
- B) 22
- C) 14
- D) 32

16

A study conducted by a school's medical board found that 23 out of the 48 students surveyed practice sanitary routines such as washing their hands before meals. If there are 2,280 students in the school, approximately how many students in the school do not practice sanitary routines (rounded up to the nearest whole number)?

17

Which of the following is the equation of $g(x) = 2x$ when it's moved 1 unit to the left and 1 unit up?

- A) $y = 2x - 1$
- B) $y = 2x + 1$
- C) $y = 2x + 5$
- D) $y = 2x + 3$

18

What is the x coordinate of the vertex for the parabola represented by the equation $y = 2x^2 + 8x + 12$?

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

19

If $\frac{x^2 - 6x + 10}{x + 2} = A + \frac{B}{x + 2}$, what is the value of B ?

20

If triangle ABC is a right triangle and B is 90° and the longest side of the triangle is 61 and the shortest side is 11, what is the length of the third side of the triangle?

- A) 40
- B) 60
- C) 62
- D) 59

CONTINUE

21

The psychology department of a school conducted a study on 20 random students in a third grade class of 58 students. 20 of the students were then offered a supplement. The study found that 15 of these students did better in their end-term exams compared to those who did not take the supplements. Which of the following statements can best be concluded from the above study?

- A) Students who take supplements do better on exams.
- B) Students who do not take supplements do not do well on their exams.
- C) Supplements improve students' performance in their exams.
- D) No conclusion can be drawn about the cause-and-effect relationship between test taking and supplement taking.

22

If $x + 3y = 9$ and $2x + 2y = 14$, what is the value of $y - x$?

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

STOP

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SCHOLASTIC APTITUDE TEST (SAT)

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Drill Problems: Week 2.5

Author: Jaehoon Song (Lecturer)

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C O L U M B I A A C A D E M Y

enrichment beyond the classroom

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Written by Jaehoon Song (Lecturer)

1. Median Calculation (10 points)

What is the median of the seven data values shown?

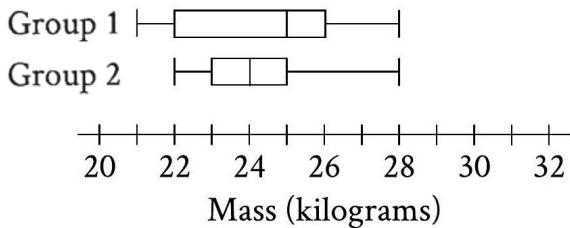
$$2, 2, 2, 3, 4, 4, 11$$

- (A) 2
- (B) 3
- (C) 4
- (D) 9

Answer:

**2. Box Plot Analysis (10 points)**

The box plots summarize the masses, in kilograms, of two groups of gazelles. Based on the box plots, which



of the following statements must be true?

- (A) The mean mass of group 1 is greater than the mean mass of group 2.
- (B) The mean mass of group 1 is less than the mean mass of group 2.
- (C) The median mass of group 1 is greater than the median mass of group 2.
- (D) The median mass of group 1 is less than the median mass of group 2.

Answer:



3. Frequency Table Analysis (10 points)

Ages of 20 Students Enrolled in a College Class The table above shows the distribution of ages of the 20

Ages of 20 Students Enrolled in a College Class

Age	Frequency
18	6
19	5
20	4
21	2
22	1
23	1
30	1

students enrolled in a college class. Which of the following gives the correct order of the mean, median, and mode of the ages?

- (A) mode < median < mean
- (B) mode < mean < median
- (C) median < mode < mean
- (D) mean < mode < median

Answer:



4. Frequency Table Construction (10 points)

Which frequency table correctly represents the data listed?

4, 4, 4, 4, 8, 8, 8, 13, 13

(A)

Number	Frequency
4	4
8	3
13	2

(C)

Number	Frequency
4	16
8	24
13	26

(B)
(D)

Number	Frequency
4	4
3	8
2	13

Number	Frequency
16	4
24	8
26	13

Answer:



5. Maximum Data Value (10 points)

The frequency table summarizes the 57 data values in a data set. What is the maximum data value in the

Frequency Table

Data value	Frequency
6	3
7	3
8	8
9	8
10	9
11	11
12	9
13	0
14	6

data set?

Answer:



6. Mean Equality (10 points)

Data set A and data set B each contain 5 numbers.

Data set A: 72, 73, 73, 76, 76

Data set B: 61, 64, 74, 85, x

If the mean of data set A is equal to the mean of data set B , what is the value of x ?

- (A) 77
- (B) 85
- (C) 86
- (D) 95

Answer:



7. Statistical Calculations (10 points)

For a school fund-raiser, 10 students sold a total of 90 boxes of cookies. Which of the following can be calculated from this information?

- (A) The average number of boxes sold per student
- (B) The median number of boxes sold per student
- (C) The greatest number of boxes sold by one student

- (D) The least number of boxes sold by one student

Answer:



8. Standard Deviation Comparison (10 points)

The results of two independent surveys are shown in the table below. Which statement is true based on the

Men's Height Survey Results

Group	Sample Size	Mean (cm)	Std. Dev. (cm)
A	2,500	186	12.5
B	2,500	186	19.1

table?

- (A) The Group A data set was identical to the Group B data set.
- (B) Group B contained the tallest participant.
- (C) The heights of the men in Group B had a larger spread than the heights of the men in Group A.
- (D) The median height of Group B is larger than the median height of Group A.

Answer:



9. Mean and Median Equality (10 points)

The mean and the median of the five numbers above are equal.

$$15, 14, 18, 17, x$$

Which of the following is NOT a possible value of x ?

- (A) 6
- (B) 11
- (C) 16
- (D) 21

Answer:



10. Missing Data Value (10 points)

Data set A consists of 10 positive integers less than 60. The list shown gives 9 of the integers from data set A.

$$43, 45, 44, 43, 38, 39, 40, 46, 40$$

The mean of these 9 integers is 42. If the mean of data set A is an integer that is greater than 42, what is the value of the largest integer from data set A?

Answer:



11. Scatterplot Analysis (10 points)

Distance and Density of Planetoids in the Inner Solar System

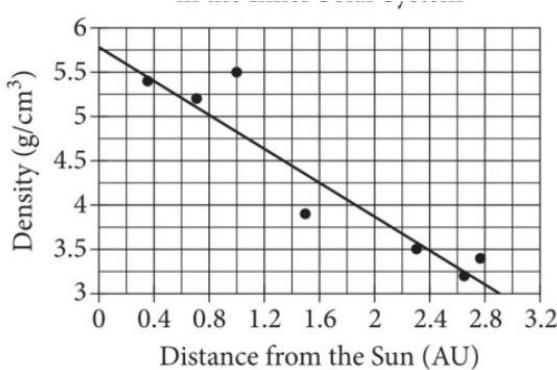


Figure 1: reference attached

The scatterplot above shows the densities of 7 planetoids, in grams per cubic centimeter, with respect to their average distances from the Sun in astronomical units (AU). The line of best fit is also shown. An astronomer has discovered a new planetoid about 1.2 AU from the Sun. According to the line of best fit, which of the following best approximates the density of the planetoid, in grams per cubic centimeter?

- (A) 3.6
- (B) 4.1
- (C) 4.6
- (D) 5.5

Answer:**12. Investment Growth Model (10 points)**

Each year, the value of an investment increases by 0.49% of its value the previous year. Which of the following functions best models how the value of the investment changes over time?

- (A) Decreasing exponential
- (B) Decreasing linear
- (C) Increasing exponential
- (D) Increasing linear

Answer:

13. Line of Best Fit Slope (10 points)

The scatterplot shows the relationship between x and y . A line of best fit is also shown.

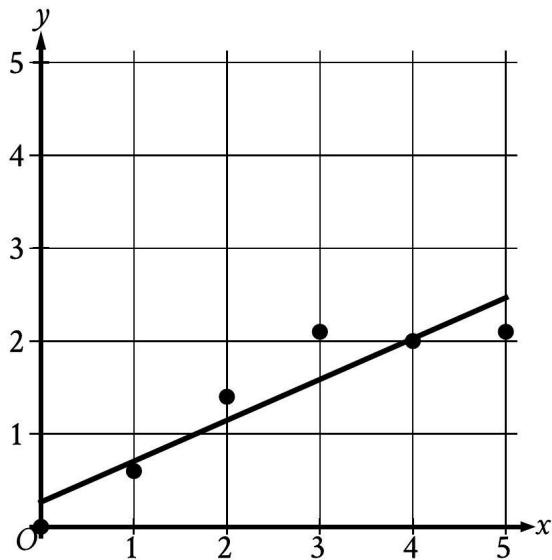


Figure 2: reference attached

Which of the following is closest to the slope of the line of best fit shown?

- (A) -2.27
- (B) -0.44
- (C) 0.44
- (D) 2.27

Answer:



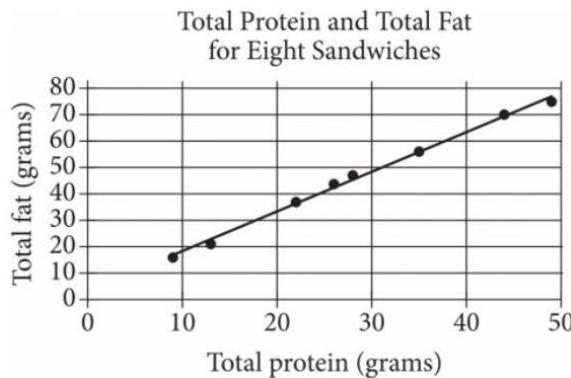
14. Protein and Fat Correlation (10 points)

Figure 3: reference attached

The scatterplot above shows the numbers of grams of both total protein and total fat for eight sandwiches on a restaurant menu. The line of best fit for the data is also shown. According to the line of best fit, which of the following is closest to the predicted increase in total fat, in grams, for every increase of 1 gram in total protein?

- (A) 2.5
- (B) 2.0
- (C) 1.5
- (D) 1.0

Answer:

15. Linear Model Selection (10 points)

The scatterplot shows the relationship between two variables, x and y .

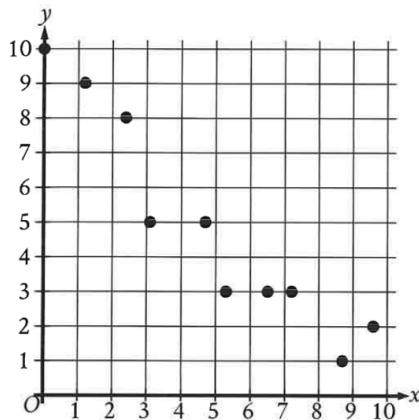


Figure 4: reference attached

Which of the following equations is the most appropriate linear model for the data shown?

- (A) $y = 0.9 + 9.4x$
- (B) $y = 0.9 - 9.4x$
- (C) $y = 9.4 + 0.9x$
- (D) $y = 9.4 - 0.9x$

Answer:

**16. Investment Comparison (10 points)**

Two investments were made as shown in the table above. The interest in Account A is compounded once

Investment Comparison

	Amount invested	Balance increase
Account A	\$500	6% annual interest
Account B	\$1,000	\$25 per year

per year. Which of the following is true about the investments?

- (A) Account A always earns more money per year than Account B.
- (B) Account A always earns less money per year than Account B.
- (C) Account A earns more money per year than Account B at first but eventually earns less money per year.
- (D) Account A earns less money per year than Account B at first but eventually earns more money per year.

Answer:



17. Function Classification (10 points)

For $x > 0$, the function f is defined as follows:

$$f(x) \text{ equals } 201\% \text{ of } x$$

Which of the following could describe this function?

- (A) Decreasing exponential
- (B) Decreasing linear
- (C) Increasing exponential
- (D) Increasing linear

Answer:

**18. Prediction from Line of Best Fit (10 points)**

The scatterplot shows the relationship between two variables, x and y . A line of best fit for the data is also shown.

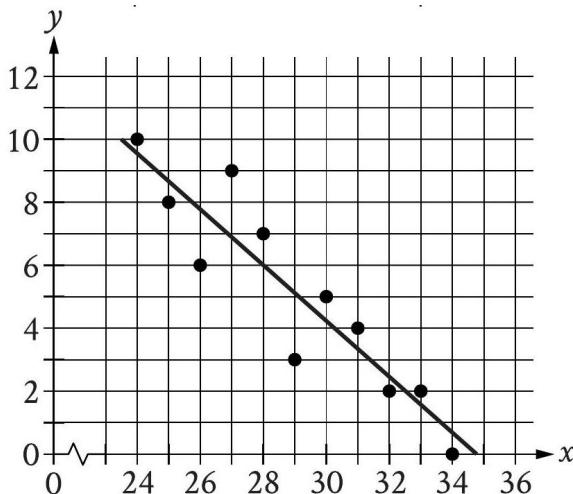


Figure 5: reference attached

At $x = 32$, which of the following is closest to the y -value predicted by the line of best fit?

- (A) 0.4
- (B) 1.5
- (C) 2.4
- (D) 3.3

Answer:



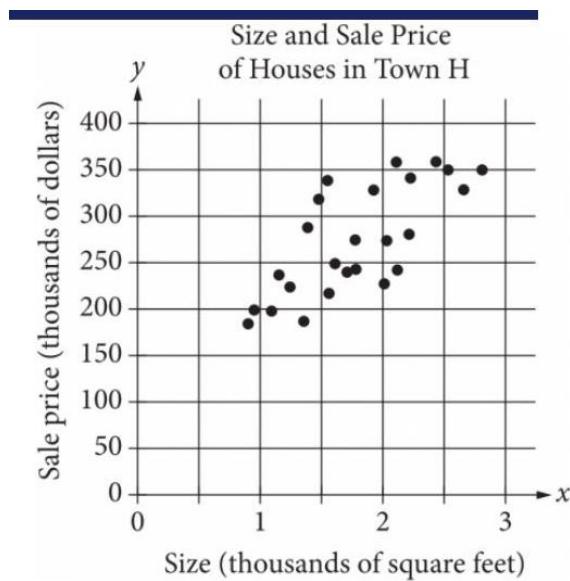
19. House Price Model (10 points)

Figure 6: reference attached

The scatterplot above shows the size x and the sale price y of 25 houses for sale in Town H. Which of the following could be an equation for a line of best fit for the data?

- (A) $y = 200x + 100$
- (B) $y = 100x + 100$
- (C) $y = 50x + 100$
- (D) $y = 100x$

Answer:

20. Elevation and Temperature Association (10 points)

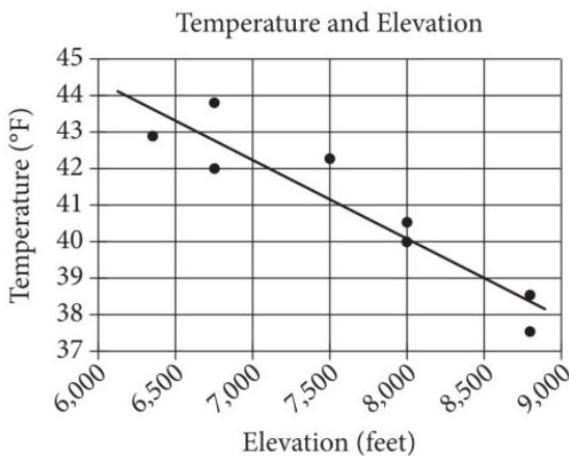


Figure 7: reference attached

The scatterplot above shows the high temperature on a certain day and the elevation of 8 different locations in the Lake Tahoe Basin. A line of best fit for the data is also shown. Which of the following statements best describes the association between the elevation and the temperature of locations in the Lake Tahoe Basin?

- (A) As the elevation increases, the temperature tends to increase.
- (B) As the elevation increases, the temperature tends to decrease.
- (C) As the elevation decreases, the temperature tends to decrease.
- (D) There is no association between the elevation and the temperature.

Answer:



21. Printer Rate Conversion (10 points)

A printer produces posters at a constant rate of 42 posters per minute. At what rate, in posters per hour, does the printer produce the posters?

Answer:



22. Speed Conversion (10 points)

The International Space Station orbits Earth at an average speed of 4.76 miles per second. What is the space station's average speed in miles per hour?

- (A) 285.6
- (B) 571.2
- (C) 856.8
- (D) 17136.0

Answer:

**23. Lightning Distance Calculation (10 points)**

For a person m miles from a flash of lightning, the length of the time interval from the moment the person sees the lightning to the moment the person hears the thunder is k seconds. The ratio of m to k can be estimated to be 1 to 5. According to this estimate, the person is how many miles from a flash of lightning if the time interval is 25 seconds?

- (A) 10
- (B) 9
- (C) 6
- (D) 5

Answer:

**24. Population Increase Calculation (10 points)**

The population density of Iceland, in people per square kilometer of land area, increased from 2.5 in 1990 to 3.3 in 2014. During this time period, the land area of Iceland was 100,250 square kilometers. By how many people did Iceland's population increase from 1990 to 2014?

- (A) 330,825
- (B) 132,330
- (C) 125,312
- (D) 80,200

Answer:

**25. Orange Purchase Calculation (10 points)**

A customer spent \$27 to purchase oranges at \$3 per pound. How many pounds of oranges did the customer purchase?

Answer:



26. Butterfly Migration Rate (10 points)

A group of monarch butterflies migrated from Chicago, Illinois, to Michoacán, Mexico, flying a total of 2,100 miles. It took a single butterfly in the group 120 days to travel this route one way. On average, how many miles did the butterfly travel per day?

- (A) 0.057
- (B) 0.729
- (C) 17.5
- (D) 24

Answer:**27. Proportional Relationship (10 points)**

If $\frac{x}{y} = 4$ and $\frac{24x}{ny} = 4$, what is the value of n ?

Answer:**28. Ratio Problem (10 points)**

In a box of pens, the ratio of black pens to red pens is 8 to 1. There are 40 black pens in the box. How many red pens are in the box?

- (A) 5
- (B) 8
- (C) 40
- (D) 320

Answer:**29. Density and Price Calculation (10 points)**

Pure beeswax has a density of 0.555 ounce per cubic inch. An online company sells pure beeswax at a price of \$8.00 per ounce. What is the selling price, in dollars per cubic inch, for pure beeswax purchased from this company?

Answer:

30. Area Calculation (10 points)

The population density of Worthington is 290 people per square mile. Worthington has a population of 92,800 people. What is the area, in square miles, of Worthington?

- (A) 102,400
- (B) 93,090
- (C) 320
- (D) 32

Answer:

**31. Percentage Expression (10 points)**

Jennifer bought a box of Crunchy Grain cereal. The nutrition facts on the box state that a serving size of the cereal is $\frac{3}{4}$ cup and provides 210 calories, 50 of which are calories from fat. In addition, each serving of the cereal provides 180 milligrams of potassium, which is 5% of the daily allowance for adults. If p percent of an adult's daily allowance of potassium is provided by x servings of Crunchy Grain cereal per day, which of the following expresses p in terms of x ?

- (A) $p = 0.5x$
- (B) $p = 5x$
- (C) $p = (0.05)^x$
- (D) $p = (1.05)^x$

Answer:

**32. Committee Composition (10 points)**

A school district is forming a committee to discuss plans for the construction of a new high school. Of those invited to join the committee, 15% are parents of students, 45% are teachers from the current high school, 25% are school and district administrators, and the remaining 6 individuals are students. How many more teachers were invited to join the committee than school and district administrators?

Answer:



33. Percent Increase Calculation (10 points)

A table of the US minimum wage for 6 different years is shown below. What was the percent increase of the

US Minimum Wage by Year

Year	US Minimum Wage (dollars per hour)
1960	\$1.00
1970	\$1.60
1980	\$3.10
1990	\$3.80
2000	\$5.15
2010	\$7.25

minimum wage from 1960 to 1970?

- (A) 30%
- (B) 60%
- (C) 62.5%
- (D) 120%

Answer:

**34. Subscription Growth (10 points)**

The manager of an online news service received the report above on the number of subscriptions sold by the

Subscription Sales

Year	Subscriptions sold
2012	5,600
2013	5,880

service. The manager estimated that the percent increase from 2012 to 2013 would be double the percent increase from 2013 to 2014. How many subscriptions did the manager expect would be sold in 2014?

- (A) 6,020
- (B) 6,027
- (C) 6,440
- (D) 6,468

Answer:



35. Snowfall Decrease (10 points)

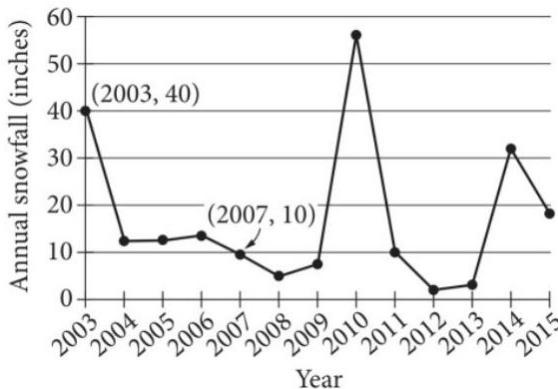


Figure 8: reference attached

The line graph shows the total amount of snow, in inches, recorded each year in Washington, DC, from 2003 to 2015. If $p\%$ is the percent decrease in the annual snowfall from 2003 to 2007, what is the value of p ?

Answer:



36. Percentage Calculation (10 points)

What percentage of 300 is 75?

- (A) 25%
- (B) 50%
- (C) 75%
- (D) 225%

Answer:



37. Sales Tax Calculation (10 points)

The cost of a certain shirt is \$20 before a 5% sales tax is added. What is the total cost, including sales tax, to purchase the shirt?

- (A) \$20.05
- (B) \$20.50
- (C) \$21.00
- (D) \$25.00

Answer:



38. Voting Analysis (10 points)

For the finale of a TV show, viewers could use either social media or a text message to vote for their favorite of two contestants. The contestant receiving more than 50% of the vote won. An estimated 10% of the viewers voted, and 30% of the votes were cast on social media. Contestant 2 earned 70% of the votes cast using social media and 40% of the votes cast using a text message. Based on this information, which of the following is an accurate conclusion?

- (A) If all viewers had voted, Contestant 2 would have won.
- (B) Viewers voting by social media were likely to be younger than viewers voting by text message.
- (C) If all viewers who voted had voted by social media instead of by text message, Contestant 2 would have won.
- (D) Viewers voting by social media were more likely to prefer Contestant 2 than were viewers voting by text message.

Answer:

**39. Return Rate Calculation (10 points)**

During the first month of sales, a company sold 1,300,000 units of a certain type of smartphone. During the same month, 15% of the units sold were returned. If sales and the return rate remain the same for each of the next 5 months, about how many units of this smartphone will be returned to the company during this 6-month period?

- (A) 195,000
- (B) 975,000
- (C) 1,170,000
- (D) 6,630,000

Answer:

**40. Enrollment Increase (10 points)**

Last year, 200 students enrolled in an interior design program. This year, the number of students enrolled is 147% of last year's number. How many students are enrolled in the interior design program this year?

- (A) 247
- (B) 294
- (C) 347
- (D) 394

Answer:



41. Cell Phone Study Analysis (10 points)

In a study of cell phone use, 799 randomly selected US teens were asked how often they talked on a cell

Cell Phone Use Study

Texting behavior	Talks on cell phone daily	Does not talk on cell phone daily	Total
Light	110	146	256
Medium	139	164	303
Heavy	166	74	240
Total	415	384	799

phone and about their texting behavior. The data are summarized in the table above. Based on the data from the study, an estimate of the percent of US teens who are heavy texters is 30% and the associated margin of error is 3%. Which of the following is a correct statement based on the given margin of error?

- (A) Approximately 3% of the teens in the study who are classified as heavy texters are not really heavy texters.
- (B) It is not possible that the percent of all US teens who are heavy texters is less than 27%.
- (C) The percent of all US teens who are heavy texters is 33%.
- (D) It is doubtful that the percent of all US teens who are heavy texters is 35%.

Answer:



42. Survey Estimation (10 points)

There are 55 students in Spanish club. A sample of the Spanish club students was selected at random and asked whether they intend to enroll in a new study program. Of those surveyed, 20% responded that they intend to enroll in the study program. Based on this survey, which of the following is the best estimate of the total number of Spanish club students who intend to enroll in the study program?

- (A) 11
- (B) 20
- (C) 44
- (D) 55

Answer:



43. Nuclear Energy Survey (10 points)

A researcher interviewed 411 randomly selected US residents and asked about their views on the use of

Views on Nuclear Energy

Response	Frequency
Strongly favor	56
Somewhat favor	214
Somewhat oppose	104
Strongly oppose	37

nuclear energy. The table above summarizes the responses of the interviewees. If the population of the United States was 300 million when the survey was given, based on the sample data for the 411 US residents, what is the best estimate, in millions, of the difference between the number of US residents who somewhat favor or strongly favor the use of nuclear energy and the number of those who somewhat oppose or strongly oppose it? (Round your answer to the nearest whole number.)

Answer:



44. Contest Probability (10 points)

The same 20 contestants, on each of 3 days, answered 5 questions in order to win a prize. Each contestant

Number of Contestants by Score and Day

	5 out of 5	4 out of 5	3 out of 5	2 out of 5	1 out of 5	0 out of 5	Total
Day 1	2	3	4	6	2	3	20
Day 2	2	3	5	5	4	1	20
Day 3	3	3	4	5	3	2	20
Total	7	9	13	16	9	6	60

received 1 point for each correct answer. The number of contestants receiving a given score on each day is shown in the table above. No contestant received the same score on two different days. If a contestant is selected at random, what is the probability that the selected contestant received a score of 5 on Day 2 or Day 3, given that the contestant received a score of 5 on one of the three days?

Answer:



45. Dice Probability (10 points)

Each face of a fair 14-sided die is labeled with a number from 1 through 14, with a different number appearing on each face. If the die is rolled one time, what is the probability of rolling a 2?

- (A) $\frac{1}{14}$
- (B) $\frac{2}{14}$
- (C) $\frac{12}{14}$
- (D) $\frac{13}{14}$

Answer:

**46. Car Selection Probability (10 points)**

The table above shows information about 14 cars listed for sale on an auto dealership's website. If one of

Prices of 14 Different Cars

Type of car	Priced at no more than \$25,000	Priced greater than \$25,000	Total
Nonhybrid	5	3	8
Hybrid	2	4	6
Total	7	7	14

the cars listed for sale is selected at random, what is the probability that the car selected will be a hybrid car priced at no more than \$25,000?

- (A) $\frac{1}{7}$
- (B) $\frac{2}{7}$
- (C) $\frac{1}{3}$
- (D) $\frac{4}{7}$

Answer:



47. Marble Probability (10 points)

Colors of Marbles in a Bag The table shows the number of different colors of marbles in a bag. If a marble

Colors of Marbles in a Bag

Color	Number
Red	8
Blue	10
Green	22
Total	40

is chosen at random from the bag, what is the probability that the marble will be blue?

- (A) $\frac{30}{40}$
- (B) $\frac{22}{40}$
- (C) $\frac{18}{40}$
- (D) $\frac{10}{40}$

Answer:**48. Gas Station Probability (10 points)**

Customer Purchases at a Gas Station On Tuesday, a local gas station had 135 customers. The table above

Customer Purchases at a Gas Station

	Beverage purchased	Beverage not purchased	Total
Gasoline purchased	60	25	85
Gasoline not purchased	35	15	50
Total	90	40	135

summarizes whether or not the customers on Tuesday purchased gasoline, a beverage, both, or neither. Based on the data in the table, what is the probability that a gas station customer selected at random on that day did not purchase gasoline?

- (A) $\frac{15}{50}$
- (B) $\frac{15}{40}$
- (C) $\frac{35}{50}$
- (D) $\frac{50}{135}$

Answer:

49. Survey Population (10 points)

A sample of 40 fourth-grade students was selected at random from a certain school. The 40 students completed a survey about the morning announcements, and 32 thought the announcements were helpful. Which of the following is the largest population to which the results of the survey can be applied?

- (A) The 40 students who were surveyed
- (B) All fourth-grade students at the school
- (C) All students at the school
- (D) All fourth-grade students in the county in which the school is located

Answer:

**50. Satisfaction Survey (10 points)**

Residents of a town were surveyed to determine whether they are satisfied with the concession stand at the local park. A random sample of 200 residents was selected. All 200 responded, and 87% said they are satisfied. Based on this information, which of the following statements must be true?

- (I) Of all the town residents, 87% would say they are satisfied with the concession stand at the local park.
 - (II) If another random sample of 200 residents were surveyed, 87% would say they are satisfied.
-
- (A) Neither
 - (B) I only
 - (C) II only
 - (D) I and II

Answer:



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SCHOLASTIC APTITUDE TEST (SAT)

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Drill Problems: Week 2.6

Author: Jaehoon Song (Lecturer)

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C O L U M B I A A C A D E M Y

enrichment beyond the classroom

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Written by Jaehoon Song (Lecturer)

1. Rectangle Area Function (10 points)

A rectangle has a length that is 15 times its width. The function $y = (15w)(w)$ represents this situation, where y is the area, in square feet, of the rectangle and $y > 0$. Which of the following is the best interpretation of $15w$ in this context?

- (A) The length of the rectangle, in feet
- (B) The area of the rectangle, in square feet
- (C) The difference between the length and the width of the rectangle, in feet
- (D) The width of the rectangle, in feet

Answer:**2. Quadratic Function Roots (10 points)**

The quadratic function h is defined as shown.

$$h(x) = 2(x - 4)^2 - 32$$

In the xy -plane, the graph of $y = h(x)$ intersects the x -axis at the points $(0, 0)$ and $(t, 0)$, where t is a constant.

What is the value of t ?

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

Answer:**3. Exponential Function Y-Intercept (10 points)**

The function f is defined by $f(x) = (-8)(2)^x + 22$. What is the y -intercept of the graph of $y = f(x)$ in the xy -plane?

- (A) $(0, 14)$
- (B) $(0, 2)$
- (C) $(0, 22)$
- (D) $(0, -8)$

Answer:

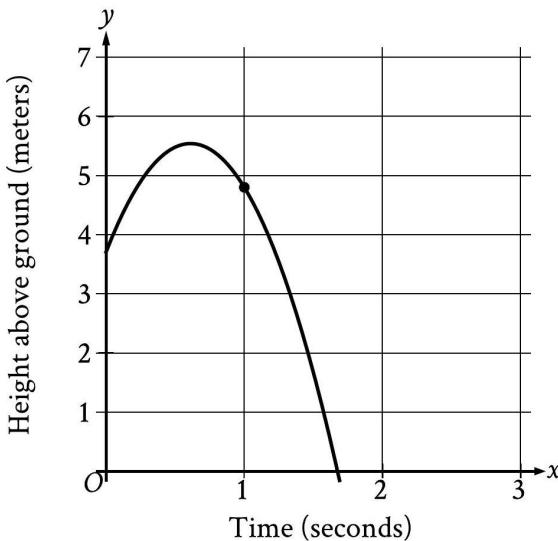
4. Ball Height Interpretation (10 points)

Figure 1: reference attached

The graph shows the height above ground, in meters, of a ball x seconds after the ball was launched upward from a platform. Which statement is the best interpretation of the marked point $(1.0, 4.8)$ in this context?

- (A) 1.0 second after being launched, the ball's height above ground is 4.8 meters.
- (B) 4.8 seconds after being launched, the ball's height above ground is 1.0 meter.
- (C) The ball was launched from an initial height of 1.0 meter with an initial velocity of 4.8 meters per second.
- (D) The ball was launched from an initial height of 4.8 meters with an initial velocity of 1.0 meter per second.

Answer:

5. Exponential Decay Y-Intercept (10 points)

The given function f models the number of advertisements a company sent to its clients each year, where x represents the number of years since 1997, and $0 \leq x \leq 5$.

$$f(x) = 9,000(0.66)^x$$

If $y = f(x)$ is graphed in the xy -plane, which of the following is the best interpretation of the y -intercept of the graph in this context?

- (A) The minimum estimated number of advertisements the company sent to its clients during the 5 years was 1,708.
- (B) The minimum estimated number of advertisements the company sent to its clients during the 5 years was 9,000.
- (C) The estimated number of advertisements the company sent to its clients in 1997 was 1,708.
- (D) The estimated number of advertisements the company sent to its clients in 1997 was 9,000.

Answer:



6. Geometric Sequence Formula (10 points)

The first term of a sequence is 9. Each term after the first is 4 times the preceding term. If w represents the n th term of the sequence, which equation gives w in terms of n ?

- (A) $w = 4(9^n)$
- (B) $w = 4(9^{n-1})$
- (C) $w = 9(4^n)$
- (D) $w = 9(4^{n-1})$

Answer:



7. Graph Y-Intercept (10 points)

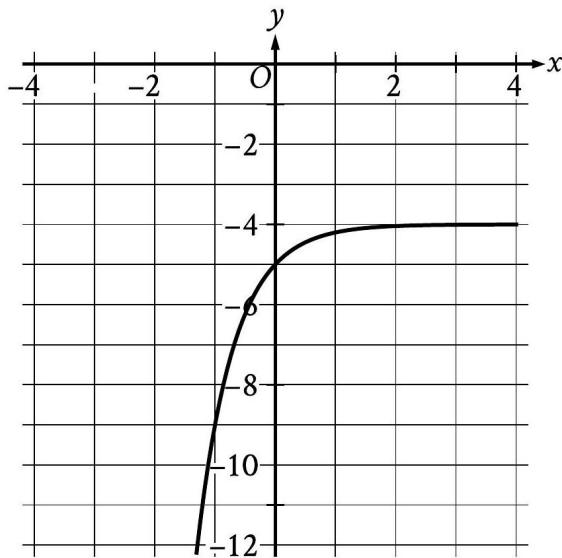


Figure 2: reference attached

What is the y -intercept of the graph shown?

- (A) $(-1, -9)$
- (B) $(0, -5)$
- (C) $(0, -4)$
- (D) $(0, 0)$

Answer:



8. Savings Account Exponential Model (10 points)

Rosa opened a savings account at a bank. The table shows the exponential relationship between the time t , in years, since Rosa opened the account and the total amount n , in dollars, in the account. If Rosa made no

Savings Account Balance

Time (years)	Total amount (dollars)
0	604.00
1	606.42
2	608.84

additional deposits or withdrawals, which of the following equations best represents the relationship between t and n ?

- (A) $n = 604(1.004)^t$
- (B) $n = 604(1.04)^t$
- (C) $n = 604(1.004)^{t+1}$
- (D) $n = 0.004(604)^t$

Answer:



9. Exponential Function Parameters (10 points)

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the xy -plane, the graph of $y = f(x) - 12$ has a y -intercept at $\left(0, -\frac{75}{7}\right)$. The product of a and b is $\frac{320}{7}$. What is the value of a ?

Answer:



10. Ocean Water Level Model (10 points)

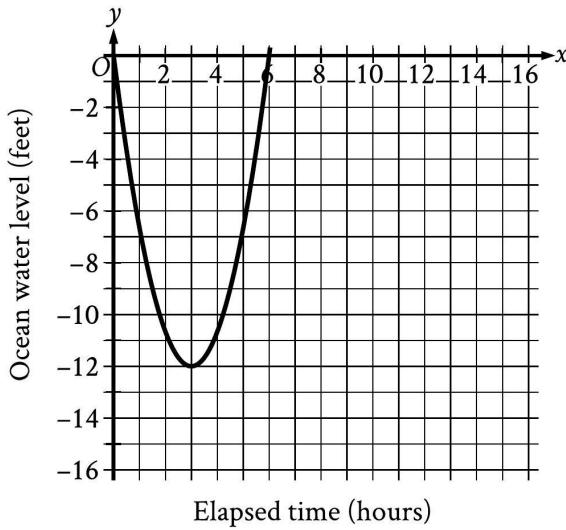


Figure 3: reference attached

Scientists recorded data about the ocean water levels at a certain location over a period of 6 hours. The graph shown models the data, where $y = 0$ represents sea level. Which table gives values of x and their corresponding values of y based on the model?

x	y
0	-12
0	3
6	6

x	y
0	0
3	12
0	-6

x	y
0	0
3	-12
6	0

x	y
0	0
12	6
-6	0

Answer:



11. Square Root Function Evaluation (10 points)

The function f is defined by $f(x) = 4 + \sqrt{x}$. What is the value of $f(144)$?

- (A) 0
- (B) 16
- (C) 40
- (D) 76

Answer:



12. Rectangular Court Dimensions (10 points)

A rectangular volleyball court has an area of 162 square meters. If the length of the court is twice the width, what is the width of the court, in meters?

- (A) 9
- (B) 18
- (C) 27
- (D) 54

Answer:**13. Softball Height Equation (10 points)**

A machine launches a softball from ground level. The softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds and hits the ground at 3.6 seconds. Which equation represents the height above ground h , in meters, of the softball t seconds after it is launched?

- (A) $h = -t^2 + 3.6$
- (B) $h = -t^2 + 51.84$
- (C) $h = -64(t - 2.7)^2 + 51.84$
- (D) $h = -16t^2 + 57.6t$

Answer:**14. Exponential Function Intercepts (10 points)**

The function f is defined by $f(x) = a^x + b$, where a and b are constants. In the xy -plane, the graph of $y = f(x)$ has an x -intercept at $(2, 0)$ and a y -intercept at $(0, -323)$. What is the value of b ?

Answer:**15. Salary Growth Model (10 points)**

The function S above models the annual salary, in dollars, of an employee n years after starting a job, where a is a constant.

$$S(n) = 38,000a^n$$

If the employee's salary increases by 4% each year, what is the value of a ?

- (A) 0.04
- (B) 0.4
- (C) 1.04
- (D) 1.4

Answer:

16. Revenue Function Interpretation (10 points)

The revenue $f(x)$, in dollars, that a company receives from sales of a product is given by the function f above, where x is the unit price, in dollars, of the product.

$$f(x) = -500x^2 + 25000x$$

The graph of $y = f(x)$ in the xy -plane intersects the x -axis at 0 and a . What does a represent?

- (A) The revenue, in dollars, when the unit price of the product is \$0
- (B) The unit price, in dollars, of the product that will result in maximum revenue
- (C) The unit price, in dollars, of the product that will result in a revenue of \$0
- (D) The maximum revenue, in dollars, that the company can make

Answer:

**17. Bacteria Growth Prediction (10 points)**

A culture of bacteria is growing at an exponential rate, as shown in the table above. At this rate, on which

Growth of a Culture of Bacteria

Day	Number of bacteria per milliliter at end of day
1	2.5×10^5
2	5.0×10^5
3	1.0×10^6

day would the number of bacteria per milliliter reach 5.12×10^8 ?

- (A) Day 5
- (B) Day 9
- (C) Day 11
- (D) Day 12

Answer:



18. Data Traffic Model Interpretation (10 points)

The equation above estimates the global data traffic D , in terabytes, for the year that is t years after 2010.

$$D = 5,640(1.9)^t$$

What is the best interpretation of the number 5,640 in this context?

- (A) The estimated amount of increase of data traffic, in terabytes, each year
- (B) The estimated percent increase in the data traffic, in terabytes, each year
- (C) The estimated data traffic, in terabytes, for the year that is t years after 2010
- (D) The estimated data traffic, in terabytes, in 2010

Answer:

**19. Quadratic Function Properties (10 points)**

In the given quadratic function, a and c are constants. The graph of $y = f(x)$ in the xy -plane is a parabola that opens upward and has a vertex at the point (h, k) , where h and k are constants.

$$f(x) = ax^2 + 4x + c$$

If $k < 0$ and $f(-9) = f(3)$, which of the following must be true?

- (I) $c < 0$
- (II) $a \geq 1$
- (A) I only
- (B) II only
- (C) I and II
- (D) Neither I nor II

Answer:

**20. Exponent Rules (10 points)**

Which expression is equivalent to $(m^4q^4z^{-1})(mq^5z^3)$, where m , q , and z are positive?

- (A) $m^4q^{20}z^{-3}$
- (B) $m^5q^9z^2$
- (C) $m^6q^8z^{-1}$
- (D) $m^{20}q^{12}z^{-2}$

Answer:



21. Polynomial Factoring (10 points)

Which of the following is a factor of the polynomial above?

$$4a^2 + 20ab + 25b^2$$

- (A) $a + b$
- (B) $2a + 5b$
- (C) $4a + 5b$
- (D) $4a + 25b$

Answer:

**22. Polynomial Operations** (10 points)

If $p = 3x + 4$ and $v = x + 5$, which of the following is equivalent to $pv - 2p + v$?

- (A) $3x^2 + 12x + 7$
- (B) $3x^2 + 14x + 17$
- (C) $3x^2 + 19x + 20$
- (D) $3x^2 + 26x + 33$

Answer:

**23. Linear Expression Simplification** (10 points)

Which of the following is equivalent to the given expression?

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

- (A) $3x - 2$
- (B) $3x + 2$
- (C) $3x - 8$
- (D) $3x + 8$

Answer:



24. Rational Expression Simplification (10 points)

Which expression is equivalent to $\frac{8x(x-7)-3(x-7)}{2x-14}$, where $x > 7$?

- (A) $\frac{x-7}{5}$
- (B) $\frac{8x-3}{2}$
- (C) $\frac{8x^2-3x-14}{2x-14}$
- (D) $\frac{8x^2-3x-77}{2x-14}$

Answer:

**25. Polynomial Factoring (10 points)**

Which of the following is equivalent to the expression $x^4 - x^2 - 6$?

- (A) $(x^2 + 1)(x^2 - 6)$
- (B) $(x^2 + 2)(x^2 - 3)$
- (C) $(x^2 + 3)(x^2 - 2)$
- (D) $(x^2 + 6)(x^2 - 1)$

Answer:

**26. Polynomial Expansion (10 points)**

Which of the following is equivalent to the expression above?

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

- (A) $4x^2 + 21x + 33$
- (B) $4x^2 + 21x + 29$
- (C) $4x^2 + x + 29$
- (D) $4x^2 + x + 33$

Answer:



27. Polynomial Multiplication (10 points)

The equation above is true for all x , where a and b are constants.

$$(ax + 3)(5x^2 - bx + 4) = 20x^3 - 9x^2 - 2x + 12$$

What is the value of ab ?

- (A) 18
- (B) 20
- (C) 24
- (D) 40

Answer:

**28. Difference of Squares** (10 points)

Which of the following expressions is equivalent to $x^2 - 5$?

- (A) $(x + \sqrt{5})^2$
- (B) $(x - \sqrt{5})^2$
- (C) $(x + \sqrt{5})(x - \sqrt{5})$
- (D) $(x + 5)(x - 1)$

Answer:

**29. Quadratic Factoring** (10 points)

Which of the following expressions is(are) a factor of $3x^2 + 20x - 63$?

- (I) $x - 9$
- (II) $3x - 7$
- (A) I only
- (B) II only
- (C) I and II
- (D) Neither I nor II

Answer:

**30. Rational Exponent Simplification** (10 points)

If $\frac{\sqrt[3]{x^5}}{\sqrt[3]{x^4}} = x^{\frac{a}{b}}$ for all positive values of x , what is the value of $\frac{a}{b}$?

Answer:



31. Polynomial Factoring (10 points)

The expression $90y^5 - 54y^4$ is equivalent to $ry^4(15y - 9)$, where r is a constant. What is the value of r ?

Answer:

**32. Rational Equation (10 points)**

The equation above is true for all $x > 2$, where r and t are positive constants.

$$\frac{2}{x-2} + \frac{3}{x+5} = \frac{x+t}{(x-2)(x+5)}$$

What is the value of rt ?

- (A) -20
- (B) 15
- (C) 20
- (D) 60

Answer:

**33. Polynomial Simplification (10 points)**

Which of the following is an equivalent form of $(1.5x - 2.4)^2 - (5.2x^2 - 6.4)$?

- (A) $-2.2x^2 + 1.6$
- (B) $-2.2x^2 + 11.2$
- (C) $-2.95x^2 - 7.2x + 12.16$
- (D) $-2.95x^2 - 7.2x + 0.64$

Answer:

**34. Root Expression Simplification (10 points)**

For what value of x is the given expression equivalent to $(70n)^{30x}$, where $n > 1$?

$$\sqrt[5]{70n}(\sqrt[6]{70n})^2$$

Answer:



35. System of Equations Solutions (10 points)

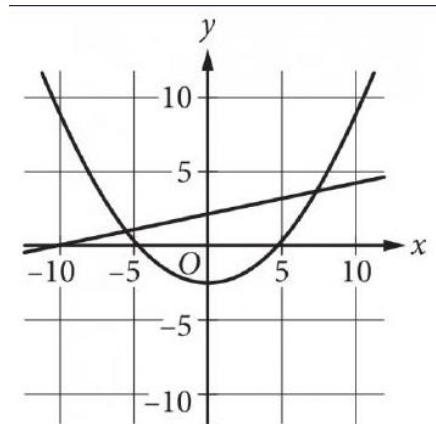


Figure 4: reference attached

A system of equations consists of a quadratic equation and a linear equation. The equations in this system are graphed in the xy -plane above. How many solutions does this system have?

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

Answer:



36. Linear Inequality (10 points)

Which of the following inequalities is equivalent to the inequality above?

$$6x - 9y > 12$$

- (A) $x - y > 2$
- (B) $2x - 3y > 4$
- (C) $3x - 2y > 4$
- (D) $3y - 2x > 2$

Answer:



37. System of Equations Solution (10 points)

If (x, y) is a solution to the system of equations above, which of the following could be the value of x ?

$$\begin{aligned}y &= x + 1 \\y &= x^2 + x\end{aligned}$$

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

Answer:

**38. Quadratic Equation Solutions (10 points)**

What values satisfy the equation above?

$$x^2 - x - 1 = 0$$

- (A) $x = 1$ and $x = 2$
- (B) $x = -\frac{1}{2}$ and $x = \frac{3}{2}$
- (C) $x = \frac{1+\sqrt{5}}{2}$ and $x = \frac{1-\sqrt{5}}{2}$
- (D) $x = \frac{-1+\sqrt{5}}{2}$ and $x = \frac{-1-\sqrt{5}}{2}$

Answer:

**39. Function Intersection (10 points)**

The graphs of the given equations intersect at the point (x, y) in the xy -plane.

$$\begin{aligned}x &= 49 \\y &= \sqrt{x} + 9\end{aligned}$$

What is the value of y ?

- (A) 16
- (B) 40
- (C) 81
- (D) 130

Answer:

**40. Absolute Value Equation (10 points)**

What is the positive solution to the given equation?

$$2|4 - x| + 3|4 - x| = 25$$

Answer:



41. Quadratic Equation Solution (10 points)

One solution to the given equation can be written as $1 + \sqrt{k}$, where k is a constant.

$$x^2 - 2x - 9 = 0$$

What is the value of k ?

- (A) 8
- (B) 10
- (C) 20
- (D) 40

Answer:

**42. Parabola and Line Intersection** (10 points)

In the xy -plane, a line with equation $2y = 4.5$ intersects a parabola at exactly one point. If the parabola has equation $y = -4x^2 + bx$, where b is a positive constant, what is the value of b ?

Answer:

**43. System of Equations Solution** (10 points)

Which ordered pair is a solution to the system of equations above?

$$\begin{aligned} x - y &= 1 \\ x + y &= x^2 - 3 \end{aligned}$$

- (A) $(1 + \sqrt{3}, \sqrt{3})$
- (B) $(\sqrt{3}, -\sqrt{3})$
- (C) $(1 + \sqrt{5}, \sqrt{5})$
- (D) $(\sqrt{5}, -1 + \sqrt{5})$

Answer:



44. Variable Isolation (10 points)

The given equation relates the variables r , s , and t . Which equation correctly expresses s in terms of r and t ?

$$6r = 7s + t$$

- (A) $s = 42r - t$
- (B) $s = 7(6r - t)$
- (C) $s = \frac{6}{7}r - t$
- (D) $s = \frac{6r-t}{7}$

Answer:

**45. Rational Equation Solution (10 points)**

If x is a solution to the given equation, which of the following is a possible value of $x + 5$?

$$\frac{1}{x^2 + 10x + 25} = 4$$

- (A) $\frac{1}{2}$
- (B) $\frac{5}{2}$
- (C) $\frac{9}{2}$
- (D) $\frac{11}{2}$

Answer:

**46. Acceleration Equation (10 points)**

During a 5-second time interval, the average acceleration a , in meters per second squared, of an object with an initial velocity of 12 meters per second is defined by the equation

$$a = \frac{v_f - 12}{5}$$

, where v_f is the final velocity of the object in meters per second. If the equation is rewritten in the form $v_f = xa + y$, where x and y are constants, what is the value of x ?

Answer:



47. Function Intersection (10 points)

The graphs of the given equations in the xy -plane intersect at the point (x, y) .

$$\begin{aligned}y &= 76 \\y &= x^2 - 5\end{aligned}$$

What is a possible value of x ?

- (A) $-\frac{76}{5}$
- (B) -9
- (C) 5
- (D) 76

Answer:

**48. Variable Isolation** (10 points)

The given equation relates the positive numbers m , n , and p . Which equation correctly gives n in terms of m and p ?

$$7m = 5(n + p)$$

- (A) $n = \frac{5p}{7m}$
- (B) $n = \frac{7m}{5} - p$
- (C) $n = 5(7m) + p$
- (D) $n = 7m - 5 - p$

Answer:

**49. Quadratic Equation Solution** (10 points)

Which of the following is a solution to the equation above?

$$2x^2 - 2 = 2x + 3$$

- (A) 2
- (B) $1 - \sqrt{11}$
- (C) $\frac{1}{2} + \sqrt{11}$
- (D) $\frac{1+\sqrt{11}}{2}$

Answer:

**50. Parabola and Line Intersection** (10 points)

In the xy -plane, a line with equation $2y = c$ for some constant c intersects a parabola at exactly one point. If the parabola has equation $y = -2x^2 + 9x$, what is the value of c ?

Answer:



51. System of Equations Solution (10 points)

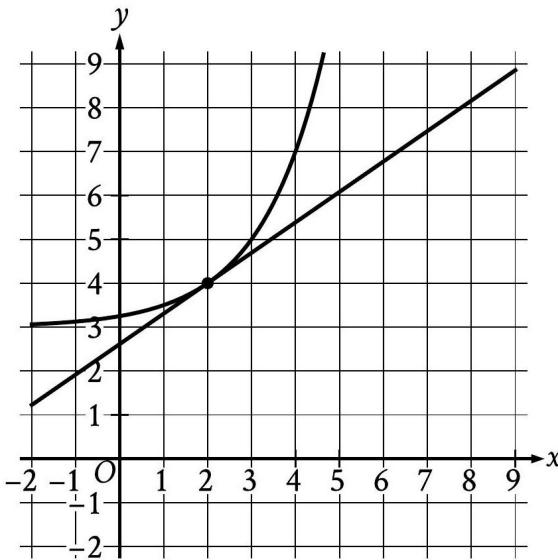


Figure 5: reference attached

The graph of a system of a linear equation and a nonlinear equation is shown. What is the solution (x, y) to this system?

- (A) $(0, 0)$
- (B) $(0, 2)$
- (C) $(2, 4)$
- (D) $(4, 0)$

Answer:



52. Polynomial Roots Product (10 points)

What is the product of the solutions to the given equation?

$$(x - 4)(x + 2)(x - 1) = 0$$

- (A) 8
- (B) 3
- (C) -3
- (D) -8

Answer:



53. Rational Equation Solution (10 points)

What is the solution to the equation above?

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

- (A) 0
- (B) 2
- (C) 3
- (D) 5

Answer:

**54. Radical Equation (10 points)**

What is the smallest solution to the given equation?

$$\sqrt{(x-2)^2} = \sqrt{3x+34}$$

Answer:



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Math

22 QUESTIONS | 35 MINUTES

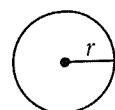
DIRECTIONS

The questions in this section address a number of important math skills. Use of a calculator is permitted for all questions.

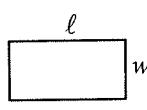
NOTES

Unless otherwise indicated:

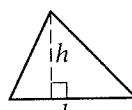
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REFERENCE

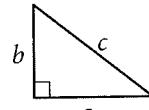
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



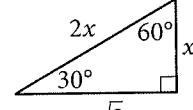
$$A = \ell w$$



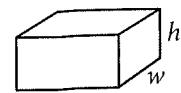
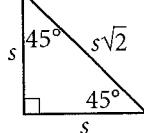
$$A = \frac{1}{2} bh$$



$$c^2 = a^2 + b^2$$



Special Right Triangles



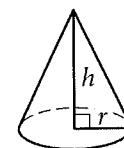
$$V = \ell wh$$



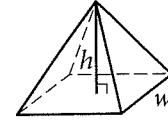
$$V = \pi r^2 h$$



$$V = \frac{4}{3} \pi r^3$$



$$V = \frac{1}{3} \pi r^2 h$$



$$V = \frac{1}{3} \ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

WEEK 2.7

2

Module
1

2

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CONTINUE

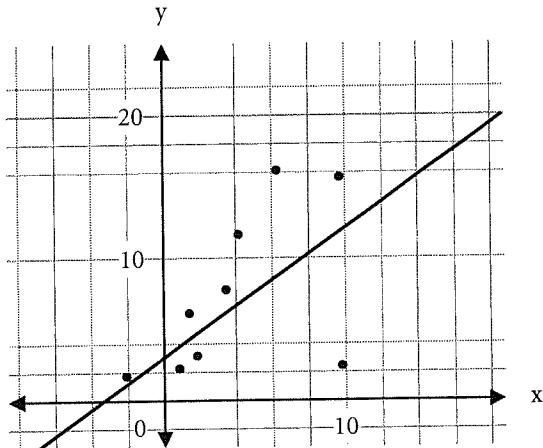
1

Ash has a walking and cycling routine. For every minute she walks, she burns 20 calories. And for every minute she cycles, she burns 35 calories. If she burns 340 calories on a particular day after walking for x minutes and cycling for y minutes, which of the following equations best represents her routine?

- A) $340 - 20x = 35y$
- B) $35y - 20x = 340$
- C) $340 - 20y = 35x$
- D) $35x - 20y = 340$

2

The graph below shows velocity (y -axis) plotted against time (x -axis). For how many data points is the actual value higher than the predicted values on the line of best fit?



- A) 9
- B) 6
- C) 3
- D) 2

3

x	$f(x)$
-2	30
0	12
3	0
5	2

Which of the following is a factor of $f(x)$?

- A) $(x + 2)$
- B) $(x - 3)$
- C) x
- D) $(x - 5)$

4

What is the value of s for the following system of equations?

$$(t - 5) + 2(s - 3) = 8$$

$$2(t - 5) - 3(s - 3) = -19$$

5

How many solutions does the equation below have?

$$3(x - 2) - 2(x - 1) = -x + 2(x + 2) - 8$$

- A) 0
- B) 1
- C) 2
- D) Infinitely many

6

Which of the following is equivalent to $2g^{\frac{4}{5}}g^{\frac{2}{5}}$?

- A) $\sqrt[5]{2g^6}$
- B) $\sqrt[5]{32g^6}$
- C) $2\sqrt[6]{g^5}$
- D) $\sqrt[6]{2g^5}$

7

A researcher found the mean mass of all cheetahs in a park. He found that the mean mass of all cheetahs in the park is between 120 lbs and 182 lbs. What is the value of the margin of error for the mean mass of the cheetahs in the park?

8

What is the value of $f(6)$, if $f(2x) = 9x - 7$?

- A) 20
- B) 47
- C) 101
- D) 11

9

A teacher takes note of the shoe sizes for 21 students in his class and creates the table below. Which of the following statements is true about the data below?

Shoe size	Frequency
1	3
2	4
3	4
4	7
5	2
6	1

- A) The mean is greater than the median
- B) The mean is the same as the median
- C) The median is greater than the mean
- D) There isn't enough information to answer the question.

10

What is the value of a in the given equation $27^x \div 81^{-x} = 3^{ax}$?

11

If the value of the sum of interior angles of the hexagon is $b\pi$, what is the value of b ?

- A) 0.25
- B) 1
- C) 4
- D) 2

12

What is the value when 80 is increased by 200%?

- A) 200
- B) 160
- C) 240
- D) 280

13

If $1 + \frac{a\sqrt{2}}{2}$ is a solution to the equation

$2x^2 - 4x - 7 = 0$, what is the possible value of a ?

14

A real estate company kept a track of the number of houses it sold in October. Its team came up with the model $h(t) = 262 - 8t$, and t represents the number of days. Which of the following best represents 262?

- A) The number of houses at the end of October
- B) The number of houses at the beginning of October
- C) The number of houses sold per day in October
- D) The number of houses sold in the first 8 days of October.

15

$\triangle ABC$ is a right-angled triangle, where B is 90° and angle C is 30° . If $AC = 32$, what is the area of triangle ABC .

- A) $128\sqrt{3}$
- B) $128\sqrt{2}$
- C) $16\sqrt{3}$
- D) $16\sqrt{2}$

16

If $(5xy + 3) - (6xy - 2xy^2 + 2) = axy^2 + bxy + c$, what is the value of $a + b$?

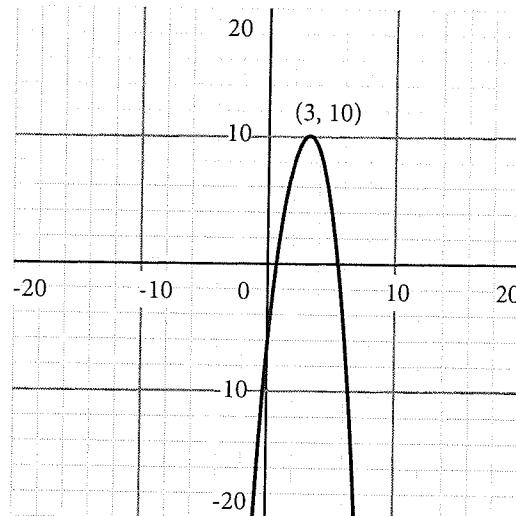
17

What is the product of the roots for the equation $3x^2 + 6x - 24 = 0$?

- A) 3
- B) -8
- C) 2
- D) -2

18

Which of the following best represents the equation of the graph below?



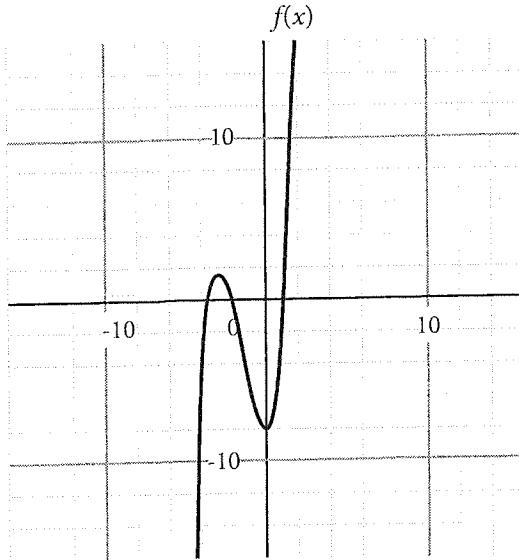
- A) $y = 2(x + 3)^2 + 10$
- B) $y = -2(x - 3)^2 + 10$
- C) $y = 2(x - 3)^2 + 10$
- D) $y = -2(x + 3)^2 + 10$

19

If $-3(-2 + 2x) = ax + b$, what is the value of ab ?

20

What is the possible value of $f(x)$ when $x = 0$?



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

21

If $\frac{3}{4}(x - 5) = 27$, what is the value of $x - 5$?

- A) 41
- B) 36
- C) $\frac{81}{4}$
- D) 31

22

Which of the following coordinates would be true for the following system of inequalities?

$$\begin{aligned}y &> -2x - 1 \\3y &< x + 9\end{aligned}$$

- A) (-2, 1)
- B) (1, 4)
- C) (3, 1)
- D) (-3, 3)



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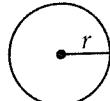
Math**22 QUESTIONS | 35 MINUTES****DIRECTIONS**

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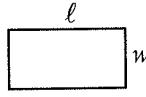
NOTES

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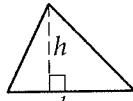
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REFERENCE

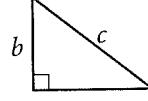
$$\begin{aligned} A &= \pi r^2 \\ C &= 2\pi r \end{aligned}$$



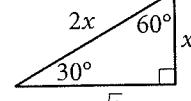
$$A = lw$$



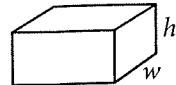
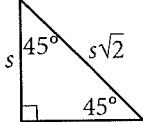
$$A = \frac{1}{2}bh$$



$$c^2 = a^2 + b^2$$



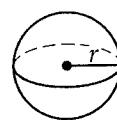
Special Right Triangles



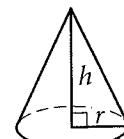
$$V = lwh$$



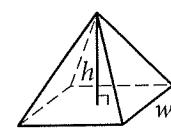
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}lwh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

WEEK 2.7

2

Module
2

2

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CONTINUE

1

If p and q are solutions to the equation below, which of the following best represents $p+q$?

$$|3x - 1| = 2$$

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

2

Which of the following coordinates lie on the circle whose equation is $(x - 3)^2 + y^2 + 8y = 84$?

- A) (1, 7)
- B) (-2, 5)
- C) (-3, 4)
- D) (3, -6)

3

If $\sin C = 0.986$ and $\cos 63 = 0.986$, what is the value of C ?

4

If $\frac{2-2i}{3+4i}$ is equal to $a+bi$. What is the value of a ?

- A) $\frac{-2}{25}$
- B) $\frac{-14}{25}$
- C) $\frac{2}{3}$
- D) $\frac{-1}{2}$

5

Which of the following can be the value of x for the system of equations below?

$$y = 2x^2 - 9x + 7$$

$$y = 2x - 2$$

- A) $\frac{11}{2}$
- B) -1
- C) $\frac{9}{2}$
- D) $\frac{7}{2}$

6

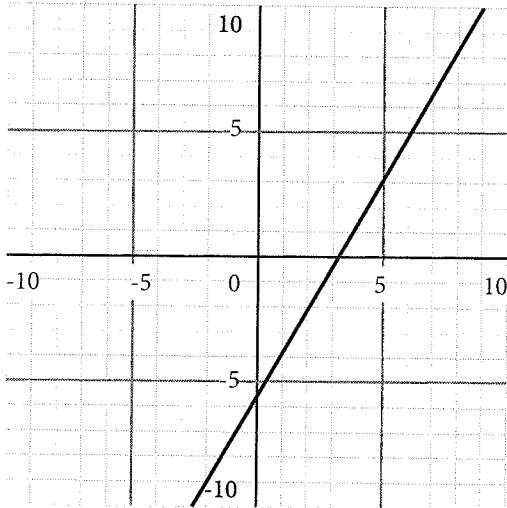
What is the positive solution to the following equation?

$$3|3x - 2| - |6x - 4| = 7$$

CONTINUE

7

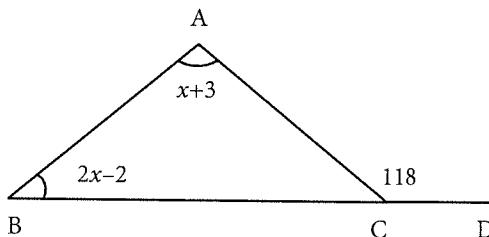
Which of the following represents a *line l* (not shown) which is perpendicular to the *line m* (shown below)?



- A) $3y = 5x - 15$
- B) $5y = 3x + 15$
- C) $5y = -3x + 15$
- D) $3y = 5x + 10$

9

In the triangle ABC (not drawn to scale) shown below, $\angle ABC = 2x - 2$ and $\angle BAC = x + 3$. If $\angle ACD = 118^\circ$, what is the value of x ?



10

It takes 4 carpenters to build a bed in 3 days, how many carpenters will it take to build the bed in 2 days?

- A) 12
- B) 6
- C) 8
- D) 24

8

What is the circumference of the circle whose equation is $x^2 + 6x + y^2 - 4y = 51$?

- A) 64π
- B) 8π
- C) 14.28π
- D) 16π

CONTINUE

11

Which of the following is equivalent to $(5xy + 3x)(x - 2y)$?

- A) $5x^2y - 6xy$
- B) $5x^2y + 3x^2 + 10xy^2 - 6xy$
- C) $5x^2y + 3x^2 - 10xy^2 - 6xy$
- D) $-5x^2y^2 + 3x^2 - 6xy$

12

What is the value of y , if $7x - 4y = 1$ and $5x + 2y = 8$?

13

Which of the following is NOT a solution to the following equation?

$$-2x \leq 8 - x$$

- A) -8
- B) -10
- C) 2
- D) -7

14

If an unfair coin is tossed 20 times, and it lands on heads 14 times. What would be the probability of it landing on heads the 21st time?

- A) 0.5
- B) 0.20
- C) 0.3
- D) 0.7

15

What is the value of $x - y$ if $3y - 2x = 16$ and $5x + y = -6$?

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

16

A student conducted research on how many fish there are in a pond after m months and came up with the model, $f(x) = 1,200(1.03)^m$.

He wanted to have the time on the model in d days instead, as shown below

(assuming 1 month has 30 days)

$$f(x) = 1,200(1.03)^{ad}$$

What is the value of a ?

CONTINUE 

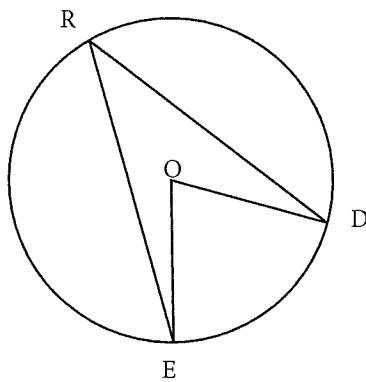
17

If the radius of a circular cylinder is 6, what is the volume of the cylinder if the height is twice its radius?

- A) 432π
- B) 864π
- C) 216π
- D) 108π

18

What is the value of the angle EOD, if the angle DRE is 35° ?



- A) 70°
- B) 35°
- C) 60°
- D) 55°

19

Which of the following is equivalent to

$$\frac{4x^2 - 3}{2x + \sqrt{3}}?$$

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

20

If the system of equations below has infinite solutions, what is the value of b ?

$$\begin{aligned} 9x - 14y &= -3 \\ ax - by &= 6 \end{aligned}$$

21

If $3x + 5y = ax - 4x - by$, what is the value of a ?

- A) 3
- B) 1
- C) -5
- D) 7



2

Module
2

2

22

Which of the following values is a solution to inequality?

$$3x + 2 < -5(x + 6)$$

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

STOP
