

2025 SAT Summer Class

Week 1

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SAT/DSAT/SSAT

Hans edu LLC (Columbia Academy)

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Written by Jaehoon Song (Lecturer)

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Algebra

(13-15 questions, about 35%)

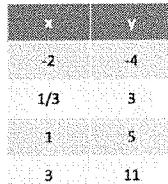
Topics: linear equations (functions) with one or two variables, System of linear equations, and Linear inequalities one or two variables. Meaning of numbers or variables in the context.

- **Linear equations:** Standard form $ax + by = c$
 Slope-intercept form $y = mx + b$,
 Point-slope form $y - y_1 = m(x - x_1)$.

(Practice problems for algebra)

- 1) In the XY-plane, line l is perpendicular to line $2x - 3y = 1$. If the line l passes through a point $(2, 1)$, which of the following is an equation of line l ?

- A) $3x + 2y = 8$
- B) $2x - 3y = -8$
- C) $y = -\frac{2}{3}x + 4$
- D) $y = -\frac{2}{3}x + \frac{7}{3}$



- 2) From the table above, four pairs of XY-coordinate points in a line are shown. If a line $ax + by = -4$, where a and b are constants, represents the relationship in the line, what is the value of a ?
- 3) A construction contractor uses the function h defined by $h(x) = 5,000 + 250x$, where x is the area of floor in square feet to estimate the cost of labor, in dollars, to build a wooden floor in a certain area. If the contractor gives the estimate of labor cost to build a wooden floor of a house in that area is \$15,000, what is the area of the wooden floor, in square feet, of the house?

- **The system of equations:**
(Ways to solve system of equations)
 - 1) Linear combination method (match the coefficients of one variable and eliminate it)
 - 2) Substitution method (isolate one variable and substitute it into the other equation)

Standard form: $\begin{cases} a_1x + b_1y = c_1 \\ a_2x + b_2y = c_2 \end{cases}$

Point-slope form: $\begin{cases} y = m_1x + b_1 \\ y = m_2x + b_2 \end{cases}$

Standard form	Types of solutions	Point-slope form
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	No solution	$m_1 = m_2 \text{ and } b_1 \neq b_2$
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Infinitely many solutions	$m_1 = m_2 \text{ and } b_1 = b_2$
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	One solution	$m_1 \neq m_2$

$$\begin{aligned}4u + 5v &= a \\ -12u - \frac{v}{b} &= 2\end{aligned}$$

- 4) In the given system of equation above, a and b are constants. If the system has infinitely many solutions, what is the absolute value of $a - b$?

5) Adrian plans to work out every morning. He runs at 8 miles per hour and swims at 4 miles per hour. His goal is to practice both exercises at least a total of 15 miles in no more than 2 hours a day. If he spends k hours in running and m hours in swimming, which of the following system of inequalities represent Adrian's goal?

- A) $\begin{cases} k + m \leq 2 \\ \frac{8}{k} + \frac{4}{m} \geq 15 \end{cases}$

B) $\begin{cases} k + m \leq 2 \\ \frac{k}{8} + \frac{m}{4} \geq 15 \end{cases}$

C) $\begin{cases} 8k + 4m \geq 15 \\ k + m \geq 2 \end{cases}$

D) $\begin{cases} 8k + 4m \geq 15 \\ k + m \leq 2 \end{cases}$

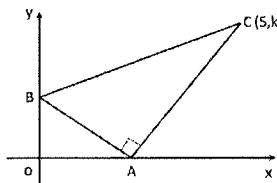
- 6) Janet purchased a blouse and a purse at a local store. The store offered a special discount on certain items. She spent a total of \$215.20 for both items. If the store offered no tax on the blouse and 10% sales tax on the purse she purchased and the sum of the prices before tax was \$198, what was the price, in dollars, of the purse?

- Properties of parallel and perpendicular lines (in the point-slope forms)

Parallel lines	$m_1 = m_2$ and $b_1 \neq b_2$
Perpendicular lines	$m_1 = -\frac{1}{m_2}$ or $m_1 \cdot m_2 = -1$

- Distance, midpoint, and slope formula between two points $A(x_1, y_1)$ and $B(x_2, y_2)$

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \text{Midpoint} \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right) \quad \text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$



- 7) In the XY-plane above, the coordinates of points B and C are $(0, 2)$ and $(5, k)$, respectively. If \overline{AB} is perpendicular to \overline{AC} and the slope of \overline{AB} is $-\frac{3}{5}$, what is the value of k ?

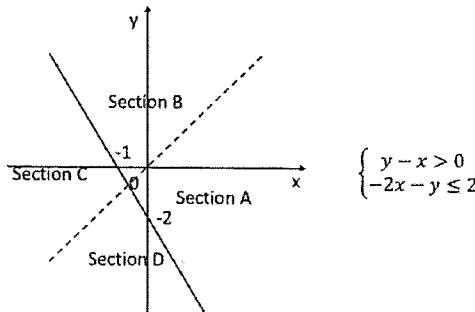
- 8) The distance between two points $A(2, a)$ and $B(-1, b)$ is 5. What is the value of $\frac{1}{2}|b - a|$?

- 9) The end points of a line segment AB are A(2, 12) and B(-4, -9), respectively. If points M is on \overline{AB} such that $AM:MB = 1:2$, what are the coordinates of point M?

- A) (0, 8)
- B) (-1, 4)
- C) (0, 5)
- D) (-1, 2)

- 10) Which of the following equations represent a line parallel to the graph of the equation $\frac{1}{5}x + \frac{1}{3}y = -2$?

- A) $5x + 3y = 1$
- B) $5x - 3y = -4$
- C) $3x - 5y = 9$
- D) $3x + 5y - 2 = 0$



- 11) A system of inequalities and a graph are shown in the XY-plane above, which section of the graph could represent all of the solutions to the system?

- A) Section A
- B) Section B
- C) Section C
- D) Section D

- 12) Elliott scored 85, 89, 95, and 80 on his exams before his last exam. If all exams weigh equally, which of the following inequalities could get him all the possible scores of the fifth exam, m that he would result in a mean score on all five exams at least 90?

- A) $85 + 89 + 95 + 80 + m \leq 450$
- B) $85 + 89 + 95 + 80 + m \geq 360$
- C) $\frac{85+89+95+80+m}{5} \leq 90$
- D) $85 + 89 + 95 + 80 \geq 450 - m$

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WEEK 1.2

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Module 1

35:00

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Section 2, Module 1: Math

Annotate

Section 2, Module 1: Math

Annotate

1

Mark for Review

If $6y = 12$, what is the value of y ?

(A) 12

(A)

(B) 6

(B)

(C) 3

(C)

(D) 2

(D)

3

Mark for Review

What is 16% of 25?

(A) 4

(A)

(B) 14

(B)

(C) 16

(C)

(D) 400

(D)

III

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Section 2, Module 1: Math

Annotate

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Mark for Review

Each side of a fair 2-sided coin is denoted heads and tails. If Jake flips the coin twice, what is the probability of having only heads as the result?

(A) $\frac{1}{2}$

(A)

(B) $\frac{1}{3}$

(B)

(C) $\frac{1}{4}$

(C)

(D) $\frac{1}{8}$

(D)

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Mark for Review

The area of Abraham's square-shaped cornfield equals 196 acres. The length of each side of Jennifer's square-shaped cornfield equals half of the corresponding side length of Abraham's cornfield. Which choice represents the area of Jennifer's cornfield, in acres?

- (A) $196 \times \frac{1}{2}$
- (B) 196×50
- (C) $196 \times (\frac{1}{2})^2$
- (D) $196^2 \times (\frac{1}{2})^2$

TESTQUBE

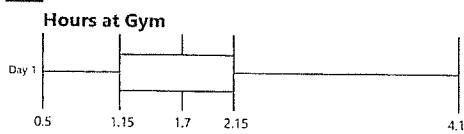
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Section 2, Module 1: Math



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Mark for Review



The box plot represents the distribution of time spent at the gym on a certain day, in hours, of 20 Monster Gym members. Which of the following interpretations of the box plot is true?

- (A) At least 5 gym members spent more than 4.1 hours at the gym.
- (B) The mean hours spent at the gym is 2.15.
- (C) The median hours spent at the gym is 2.15.
- (D) At least 15 gym members spent more than 1.15 hours at the gym.

TESTQUBE

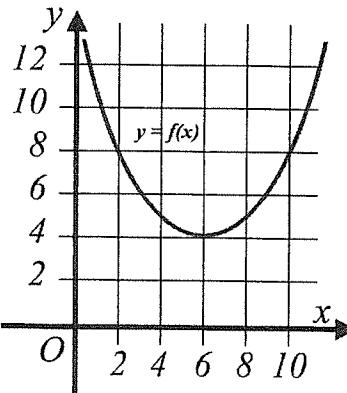
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Section 2, Module 1: Math



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Mark for Review



The figure above shows the graph of the quadratic function $y = f(x)$ on the xy -plane. How many different real root(s) does the quadratic equation $f(x) = 0$ have?

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

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TESTQUBE

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Module
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Section 2, Module 1: Math

Annotate

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Mark for Review

A city government plans to spend at most 24,000 dollars for a city environment campaign, which consists of tree planting and garbage recycling. Tree planting costs 55 dollars per tree (t), and garbage recycling costs 90 dollars per gallon of garbage (g). Which inequality represents this situation?

(A) $55t \leq 24,000$

A

(B) $55t + 90g \leq 24,000$

B

(C) $90t + 55g \leq 24,000$

C

(D) $55t + 90t \leq 24,000$

D

IV

TEST QUBE

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Section 2, Module 1: Math

Annotate

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9

Mark for Review

$x + 2y = 11$

$4xy = 20$

(x, y) is the solution for the system of equations above. Find one value of y that satisfies the system of equations.

V

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Section 2, Module 1: Math

Annotate

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10

Mark for Review

Each side of a fair 6-sided dice has a different integer from 1 to 6. When the dice is rolled once, what is the probability of rolling a prime number?

(A) $\frac{1}{6}$

A

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

B

(C) $\frac{1}{3}$

C

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

D

TEST QUBE

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Section 2, Module 1: Math

Annotate

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11

Mark for Review

Mountain A erodes every year, causing a decrease in height by 0.1% compared to the previous year. If the current height of mountain A is M feet, which choice best models the height of mountain A , in feet, after x years?

(A) $M(0.1)^x$

A

(B) $M(1 - 0.9)^x$

B

(C) $M(1 - 0.001)^x$

C

(D) $M(0.001)^x$

D

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Section 2, Module 1: Math



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Mark for Review

Student	Credits
A	11
B	14
C	13
D	18
E	12
F	10
G	13

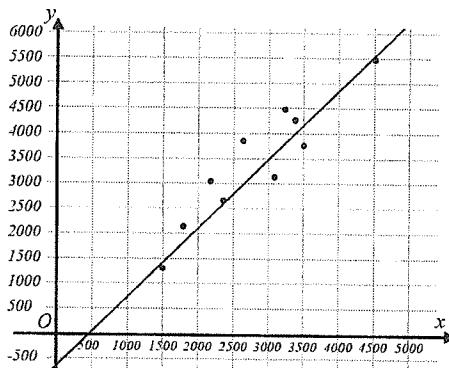
Seven students A, B, C, D, E, F, and G take credit courses at Wharton High School. The total credits each student takes this semester are shown in the table above. What is the median value of the seven students' credits at Wharton High School?

Section 2, Module 1: Math



13

Mark for Review



The scatterplot above shows the statistics of major cities in data set P , where the x -values represent the land area (in square kilometers) and the y -values represent the population (in thousands). Which choice most appropriately models the line of best fit for data set P ?

(A) $y = -1.41x + 560$

(A)

(B) $y = -1.41x - 560$

(B)

(C) $y = 1.41x + 560$

(C)

(D) $y = 1.41x - 560$

(D)

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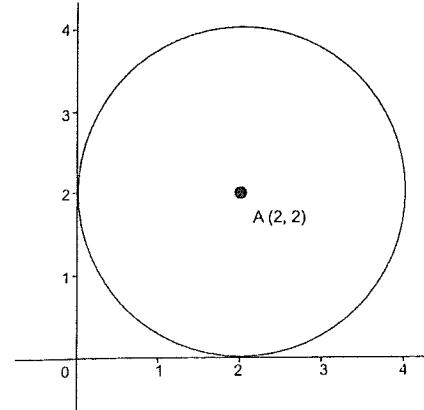
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Annotate

14

Mark for Review



II

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IV

V

What is the area of a circle whose center is $A(2, 2)$ and is tangent to both x -axis and y -axis?

(A) π

(A)

(B) 2π

(B)

(C) 4π

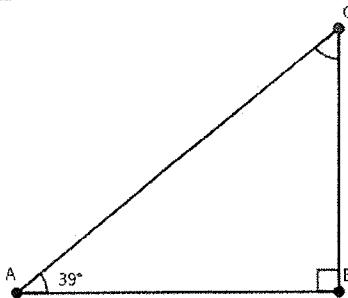
(C)

(D) 8π

(D)

15

Mark for Review



Among the internal angles in right triangle ABC , angle B has the largest value. If angle A equals 39° , what is the value, in degrees, of angle C ?

TEST QUBE

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Annotate

Section 2, Module 1: Math

16

Mark for Review

Which expression is equivalent to $x(xy)^3 \times \frac{x}{y}$ where x and y are different positive real numbers?

(A) x^5y^2

(A)

(B) x^4y^3

(B)

(C) x^3y^{-2}

(C)

(D) $(xy)^3$

(D)

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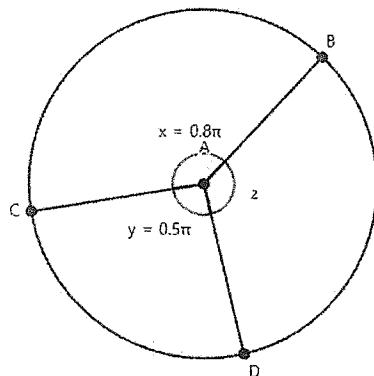
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Mark for Review



Points B , C , and D are on a circle with center A . Angle BAC (angle x) equals 0.8π and angle CAD (angle y) equals 0.5π , each in radians. What is the measure of the smaller angle BAD , in radians? (The picture is not drawn to scale.)

 A 2π B 1.5π C 0.7π D 0.5π

IV

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Section 2, Module 1: Math



18

Mark for Review

What is the correct set of solutions for equation $x^2 - 12x + 27 = 0$?

- A $x = 3$
or
 $x = 9$

- B $x = -3$
or
 $x = 9$

- C $x = 3$
or
 $x = -9$

- D $x = -3$
or
 $x = -9$

II

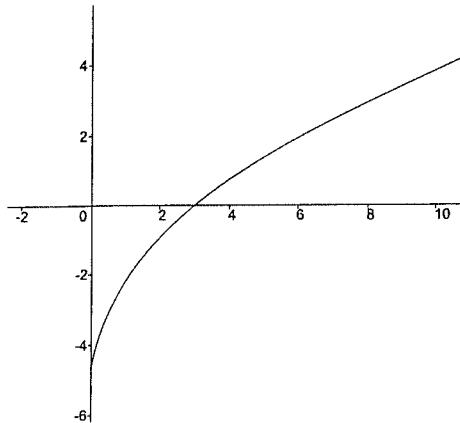
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Section 2, Module 1: Math

**19**

Mark for Review



- IV** A part of the graph of $f(x) = 2\sqrt{2x} - 5$ on the xy -plane is shown above. Each point of the graph of $f(x)$ is translated by 6 to the positive x -direction, forming a new graph identical to the graph of $g(x)$.

Which equation defines $g(x)$?

(A) $g(x) = 2\sqrt{12x} - 5$

(B) $g(x) = 2\sqrt{x - 6} - 5$

(C) $g(x) = 2\sqrt{2(x - 6)} - 5$

(D) $g(x) = 2\sqrt{2x} - 11$

V**VI****VII**

Section 2, Module 1: Math

**20**

Mark for Review

$$f(x) = \frac{1}{x-11}$$

What is the value of x , if $f(x) = \frac{1}{35}$?

TEST QUBE

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Section 2, Module 1: Math

Mark for Review

21

In a city, 60% of the population owns a car, and

40% of those car owners also own a motorcycle.

If the city has a population of 50,000, how many

people own both a car and a motorcycle?

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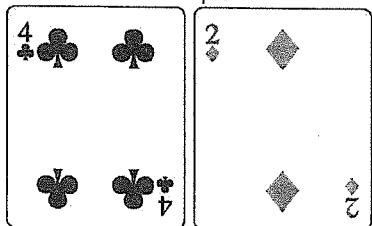
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Mark for Review

Table

Suit	Numerals	Faces
Spades	1, 2, 3, 4, 5, 6, 7, 8, 9, and 10	Jack, Queen, and King
Hearts	1, 2, 3, 4, 5, 6, 7, 8, 9, and 10	Jack, Queen, and King
Clubs	1, 2, 3, 4, 5, 6, 7, 8, 9, and 10	Jack, Queen, and King
Diamonds	1, 2, 3, 4, 5, 6, 7, 8, 9, and 10	Jack, Queen, and King

Example



A standard card deck contains 52 unique cards. On each card, either a numeral or a face is denoted as shown in the table. (Aces are considered as 1.) Julia randomly picked two different numeral cards from a deck and placed one on the left and one on the right. What is the chance of the numeral denoted on the card Julia placed on the left is exactly two times bigger than the one on the right?

- (A) $\frac{80}{40 \times 39}$
- (B) $\frac{16}{40 \times 39}$
- (C) $\frac{80}{52 \times 52}$
- (D) $\frac{16}{52 \times 52}$



2

Module
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2

35:00

Section 2, Module 2: Math



Section 2, Module 2: Math



1

Mark for Review

II 140 grams of white rice contains 42 grams of carbohydrates. What is the percentage of carbohydrates in white rice?

(A) 10%

A

(B) 20%

B

(C) 30%

C

(D) 42%

D

3

Mark for Review

$$2(x + y) = 14$$

$$x - by = -13$$

III $x = 2$ is a part of the solution for the system of equations above, where b is a constant real number. What is the value of b ?

(A) 1

A

(B) 2

B

(C) 3

C

(D) 4

D

IV

TEST QUBE

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TEST QUBE

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Section 2, Module 2: Math



2

Mark for Review

V Kepler school library charges a 1.50 dollars daily fee for books returned after 14 days of borrowing. Steven borrowed a book at Kepler school library and returned it late, and paid 4.50 dollars as a late return fee. How long is the period, in days, between Steven borrowing and returning the book?

(A) 1

A

(B) 4

B

(C) 14

C

(D) 17

D

Section 2, Module 2: Math



4

Mark for Review

$$f(x) = 380,000 - 75x$$

f(x) models the distance, in million miles, between the Earth and an outer Galaxy A. x years past 1970 for $x < 50$. Which choice best describes this context?

(A) Galaxy A was traveling away from the Earth in 1970.

A

(B) Galaxy A approaches earth 75 million miles every year.

B

(C) Galaxy A was 75 million miles away from the Earth in 1970.

C

(D) Galaxy A would be 384,500 miles away from the Earth in the year 2030.

D

VI

TEST QUBE

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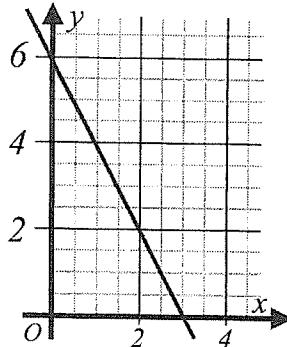


Section 2, Module 2: Math

Mark for Review

5

Mark for Review



What is the y -intercept of the graph shown?

(A) 6

(A)

(B) 4

(B)

(C) 3

(C)

(D) 0

(D)

Section 2, Module 2: Math

Mark for Review

6

Mark for Review

Vigo's school band consists of guitar players and flute players, where a band member plays exactly one kind of instrument between the two. If there are twice as many guitar players as there are flute players, and there are 18 members in Vigo's band, how many guitar players are present in Vigo's band?

(A) 12

(A)

(B) 8

(B)

(C) 6

(C)

(D) 4

(D)

TESTQUBE

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IV

Section 2, Module 2: Math

Mark for Review

7

Mark for Review

V

Factory F has a 2% chance of producing defective products. Out of 5,000 items produced from factory F , which of the following values is closest to the expected quantity of defective products?

(A) 2

(A)

(B) 10

(B)

(C) 100

(C)

(D) 1,000

(D)

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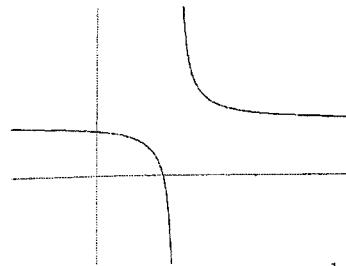
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Mark for Review

**III**

An overview of the graph of $y = \frac{1}{x-3} + 2$ is shown.
What is the x -intercept of the graph?

IV**V****VI****VII**

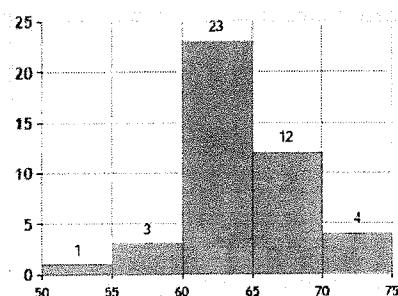
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Mark for Review



The histogram shows the distribution of the ages of all 43 students in a certain senior literature course. Which of the following is true?

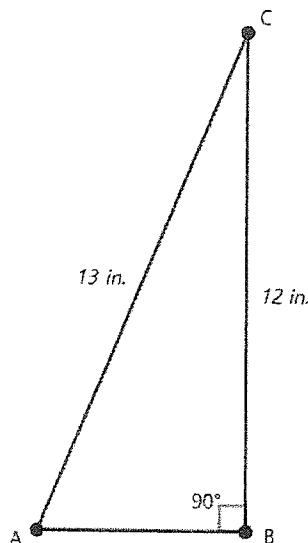
- (A) The median age of the students is greater than or equal to 60, and less than 65.
- (B) A student at the age of 57 is above the 90th percentile of age.
- (C) 60 students are 23 years old.
- (D) 12 students are older than or at the age of 70.

Section 2, Module 2: Math



10

Mark for Review



In a right triangle ABC where angle $B = 90^\circ$, the hypotenuse AC is 13 inches long, and the opposite B is 12 inches long. What is $\cos(A)$?

(A) $\frac{1}{13}$

(A)

(B) $\frac{5}{13}$

(B)

(C) $\frac{13}{5}$

(C)

(D) $\frac{13}{12}$

(D)

Section 2, Module 2: Math



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Mark for Review

Approve Relocation	44
Against Relocation	56

This winter, City A is planning a vote for or against the relocation of the city hall. Kristin visited 100 restaurants near the city hall to interview restaurant owners and collected the data above. Based on the data, she concluded that among 200,000 voters in City A , approximately 88,000 will vote for the relocation. Which of the following is the best strategy Kristin can apply to improve the accuracy of her research?

- (A) Interviewing 10 restaurant owners instead of 100.

(A)

- (B) Revising the conclusion such that 112,000 voters will vote for the relocation.

(B)

- (C) Calling random voters in City A on the phone to conduct the interview rather than visiting the restaurants.

(C)

- (D) Interviewing additional 100 restaurant owners in another city to enlarge the sample size.

(D)

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Module 2

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Section 2, Module 2: Math



12

Mark for Review

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

What is the x -value when $f(x) = 3$?

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IV

TEST QUBE

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Section 2, Module 2: Math



13

Mark for Review

$$f(x) = 2,260(1.05)^{\frac{x}{6}}$$

$f(x)$ models the population of certain fungi per square centimeter of an experimental medium x hours after the initial observation. Which of the following functions best models the population of the fungi per square centimeter of the medium y days after the initial observation?

V

(A) $24 \times 2,260(1.05)^{\frac{y}{6}}$

(B) $2,260(1.05)^{4y}$

(C) $2,260(1.05)^{\frac{y}{6}}$

(D) $2,260(1.05 \times 24)^{\frac{y}{6}}$

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Section 2, Module 2: Math



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Mark for Review

$$x^2 + 16x + k = 0$$

The given equation has two distinct real solutions for x , where k is a constant. Which of the following values can k be to satisfy the condition above?

(A) 0

(A)

(B) 64

(B)

(C) 128

(C)

(D) 1,024

(D)

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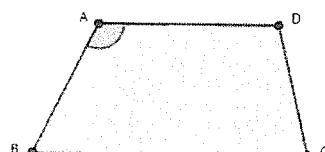
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16

Mark for Review



Trapezoids $ABCD$ and $BPQC$ are similar, where sides CD and DA of $ABCD$ correspond to QC and CB of $BPQC$, respectively. If angle P measures 63° , what is the value, in degrees, of angle A ?

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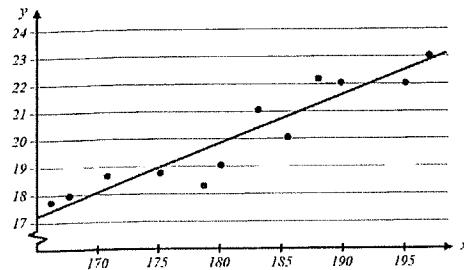
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⋮

18

Mark for Review



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A group of geologists analyzed fossils from the Jurassic Era excavated in a certain region to measure the average atmospheric temperature at the time when the fossil was formed. The x values of the scatterplot represent the ages of the fossil records (in million years ago), and the y values represent the calculated average atmospheric temperature of the region based on each record (in degrees Celsius). The slope of the line of best fit is 0.19. Which of the following interpretations for the number 0.19 is most appropriate in this context?

(A) The average atmospheric temperature increased approximately 0.19 degrees Celsius per million years during the Jurassic Era.

Ⓐ

(B) The average atmospheric temperature in the Jurassic Era was 0.19 degrees Celsius.

Ⓑ

(C) The average atmospheric temperature in the Jurassic Era was 0.19 degrees Celsius higher than now.

Ⓒ

(D) The average atmospheric temperature increased 0.19 degrees Celsius every year during the Jurassic Era.

Ⓓ

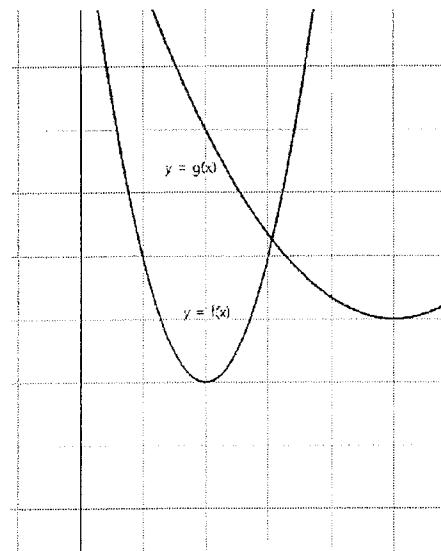
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⋮

19

Mark for Review



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

$$g(x) = \frac{1}{3}(x - 5)^2 + 3.$$

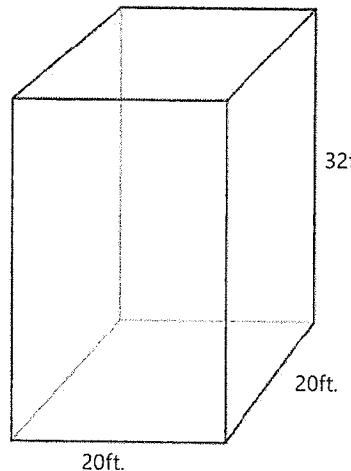
The distance between the vertex of $y = f(x)$ and the vertex of $y = g(x)$ plotted on xy -plane is \sqrt{d} . What is the value of d ?

Section 2, Module 2: Math



20

Mark for Review



The base of a 32-foot-deep cuboid diving pool is a square with 20 feet of each side. The pool is full of water with which the density equals 62.4 pounds per cubic foot. Which of the following is closest to the total mass of the water in pounds?

- (A) 800,000 pounds Ⓐ
- (B) 40,000 pounds Ⓑ
- (C) 13,000 pounds Ⓒ
- (D) 200 pounds Ⓓ

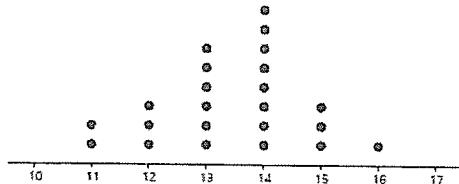
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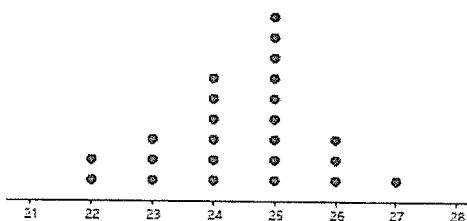
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Mark for Review

Dot Plot A: Data Set X



Dot Plot B: Data Set Y



Dot plots *A* and *B* represent the distribution of 25 integer values each from data sets *X* and *Y*, respectively. Each value in data set *Y* is greater than the corresponding value in data set *X* by 11. Which of the following descriptions about the relationship between data sets *X* and *Y* is true?

- (A) The mean value of data set *X* equals 15, and the mean value of *Y* equals 26. Ⓐ
- (B) The median of data set *Y* equals the median of data set *X*. Ⓑ
- (C) The data set *Y* contains 11 more values than data set *X*. Ⓒ
- (D) The range of data set *Y* equals the range of data set *X*. Ⓓ



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22

Mark for Review

$f(x) = 39.1(0.98)^{\frac{x}{12}}$ models the air pressure of a car tire, in psi , after x hours of filling the tire with air. What does the number 0.98 mean in this context?

(A) An average rate of decrease in the tire pressure per 12 hours in percent.

(B) The ratio of the tire pressure at a certain time to the tire pressure 12 hours after the certain time.

(C) An average decrease in the tire pressure per 12 hours in psi/hour .

(D) The ratio of the tire pressure 12 hours after a certain time to the tire pressure at the certain time.

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Advanced Math

(13-15 questions, about 35%)

Topics: Equivalent equations, non-linear equations in one variable and systems of equations in two variables, non-linear functions. Solving rational equations and graphs of rational and polynomial functions.

- **Equivalent equations:** The expressions on both sides of the given equation are always identical for all values of the given variables. It means that the equation is true for all values of the variable.

(Practice problems for Advanced math)

1) $x^3 + 2x^2 - 4x + 1 = (x + b)(x^2 + cx - 1)$

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

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

2) Which of the following is equivalent to $3b^2 + 18a^4 - 5b^2$?

- A) $2(3a - b)(3a + b)$
- B) $2(3a - b^2)(3a + b^2)$
- C) $3(2a^2 - b)(2a^2 + b)$
- D) $2(3a^2 - b)(3a^2 + b)$

- **Quadratic Equation:**

i. Standard form $y = ax^2 + bx + c$.

Vertex (h, k) : $h = -\frac{b}{2a}$. And substitute h into the equation to find the value of k.

Axis of symmetry: $x = h$. (In SAT math, very useful information to find the unknown Y values or unknown x-intercept.)

Shape: $a > 0$: opens upwards. $a < 0$: opens downwards.

This form shows the y-intercept: the value of c.

ii. Vertex form $y = a(x - h)^2 + k$.

Vertex (h, k). when $a > 0$, the graph has a minimum value of k at $x = h$.

When $a < 0$, the graph has a maximum value of k at $x = h$.

This form shows the maximum/minimum values of the function.

iii. Zeros form $y = a(x - x_1)(x - x_2)$.

Vertex (h, k): $h = \frac{x_1+x_2}{2}$ (the mid-point of x_1 and x_2) And substitute h into the equation to find the value of k.

This form shows two x-intercepts (zeros) in the equation.

- How to find solutions of quadratic equations (x-intercepts or zeros)

- Factor if possible.

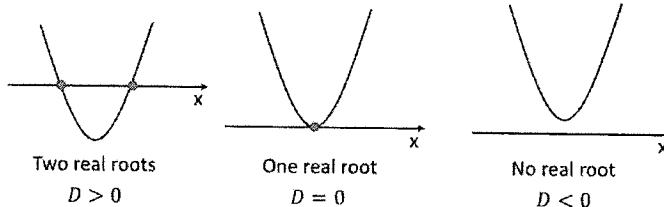
$a(x - x_1)(x - x_2) = 0$. Then, $x = x_1$ or $x = x_2$.

- Use the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Note: $D(\text{Discriminant}) = b^2 - 4ac$.

The value of D will tell you how many real solutions the equation will have.



- Complete the square.

$x^2 + bx + c = 0$. Add $\left(\frac{b}{2}\right)^2$ on both sides of the equation. And factor it.

- Sum or Product of two roots of a quadratic equation in standard form (known as Fundamental theorem of algebra)

$y = ax^2 + bx + c$
Sum = $-\frac{b}{a}$
Product = $\frac{c}{a}$

(Quadratic Equations/Functions Practice Problems)

3) What is the value of m if $20x^2 + mx - 21 = (5x + a)(bx + 7)$, where a, b, and m are constant?

- A) -13
- B) 13
- C) 23
- D) -23

4) $f(x) = kx^2 + 2$, where k is a constant. what is the same value of $f(3)$?

- A) $f(1)$
- B) $f(4)$
- C) $f(-4)$
- D) $f(-3)$



- 5) A ball is launched straight upward from a cliff (10m above the ground). The motion of a ball could be described as $h(t) = -4.9t^2 + 24t + 10$, where t is the time, in second, the ball is in the air and h is the height, in meters, of the ball after it was launched. How long will it take for a ball to reach its peak?
- A) 2.45 sec
B) 24 sec
C) 10 sec
D) 4.9 sec
- 6) In the system of equations $\begin{cases} y = ax^2 + b \\ y = 1 \end{cases}$, for which of the following values of a and b does the system have two solutions?
- A) $a = 2, b = 1$
B) $a = -1, b = 5$
C) $a = 2, b = 5$
D) $a = -2, b = 0$
- 7) In the system of equations $\begin{cases} f(x) = -x^2 + 2x + 6 \\ h(x) = k \end{cases}$, where k is a constant. $f(x) \leq h(x)$ for all real values of x . What is the minimum value of k ?
- 8) In the system of equations $\begin{cases} y = -(x + 2)^2 \\ y = m \end{cases}$, where m is a constant. If the system has two points of intersections in the XY-plane and the distance between two points is 12, what is the value of m ?
- A) -36
B) 36
C) -64
D) 64



- 9) In a quadratic equation $2x^2 + 6x - 8 = 0$, Let a and b are two different roots. What is the value of $(a - 1)(b - 1)$?

- 10) The graph of $y = x^2 - 4x + k$ intersects the line $y = -2$ at one point. What is the value of k ?

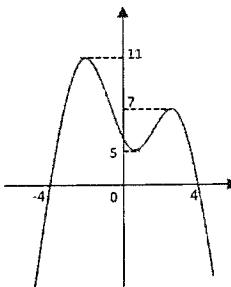
- 11) In a quadratic equation $h(t) = -16t^2 + 128t$. The function $h(t)$ represents the height, in feet, of an object t seconds after it is thrown upwards from the ground with an initial speed 128 feet per second. How long will the object stay above 192 ft from the ground?

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

- 12) In the equation $\frac{x^2}{4} - 3x + k^2 = 0$, where k is a constant. If the equation has exactly one solution, what could be the value of k ?

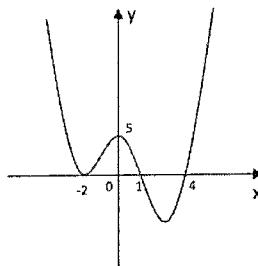
- A) 3
- B) 2
- C) 1
- D) 0

- Graphs of Polynomial and rational functions



- 13) The graph of a polynomial function $y = f(x)$ is shown above. If a horizontal line $g(x) = k$ (not shown), where k is a constant, meets four times with $y = f(x)$, which of the following could be the value of k ?

- A) 7
B) 8
C) 6
D) 4



- 14) Which of the following could be the equation of the graph shown above?

- A) $y = \frac{5}{16}(x - 2)^2(x + 1)(x + 4)$
B) $y = -\frac{5}{16}(x + 2)^2(x - 1)(x - 4)$
C) $y = \frac{5}{16}(x + 2)^2(x - 1)(x - 4)$
D) $y = 5(x + 2)^2(x - 1)(x - 4)$

$$\frac{k^2}{\sqrt{k^2 - x^2}} = \frac{x^2}{\sqrt{k^2 - x^2}} + 29$$

- 15) In the equation shown above, k is a constant. Which of the following is one of the solutions to the equation?

- A) $-k$
B) $k^2 - 29^2$
C) $-\sqrt{k^2 - 29^2}$
D) $\sqrt{29^2 - k^2}$

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Mark for Review

$f(x)$ is defined by $f(x) = 2x - 12$. What is the value of x when $f(x) = 2$?

- (A) -12
(B) -8
(C) 2
(D) 7

Section 2, Module 1: Math

Annotate

3

Mark for Review

Which of the following is a common factor of $x(x + 2)$ and $x^2 + 4x + 4$?

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

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Annotate

2

Mark for Review

Stephanie is planning to hold a party. She intends to spend no more than 140 dollars on decorating the party room and preparing the food. The room decoration costs 38 dollars regardless of the number of guests, and food preparation costs 9 dollars per guest. Which of the following expressions is most appropriate to find the maximum number of guests, g ?

- (A) $38 - 9g \leq 140$
(B) $38 + 9g \geq 140$
(C) $9 + 39g \leq 140$
(D) $38 + 9g \leq 140$

TESTQUBE

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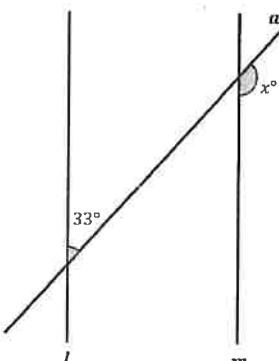
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Annotate

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Mark for Review



Note: Figure Not Drawn to Scale

Line a intersects with parallel lines l and m in the diagram shown above. What is the value of x ?

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TESTQUBE

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Section 2, Module 1: Math



5

Mark for Review

What is the sum of two distinct real solutions for $x^2 - 6x - 16$?

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6

Mark for Review

Each side of a right hexagon H whose area is $24\sqrt{3}$ is 4 units long. What is the area of a right hexagon J that has a side length of 2?

(A) $3\sqrt{3}$

(A)

(B) $6\sqrt{3}$

(B)

(C) $12\sqrt{3}$

(C)

(D) $48\sqrt{3}$

(D)

V

VII

TESTCUBE

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7

Mark for Review

Light travels at a constant speed of 300,000 kilometers per second in a vacuum. However, the speed of light is halved in water. How long, in kilometers, would light travel in 10 seconds underwater?

(A) 3,000,000 km

(A)

(B) 1,500,000 km

(B)

(C) 750,000 km

(C)

(D) 300,000 km

(D)

TESTCUBE

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Section 2, Module 1: Math



8

Mark for Review

$$y = -4x + 4$$

$$x - 1 = 16$$

(x, y) is a solution for the given system of equations. What is the value of y ?

(A) -1

(A)

(B) -4

(B)

(C) -16

(C)

(D) -64

(D)

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9

Mark for Review

11, 9, 17, 15, 3

Data set S consists of five values as shown above. What is the mean value of data set S ?

Section 2, Module 1: Math



11

Mark for Review

Which of the following expressions is equivalent to $2ab$?

(A) $\frac{a^2b^2}{2ab}$

A

(B) $\frac{2a^{-1}b}{b}$

B

(C) $\frac{2a}{b}$

C

(D) $\frac{2a^2}{ab^{-1}}$

D

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10

Mark for Review

The graphs of $y = \sqrt{x} - 2$ and $x = 4$ intersect at exactly one point $P(x, y)$. What is the value of y ?

(A) -3

A

(B) 0

B

(C) 3

C

(D) 6

D

Section 2, Module 1: Math



12

Mark for Review

Nutrient	Calories per gram
Carbohydrate	4 kcal/g
Fat	9 kcal/g
Protein	4 kcal/g

The table above shows the calories for each nutrient: carbohydrate, fat, and protein. For example, 1 gram of protein contains 4 kcal. A serving of certain food consists of 30 grams of fat and carbohydrates together and contains no protein. If the food contains 210 kcal per serving, how many calories, in kcal, in a serving of the food are from fat?

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13

Mark for Review

1 foot equals 12 inches. How much is 1 cubic foot (ft^3) in cubic inches?

(A) 12

(A)

(B) 144

(B)

(C) 1,728

(C)

(D) 20,736

(D)

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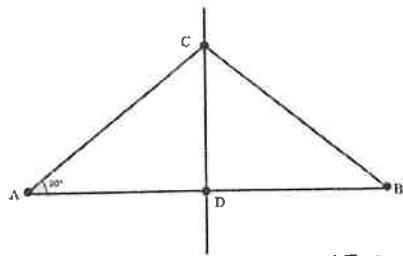
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14

Mark for Review



Straight line CD bisects the edge AB of an isosceles triangle ABC as shown. If the angle CAB is 30 degrees, what is the value, in radians, of angle ACD ?

(A) $\frac{\pi}{3}$

(A)

(B) $\frac{\pi}{6}$

(B)

(C) $\frac{\pi}{2}$

(C)

(D) $\frac{2\pi}{3}$

(D)

2

Module
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Section 2, Module 1: Math



15

Mark for Review

$$S(t) = 30 + 2t$$

The formula above models the speed of a car t seconds after passing the speed enforcement camera in $\frac{\text{miles}}{\text{hour}}$. Find the speed of the car, in $\frac{\text{miles}}{\text{hour}}$, 3 seconds after the event.

TESTSQUARE

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Section 2, Module 1: Math



16

Mark for Review

Function g is defined by $g(x) = 1.5^x$. What is the value of x if $g(x) = 1.5$?

- (A) 0 Ⓐ
- (B) 1 Ⓑ
- (C) 1.5 Ⓒ
- (D) 2 Ⓓ

TESTSQUARE

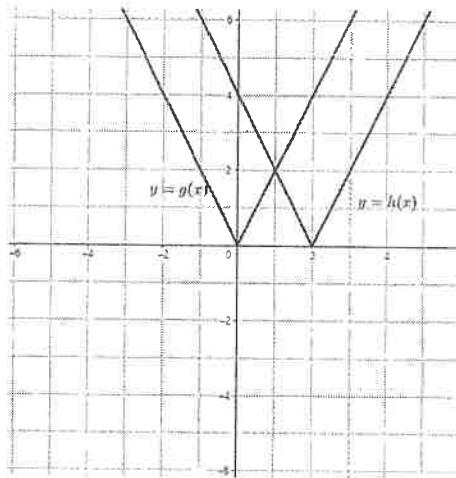
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17

Mark for Review



The graph of $g(x) = |2x|$ on the xy -plane is given. The graph of $h(x)$ is generated by pushing the graph of $g(x)$ by 2 units to the right. Which of the following correctly defines $h(x)$?

- (A) $h(x) = |2x| + 2$ Ⓐ
- (B) $h(x) = |2(x + 2)|$ Ⓑ
- (C) $h(x) = |2(x - 2)|$ Ⓒ
- (D) $h(x) = |2x| - 2$ Ⓓ

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Section 2, Module 1: Math



18

Mark for Review

Function f is defined by $f(x) = x^2 - 7$. What is the minimum value of $f(x)$?

III

Section 2, Module 1: Math



20

Mark for Review

What is a solution for an equation $x^3 - 27 = 0$?

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

IV

TESTQUBE

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Section 2, Module 1: Math



19

Mark for Review

Data set X
12, 9, 5, 5, 1, 1, 1, 9, 1, 8

VI

Restaurant B replaces the knife when the durability of the knife reaches below 95%. Durability is defined as the proportion of the knife's original strength or effectiveness that remains after a certain period of use. The formula $D(w) = 100(0.99)^w$ models the durability of a knife in Restaurant B , w weeks after the purchase. Data set X represents the period of use of all 10 knives in Restaurant B in weeks. How many knives in Restaurant B are subject to replacement?

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Section 2, Module 1: Math

Annotate

21

Mark for Review

The median payment of 21 employees of Company A is 49,000 dollars per year. Which of the following changes in Company A cannot possibly change the median payment?

- (A) The company hires 2 more interns each of who receives 32,000 dollars per year.
- (B) The company decides to cut down every employee's annual payment by 1,000 dollars.
- (C) The company pays an extra 2,000 dollars for an employee who receives the top payment.
- (D) The company doubles all employee payments.

(A)

(B)

(C)

(D)

Section 2, Module 1: Math

Annotate

22

Mark for Review

The density of a certain steel is 0.25 pounds per cubic inch. Which of the following answer choices most accurately shows the mass, in pounds, of a metal sphere with a diameter of 6 inches?

- (A) 13 pounds
- (B) 28 pounds
- (C) 113 pounds
- (D) 339 pounds

(A)

(B)

(C)

(D)

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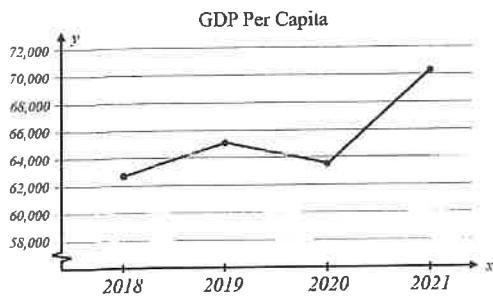
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Section 2, Module 2: Math



1

Mark for Review



The given graph represents the four-year change in a particular country's Gross Domestic Product per capita, in dollars per capita. In which year in the four years did the country have the highest GDP per capita?

- (A) 2018
 (B) 2019
 (C) 2020
 (D) 2021

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Section 2, Module 2: Math



2

Mark for Review

Various dating systems call a year differently. For example, the year 2023 in Gregorian Calendar equals the year 2567 in Buddhist Calendar. Assuming the starting date and length of a year are the same, the year in Gregorian Calendar G can be modeled in a linear function $f(B)$ where B is the year in Buddhist Calendar, such that $f(B) = B + c$ where c is constant. What is the value of c ?

- (A) 2567
 (B) 544
 (C) -544
 (D) -2567

TESTQUBE

Question 2 of 22 >



Section 2, Module 2: Math

3

Mark for Review

Which of the following expressions is equivalent to $xy + 2x^2y^2 - xy^3$?

- (A) $xy(xy - y^2)$
 (B) $2xy(x + y^2)$
 (C) $xy(1 + 2xy - y^2)$
 (D) $y(xy + 2x^2 - y)$

TESTQUBE

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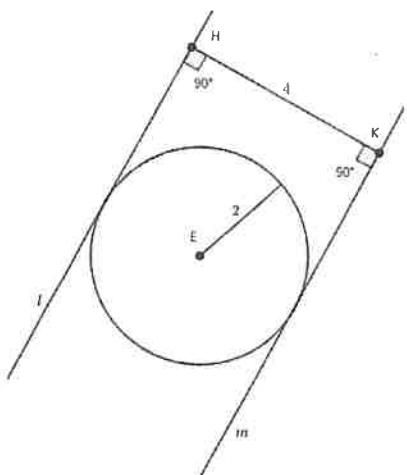
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Section 2, Module 2: Math



4

Mark for Review



In the shown figure, straight lines l and m are tangent to a circle with a radius of 2 units. HK is perpendicular to both lines l and m and is 4 units long. At how many points do lines l and m intersect?

(A) 0

(A)

(B) 1

(B)

(C) 2

(C)

(D) Infinitely many

(D)

Section 2, Module 2: Math



5

Mark for Review

Emily has 21 chairs in her office. Some of the chairs have four legs each, while the others have three legs each. If there are a total of 72 legs, how many three-legged chairs does Emily have in her office?

II

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TESTSQUARE

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Section 2, Module 2: Math



6

Mark for Review

Function f is defined by $f(x) = \frac{1}{x} + 2$. What is the value of $f(\frac{1}{2})$?

(A) $\frac{5}{2}$

(A)

(B) 3

(B)

(C) $\frac{7}{2}$

(C)

(D) 4

(D)

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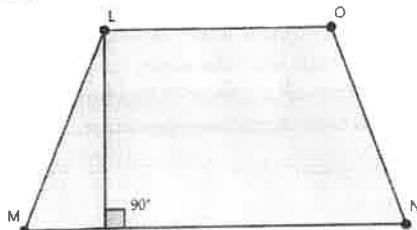
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Annotate

7

Mark for Review



In a given figure, LO and MN are parallel sides of trapezoid $LMNO$. The mean of the lengths LO and MN is 8 units. If the area of trapezoid $LMNO$ is 32 square units, what is the height of the trapezoid $LMNO$?

IV

TESTCUBE

Question 7 of 22 >

Section 2, Module 2: Math

Annotate

8

Mark for Review

Which of the following statements is true for a circle that is defined by $(x + 2)^2 + (y - 1)^2 = 4$?

- (A) It has a radius of 4 units.
- (B) It is tangent to the y -axis.
- (C) Its center is $(1, 2)$.
- (D) It has a diameter of 2 units.

V

VII

TESTCUBE

Question 8 of 22 >

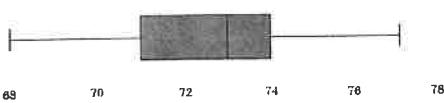
Section 2, Module 2: Math

Annotate

9

Mark for Review

Basketball Team



The box plot shows the distribution of the heights, in inches, of 19 players in a high school basketball team. What is the height, in inches, of the player at 25th percentile?

- (A) 68
- (B) 71
- (C) 73
- (D) 74

TESTCUBE

Question 9 of 22 >

Section 2, Module 2: Math

Annotate

10

Mark for Review

Factory F produces ballpoint pens. 7% of the produced pens contain more than 1.1mL of ink. Which of the following quantities is most reasonable for the number of pens that contain more than 1.1mL of ink out of 20,000 randomly chosen ballpoint pens produced at factory F ?

- (A) 1.1
- (B) 7
- (C) 140
- (D) 1,400

TESTCUBE

Question 10 of 22 >

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2

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2

2

Section 2, Module 2: Math



11

Mark for Review

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

What is one of the values of x that satisfies the given equation?

Section 2, Module 2: Math



13

Mark for Review

Which of the following expressions has the same value as $2\sqrt{2}$?

(A) 2^2

(B) $\frac{8}{2}$

(C) $\sqrt{8}$

(D) $\sqrt{4}$

TEST QUBE

Question 11 of 22 >

IV

TEST QUBE

Question 13 of 22 >

IV

Section 2, Module 2: Math



12

Mark for Review

A power plant absorbs solar energy and converts it. During the conversion, 60% of the energy absorbed is lost and the rest is converted to electric energy. How much energy, in Joules, would the power plant convert out of 1,000 Joules of solar energy?

(A) 200

(A)

(B) 400

(B)

(C) 600

(C)

(D) 800

(D)

Section 2, Module 2: Math



14

Mark for Review

When a printer starts printing, it loads document data from a computer and prints out the document. Amma's printer always takes 12 seconds to load data and prints 10 pages per minute. Which of the following functions correctly models the time T , in seconds, it takes for Amma's printer to start loading a document and complete printing p pages?

(A) $T(p) = 12 + 6p$

(A)

(B) $T(p) = 6 + \frac{1}{12}p$

(B)

(C) $T(p) = 12 + 10p$

(C)

(D) $T(p) = 12 + \frac{1}{10}p$

(D)

TEST QUBE

Question 12 of 22 >

VI

TEST QUBE

Question 14 of 22 >

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2

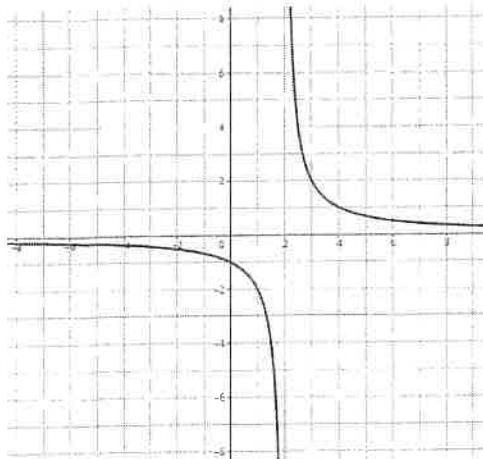
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Section 2, Module 2: Math



15

Mark for Review



IV

- The graph of $y = \frac{2}{x-2}$ is shown. Which of the following values of x does not have a corresponding y value?

(A) 1

Ⓐ

(B) 2

Ⓑ

(C) 3

Ⓒ

(D) 4

Ⓓ

V

- TESTQUBE** Question 16 of 22 >
- $x = y(y^2 - 11y - 20) + 1$
 $(a, 0)$ is one of the solution sets for the given equation. What is the value of a ?

17

Mark for Review

VI

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Section 2, Module 2: Math

Annotate

18

Mark for Review

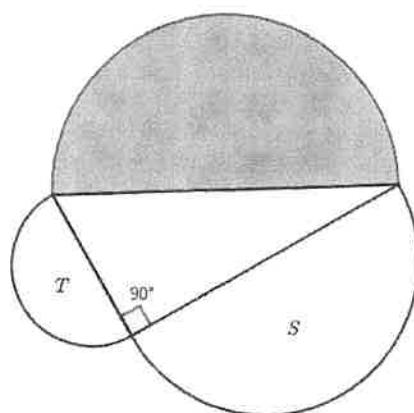
- What is the area of a square with a perimeter of 12?
- (A) 16
 - (B) 9
 - (C) 8
 - (D) 4

Section 2, Module 2: Math

Annotate

19

Mark for Review



In the given figure, each of the three semicircles has a diameter that equals a corresponding side length of a right triangle. S and T are the areas of two smaller semicircles. What is the area of the largest semicircle in terms of S and T ?

- (A) $S + T$
- (B) $S^2 + T^2$
- (C) ST
- (D) \sqrt{ST}

Section 2, Module 2: Math



20

Mark for Review

A bicycle lock consists of a three digit password. Each digit of the password can have an integer value from 0 to 6, where the same number may appear more than once. A different order of the same combination sets a different password. For example, 656 and 566 are two different valid passwords. What is the number of different passwords that can be set for the lock?

(A) 3^6

(A)

(B) 6^3

(B)

(C) 3^7

(C)

(D) 7^3

(D)

IV

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Section 2, Module 2: Math



21

Mark for Review

Factory A produces 12-ounce packs of breakfast cereal in four parallel production lanes. The owner conducted research to find if the production lanes are operating as intended. She randomly selected a production lane and measured the masses of 5 consecutively produced packs from the lane. She found the mean value of 13.5 ounces per pack of breakfast cereal. She concluded that Factory A has a defect in all production lanes. Which of the following strategy is most appropriate for the owner to apply in order to improve her research?

(A) Measuring the mass of just one pack instead of 5.

(A)

(B) Using pounds as a unit instead of ounces.

(B)

(C) Examining 50 randomly selected packs from Factory A.

(C)

(D) Comparing the result of the same research from another factory.

(D)

2

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Annotate

22

Mark for Review



The clock marks the time 2 : 00. The angle between the hour hand and the minute hand is $\frac{\pi}{d}$ radians. What is the value of d ?

II

III

IV

V

VI

VII

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Problem-Solving and Data analysis

(5-7 questions, about 15%)

Topics: Ratios, rates, proportional relationship, units. Percentages, one or two variable data: distributions and measures of center and spread, Scatterplots. Probability and conditional probability, Inference from sample statistics and margin of error.

- Exponential growth/decay

$p(t) = A(1 + r)^t$, where r is % in decimal and t is the time unit. (Exponential growth)
 $p(t) = A(1 - r)^t$, where r is % in decimal and t is the time unit (Exponential decay)

(Exponential growth/decay Practice Problems)

- 1) A certain animal population in South Africa is about 2,000 currently. The scientists expect the population will continue to decay 5% every year due to the environmental issues.
 $P(t) = 2,000 a^t$, where t is in years. If this exponential model, $P(t)$ represents the population t years from now, what is the value of a ?

A) 1.05
B) 0.95
C) 5
D) 0.05

2) Elliott measured the temperature of a tea placed in his room with a constant temperature of 75 degrees Fahrenheit. The temperature of tea was 180°F at 7:00 a.m. and 120°F at 7:10 a.m. Assume that the temperature of tea continues to decrease close to the room temperature. Which of the following best models the temperature $T(m)$, in degrees Fahrenheit, of the tea m minutes after it was placed in his room at 7:00 a.m.?

A) $T(m) = 180(0.67)^{\frac{m}{10}}$
B) $T(m) = 180(1.67)^{\frac{m}{10}}$
C) $T(m) = 75 + 105(0.43)^m$
D) $T(m) = 75 + 105(0.43)^{\frac{m}{10}}$

3) A spacecraft launches from a launching pad from the ground. The spacecraft ascends from the ground to an altitude of 100,000 ft at a constant rate of 1,000 feet per minute. What type of function best represents the relationship between the altitude of the spacecraft and time?

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



- Percent increase/decrease

$$\text{Percent increase} = \frac{\text{Increase}}{\text{Original amount}} \times 100 (\%)$$

$$\text{Percent decrease} = \frac{\text{decrease}}{\text{Original amount}} \times 100 (\%)$$

- Ratio / Proportions

A ratio is a comparison of two numbers in the same unit.

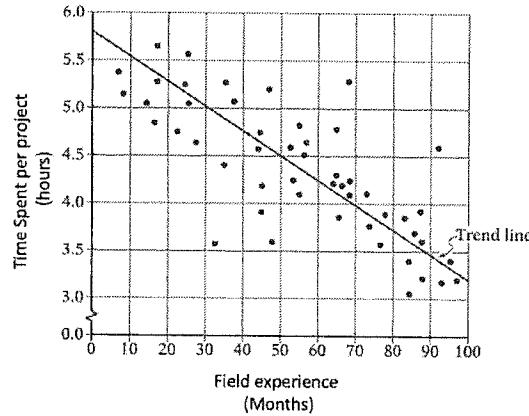
A proportion is an equation with a ratio on each side. It is a statement that two ratios are equal.

(Practice problems with related topics)

- 4) If $5a + 3b$ is equal to 300 percent of $6b$, what is the value of $\frac{a}{b}$?
- 5) The price of a certain product was first decreased by 20% and then the new price was increased by 20%. Which of the following is true about the price change from the initial price?
- A) The price stayed the same.
 - B) The price went up by 4 percent.
 - C) The price went down by 4 percent.
 - D) Not enough information to compute.
- 6) On an engineer's blueprint, 1 inch represents 2 feet in real dimensions. If a heating oven is represented on the blueprint by a rectangle that has sides of lengths 4 inches and 5 inches, what is the actual area of the oven, in square feet?
- A) 40
 - B) 80
 - C) 120
 - D) 160
- 7) County A has two school districts (1st grade to 12th grade). The first school district has an area of 110 square miles and a population density of 90 students per square miles. And the second district has an area of 70 square miles and a population density of 120 students per square miles. What is the student population density, the number of students per square miles, for all of County A? (Answer into the nearest integer.)

- Interpreting data / relationships in scatterplot, table, and equations in Statistics

TIME SPENT IN HOURS PER PROJECT AND FIELD EXPERIENCE IN MONTHS
IN ABC MANUFACTURING COMPANY



(Types of questions could be asked in this context from the scatterplot above)

- 8) According to the scatterplot, a line of best fit is drawn in the graph above. Which of the following equations best represents the line of best fit?
 - A) $y = \frac{1}{40}x - 5.75$
 - B) $y = -\frac{1}{40}x + 4.5$
 - C) $y = -40x + 5.75$
 - D) $y = -\frac{1}{40}x + 5.75$

- 9) For how many data shown was the number of hours spent per project less than the number of hours predicted by the line of best fit if the data were chosen over 80-month field experience?
 - A) 5
 - B) 6
 - C) 7
 - D) 8

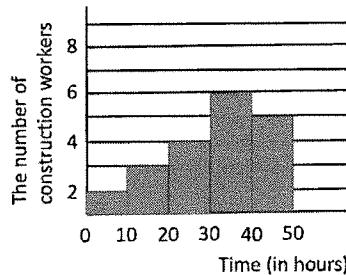
- 10) Which of the following best interpret the slope of the line of best fit in this context?
 - A) An engineer in the company would spend an hour less on each project if the person experienced every 40 projects.
 - B) An engineer in the company would spend an hour less on each project if the person had every 40 months field experience.
 - C) An engineer in the company could finish one more project if the person had more than 40-month field experience.
 - D) An engineer in the company would spend an hour less on each project if the person had every 40 hours field experience.

Pet distribution in ABC High school students' household

	Less than 10 kg	10-15 kg	Greater than 15 kg	Total
DOG	14	20	48	82
CAT	9	7	22	38
Total	23	27	70	120

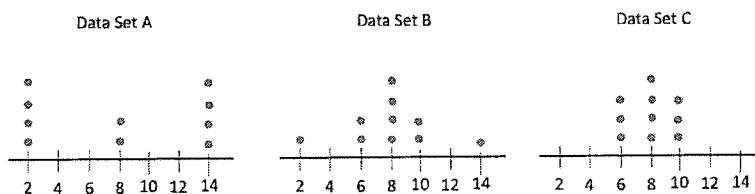
- 11) The table above summarizes the distribution of Pets weight, in kilograms, in ABC High school students' household. What is the probability of selecting a cat, given that the pet's weight is greater than 15kg?

- A) $\frac{24}{35}$
- B) $\frac{11}{35}$
- C) $\frac{11}{60}$
- D) $\frac{2}{5}$



- 12) In the histogram shown summarizes the distribution of time, in hours, worked by 20 construction workers last week. The first bar represents the number of workers who worked at least 0 hours and less than 10 hours and the second bar represents the number of workers who worked at least 10 hours and less than 20 hours and so on. Which of the following could be the median and mean amount of time worked, in hours, for 20 construction workers assuming only whole numbers of working hour considered?

- A) Median = 25, Mean = 25
- B) Median = 32, Mean = 27
- C) Median = 33, Mean = 35
- D) Median = 27, Mean = 33



- 13) The dot plots show the distribution of math quiz scores in 3 classes of 10 students each class. Which of the following is the correct order about the standard deviations?

- A) $A < B < C$
- B) $A < C < B$
- C) $C < B < A$
- D) $B < C < A$

- Strategy in survey problems

- If the subjects in the sample of a study were selected at random from the entire population, the result can be generalized to the entire population.
- If the subjects in the sample were randomly assigned to the treatments, it may be appropriate to make conclusions about cause and effect.

	Subjects selected at random	Subjects NOT selected at random
Subjects randomly assigned to treatments	<ul style="list-style-type: none"> Results can be generalized to the entire population Conclusions about cause and effect can be appropriately be drawn 	<ul style="list-style-type: none"> Results CANNOT be generalized to the entire population Conclusions about cause and effect can be appropriately be drawn
Subjects NOT randomly assigned to treatments	<ul style="list-style-type: none"> Results can be generalized to the entire population Conclusions about cause and effect should NOT be drawn 	<ul style="list-style-type: none"> Results CANNOT be generalized to the entire population Conclusions about cause and effect should NOT be drawn

(Practice problems in data analysis and statistics)

- A sample of 50 sixth-grade students were randomly selected from a certain elementary school. The 50 students completed a survey regarding to morning meditation before the first class starts, and 45 students replied that the meditation in the morning was helpful to focus in class. Which of the following is the largest population to which the results of the survey can be applied?
 - All students at the same school
 - The 50 students who were surveyed
 - All sixth-grade students in the county in which the school is located
 - All sixth-grade students at the same school
- A community college offered a Japan tour over the summer to students who would take Japanese course in the fall. The students who visited Japan over the summer through the program did better in the course than students who didn't visit Japan over the summer. Based on the results, which of the following is the most appropriate conclusion?
 - Visiting foreign countries over the summer will cause an improvement for any student who takes the same foreign language course.
 - Visiting Japan over the summer will cause an improvement for any student who takes Japanese language course.
 - Visiting Japan over the summer was the cause of the improvement for the students at the specific community college.
 - No conclusion about the cause can be made regarding students who visited Japan over the summer and their performance in the Japanese course because students who visited Japan were volunteered.

- 16) A data set of 20 different numbers has a mean of 55 and a median of 55 as well. A new data set was created by adding 10 to each number in the original set of data that is greater than the median and subtracting 10 to each number in the original set of data that is less than the median. Which of the following does not have the same value in both the original and the new data set?

- A) Median
- B) Mean
- C) Standard Deviation
- D) Sum of the data

Sample	Percent in favor of new menu	Margin of error
A	78%	1.5%
B	68%	4.3%

- 17) The results of two random samples of survey for a new item in a local ice-cream shop are shown above. The samples were selected from the same population and the margins of error were calculated using the same method. Which of the following is the most proper reason that the margin of error for sample A is less than that of sample B?

- A) Sample A had a larger sample size.
- B) Sample B had a larger sample size.
- C) Sample A had a higher percentage of favorable response.
- D) Sample A could be more knowledgeable in new item.

- 18) In which of the following tables is the relationship between the values of x and their corresponding y -values non-linear?

A)

x	1	2	3	4
y	4	6	8	10

B)

x	1	2	3	4
y	-12	-6	0	6

C)

x	1	2	3	4
y	2	4	8	16

A)

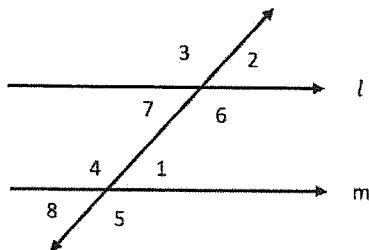
x	1	2	3	4
y	4.5	6.5	8.5	10.5

Geometry and Trigonometry

(5-7 questions, about 15%)

Topics: Area and volume. Lines, angles, and triangles, right triangles, trigonometry, Circles.

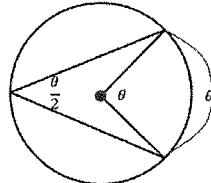
- Angles associated with parallel lines



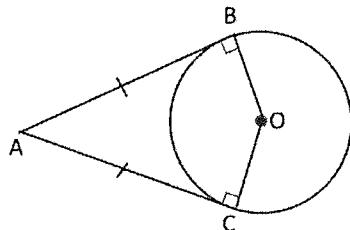
when $l \parallel m$,

- Corresponding angles are congruent: $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$, $\angle 5 \cong \angle 6$, $\angle 7 \cong \angle 8$
- Alternate interior angles are congruent: $\angle 1 \cong \angle 7$, $\angle 4 \cong \angle 6$
- Same side interior angles are supplementary: $\angle 1 + \angle 6 = 180^\circ$, $\angle 4 + \angle 7 = 180^\circ$
- Alternate exterior angles are congruent: $\angle 3 \cong \angle 5$, $\angle 2 \cong \angle 8$
- Vertical angles are congruent: $\angle 1 \cong \angle 8$, $\angle 4 \cong \angle 5$

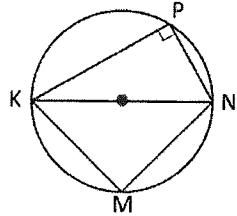
- Angles associated with circles



- Measure of arc is the same as the central angle
- The measure of inscribed angle is half the measure of the same intercepted arc



- The lengths of two tangent segments from a point outside of a circle are congruent ($AB = AC$)
- the segments form a right angle with the radius drawn to the point of tangency ($OB \perp AB$, $OC \perp AC$)

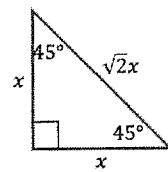
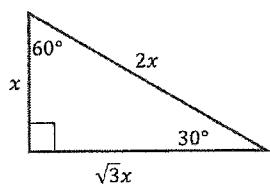


- Any inscribed angle drawn from the endpoints of diameter ($\angle KPN$ or $\angle KMN$ are right angles)
- If a quadrilateral is inscribed in a circle, its opposite angles are supplementary. ($\angle KPN + \angle KMN = 180^\circ$)

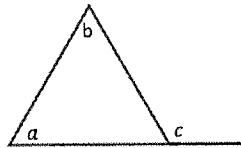
- Angles in polygons

- i. Sum of interior angles in any polygon = $(n - 2) \cdot 180^\circ$, where n is the number of sides.
- ii. Each interior angle of a regular polygon = $\frac{(n-2) \cdot 180^\circ}{n}$, where n is the number of sides.
- iii. Sum of exterior angles of any polygon = 360°
- iv. Each exterior angle of a regular polygon = $\frac{360^\circ}{n}$, where n is the number of sides.

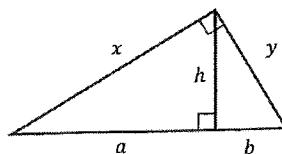
- Angles associated with triangles



3 - 4 - 5
5 - 12 - 13
7 - 24 - 25
8 - 15 - 17



- One exterior angle is same as the sum of two remote interior angles
 $\angle a + \angle b = \angle c$

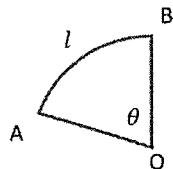


$$\begin{aligned}x &= \sqrt{a \cdot (a+b)} \\y &= \sqrt{b \cdot (a+b)} \\h &= \sqrt{a \cdot b}\end{aligned}$$

- Circle equation

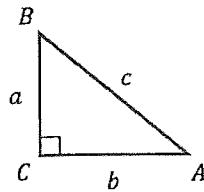
$(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the coordinates of the center of the circle and r is the radius.

- Area of a sector and Length of an arc



- Area of a sector = $\frac{\theta}{360^\circ} \cdot \pi r^2$, where θ is the central angle in degrees
- Length of an arc = $\frac{\theta}{360^\circ} \cdot 2\pi r$, where θ is the central angle in degrees

- Trigonometry



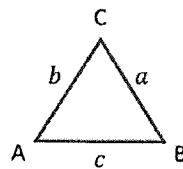
- $\sin A = \frac{a}{c}$, $\cos A = \frac{b}{c}$, $\tan A = \frac{a}{b}$ (Soh-Cah-Toa)
- $\sin A = \cos B$ (co-functions)

Note: $A = 90^\circ - B$ or $A + B = 90^\circ$ (complementary angles)

- How to convert angles in different mode (radians to degrees or degrees to radians)

- Radians to degrees : multiply by $\frac{180^\circ}{\pi}$
- Degrees to radians : multiply by $\frac{\pi}{180^\circ}$

• Isosceles triangle property and triangle inequalities



Isosceles Triangle Property

- If $\angle A \cong \angle B$, then $a = b$
- If $a = b$, then $\angle A \cong \angle B$

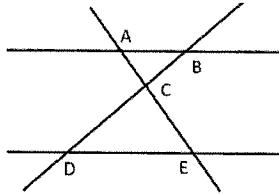
Triangle inequalities

- $|a - b| < c < a + b$

(Practice Problems in Geometry and Trigonometry)

- 1) In a right triangle, the tangent of one of the two acute angle is $\frac{1}{3}$. Which of the following is the sine of the other angle?

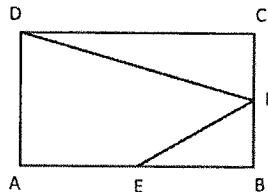
A) $\frac{1}{\sqrt{10}}$ B) $\sqrt{10}$ C) $\frac{\sqrt{10}}{3}$ D) $\frac{3}{\sqrt{10}}$



Note: Figure not drawn to scale

- 2) In the figure above, $\triangle ABC$ is similar to $\triangle EDC$. Which of the following must be true?

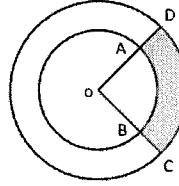
A) $\overline{AB} \perp \overline{AE}$ B) $\overline{BD} \perp \overline{DE}$ C) $\overline{AB} \parallel \overline{DE}$ D) $\overline{BC} \perp \overline{CE}$



Note: Figure not drawn to scale

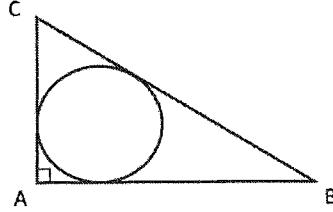
- 3) In the rectangle ABCD above, Points E and F are midpoints of the sides AB and BC, respectively. If $\tan \angle FDC = \frac{1}{2}$, what is the value of $\sin \angle BEF$?

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



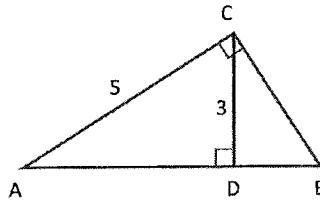
- 4) Two concentric circles with a center O are drawn above. The area of the shaded region is 16π . If the measure of angle AOB is $\frac{2\pi}{9}$ and $OA:AD = 3:2$, what is the length of a minor arc CD ?

A) $\frac{10\pi}{9}$ B) $\frac{10\pi}{3}$ C) $\frac{9\pi}{5}$ D) 3π



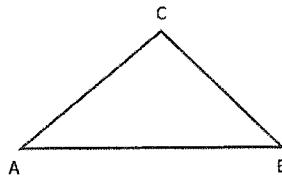
- 5) In the right triangle ABC above, $AC = 7$, $BC = 25$. What is the length of the radius of the inscribed circle?

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



- 6) In the right triangle ABC above, what is the value of $\cos \angle CBD$?

A) $\frac{3}{4}$ B) $\frac{3}{5}$ C) $\frac{3}{5}$ D) $\frac{5}{3}$

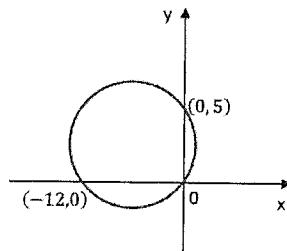


Note: Figure not drawn to scale

- 7) In the triangle ABC above, $\sin \angle A = \cos \angle B$. Which of the following is correct for triangle ABC?

A) Acute triangle
B) Obtuse triangle
C) Right triangle
D) Isosceles triangle

- 8) The number of radians in a 540-degree angle can be written as $k\pi$, where k is a constant. What is the value of k ?
- 9) A circle in the XY-plane has equation $(x - 1)^2 + (y + 2)^2 = 9$. Which of the following points lie in the interior of the circle?
- A) $(2, -1)$
 - B) $(-3, 2)$
 - C) $(2, 4)$
 - D) $(-2, 0)$
- 10) The graph of $2x^2 + x + 2y^2 + y = \frac{1}{4}$ in the XY-plane is a circle. What is the length of the radius of the circle?



- 11) The graph of a circle is drawn in the XY-plane above. If the circle intersects at three points as shown, what is the length of the radius of the circle?

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Section 2, Module 1: Math**SAT Prep Test 1—Math
Module 1**

Turn to Section 2 of your answer sheet (p. 76) to answer the questions in this section.

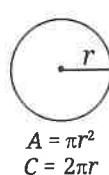
DIRECTIONS

The questions in this section address a number of important math skills.
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NOTES

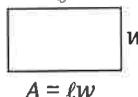
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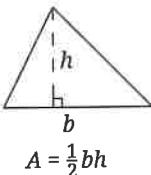
REFERENCE

$$A = \pi r^2$$

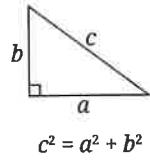
$$C = 2\pi r$$



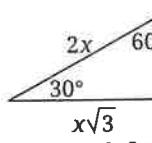
$$A = lw$$



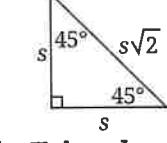
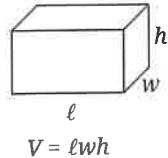
$$A = \frac{1}{2}bh$$



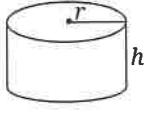
$$c^2 = a^2 + b^2$$



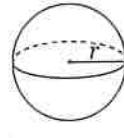
$$x\sqrt{3}$$


Special Right Triangles


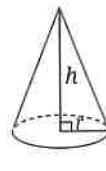
$$V = lwh$$



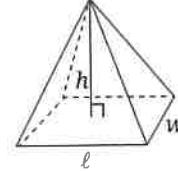
$$V = \pi r^2 h$$



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



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



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

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

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

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 1: Math

1

Mark for Review

Data set S: 2, 3, 8, 8, 11, 24

Data set T: 3, 8, 8, 11, 24

The values in data sets S and T are given. Which of the following is a true statement comparing the means of the two data sets?

- (A) There is not enough information to compare the means.
- (B) The means of data set S and data set T are equal.
- (C) The mean of data set S is less than the mean of data set T.
- (D) The mean of data set S is greater than the mean of data set T.

2

Mark for Review

If $x = 8$, what is the value of $30 - x$?

- (A) 14
- (B) 22
- (C) 30
- (D) 38

3

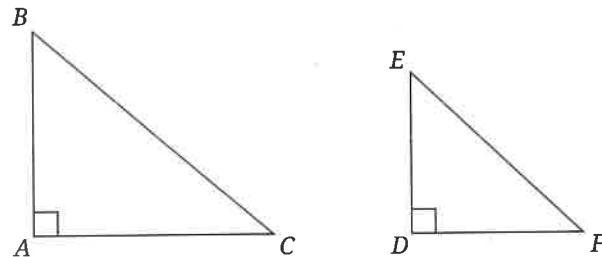
Mark for Review

The valve of a water tank remained open for 44 seconds. The water tank contained 7,854 liters of water before the valve was opened and 1,192 liters of water once the valve was closed. Approximately how many liters of water, on average, drained from the tank each second while the valve was open?

- (A) 27
- (B) 151
- (C) 206
- (D) 6,662

4

Mark for Review



Note: Figures not drawn to scale.

Similar right triangles ABC and DEF are shown, where B corresponds to E . If the measure of angle E is 52° , what is the measure of angle C ?

- (A) 38°
- (B) 52°
- (C) 128°
- (D) 142°

5 Mark for Review

Last week, a softball equipment company made \$26,000 from the sale of equally-priced bats and equally-priced gloves. When b is the number of bats sold and g is the number of gloves sold, the equation $500b + 300g = 26,000$ represents this situation. The sales price of each glove is how many dollars less than the sales price of each bat?

6 Mark for Review

$$\begin{aligned} 8x - y &= -17 \\ -7x &= 14 \end{aligned}$$

The given system of equations has one solution at (x, y) . What is the value of $x - y$?

A -31**B** -3**C** 3**D** 31**7** Mark for Review

The function $f(d) = 750d + 12,000$ models the amount of money, in dollars, that an arts organization has in its account d days after starting a fundraising campaign. Based on this model, how much money, in dollars, did the organization have in its account before starting the fundraising campaign?

A 16**B** 750**C** 11,250**D** 12,000**8** Mark for Review

Equilateral triangle T has a perimeter that is one-third the perimeter of equilateral triangle S. If one side of triangle S is 9 inches long, what is the length, in inches, of one side of triangle T?

A 3**B** 9**C** 12**D** 27**CONTINUE**

Section 2, Module 1: Math

9 **Mark for Review**

If $|7x + 14| = 49$, what is one possible value of $x + 2$?

10 **Mark for Review**

x	$g(x)$
-30	-116
-24	-86
-18	-56
-12	-26
-6	4

Five values of x and their corresponding values of $g(x)$ are shown in the table. The relationship between x and $g(x)$ is linear. If the function g is defined by $g(x) = kx + 34$, what is the value of the constant k ?

11 **Mark for Review**

The expression $(-3x^4 + 13) + (-8x^4 - 9)$ is equivalent to $cx^4 + 4$, where c is a constant. What is the value of c ?

12 **Mark for Review**

$$\frac{22m}{n} = \frac{2}{3s}$$

The given equation relates the numbers m , n , and s , where n is not equal to 0 and $s > 1$. Which equation correctly expresses m in terms of n and s ?

(A) $m = 2n - 66s$

(B) $m = 66ns$

(C) $m = \frac{3ns}{44}$

(D) $m = \frac{2n}{66s}$

13 **Mark for Review**

A certain ant colony contains 96,000 ants. A disease infects the colony, causing the number of ants to decrease by one-half every 4 days. How many ants remained in the colony 20 days after the infection started?

(A) 3,000

(B) 4,800

(C) 6,000

(D) 24,000

14 Mark for Review

$$x < 53$$

$$x - 7y < 16$$

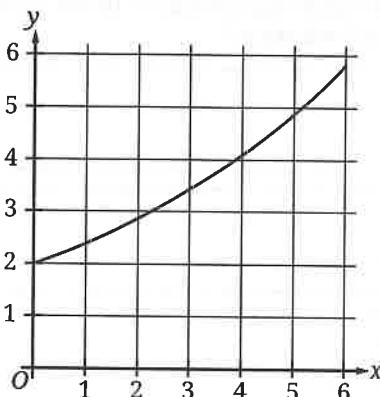
When the given system of inequalities is graphed in the xy -plane, one of the solutions is $(39, y)$. Which of the following could be the value of y ?

(A) -4

(B) -3

(C) 3

(D) 4

16 Mark for Review

A certain collector's item increased in value every month for the first six months after it was purchased. The graph shows the value, y , in hundreds of dollars, of the item x months after it was purchased, where $0 \leq x \leq 6$. Which of the following is the best interpretation of the y -intercept of the graph in this context?

(A) The value of the item when it was purchased was \$2.

(B) The value of the item increased by \$200 over the first six months after it was purchased.

(C) The value of the item when it was purchased was \$200.

(D) The value of the item six months after it was purchased was \$2,000.

15 Mark for Review

$$\sqrt[9]{s^5t^5}$$

If s and t are positive, which of the following expressions is equivalent to the given expression?

(A) $(st)^{\frac{5}{9}}$ (B) $(st)^{\frac{9}{5}}$ (C) $(st)^{14}$ (D) $(st)^{45}$

CONTINUE

Section 2, Module 1: Math

17

Mark for Review

Which of the following systems of linear equations has exactly one real solution?

(A) $y = 2$
 $y = 4$

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

(C) $y = 4x - 4$
 $y = 4x + 4$

(D) $y = 4x - 2$
 $y = 8x - 4$

18

Mark for Review

The n th term of a sequence is represented by s , and each term after the first term is one-half of the preceding term. If the first term of the sequence is 56, which of the following equations expresses s in terms of n ?

(A) $s = \frac{1}{2}(56^{n-1})$

(B) $s = \frac{1}{2}(56^n)$

(C) $s = 56\left(\frac{1}{2}\right)^{n-1}$

(D) $s = 56\left(\frac{1}{2}\right)^n$

19

Mark for Review

In 2023, a certain streaming service decreased its number of movies available by 9% from the number of movies available in 2022. If the number of movies available in 2023 is m times the number of movies available in 2022, what is the value of m ?

(A) 0.09

(B) 0.91

(C) 1.09

(D) 1.91

20

Mark for Review

The maximum value of q is 14 more than 7 times the value of r . Which inequality represents the relationship between q and r ?

(A) $q \leq 7r + 14$

(B) $q \leq 14r + 7$

(C) $q \geq 7r + 14$

(D) $q \geq 14r + 7$

21 Mark for Review

The equation $5x + 3y = -8$ represents line l . Line m is obtained by shifting line l up 2 units in the xy -plane. The x -intercept of the graph of line m is (a, b) . What is the value of a ?

22 Mark for Review

$$AB = 42$$

$$BC = 56$$

$$CA = 70$$

Right triangle ABC is similar to triangle DEF , where A corresponds to D and B corresponds to E . The lengths of the sides of triangle ABC are given. What is the value of $\cos D$?

(A) $\frac{3}{5}$

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

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

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

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.

SAT Prep Test 1—Math

Module 2—Easier

Turn to Section 2 of your answer sheet (p. 76) to answer the questions in this section.

DIRECTIONS

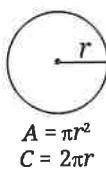
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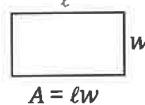
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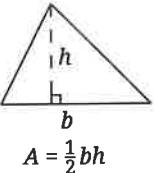


$$A = \pi r^2$$

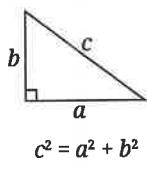
$$C = 2\pi r$$



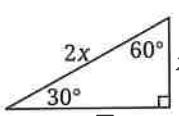
$$A = lw$$



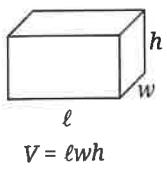
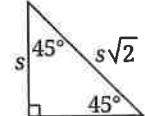
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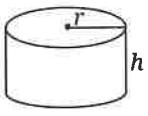
$$c^2 = a^2 + b^2$$



Special Right Triangles



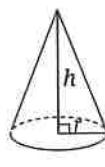
$$V = lwh$$



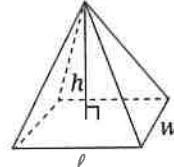
$$V = \pi r^2 h$$



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



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



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

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.

CONTINUE ➔

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CONTINUE

Section 2, Module 2—Easier: Math

WEEK 1.6

1 Mark for Review

An automobile factory makes 1,200 vehicles in 1 day. If the factory operates continuously for 1 week at this rate, how many vehicles will it make?

2 Mark for Review

If $10\alpha = 30$, what is the value of 9α ?

(A) 27

(B) 40

(C) 270

(D) 360

3 Mark for Review

Talula baked 340 cookies and gave 20% of them to her neighbors. How many of the cookies did Talula give to her neighbors?

(A) 14

(B) 34

(C) 54

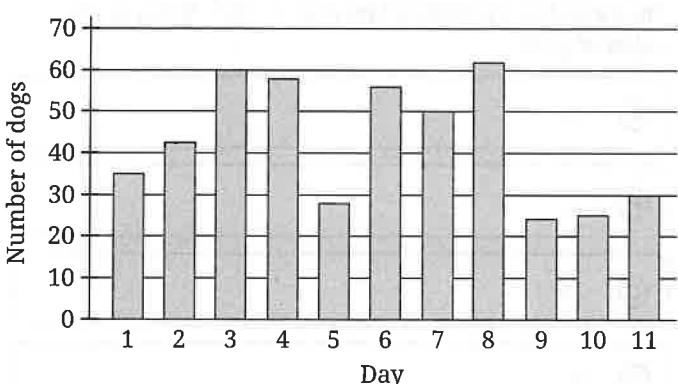
(D) 68

4 Mark for Review

$$h(x) = 11x - 5$$

The function h is defined by the given equation. When $x = 6$, what is the value of $h(x)$?

Section 2, Module 2—Easier: Math

5 Mark for Review

The distribution of 469 dogs that visited a dog park over an 11-day period is shown in the bar graph. How many dogs visited this dog park on day 7?

7 Mark for Review

Which of the following expressions is equivalent to $14a + 7ab^2$?

(A) $2a(7 + 7b^2)$

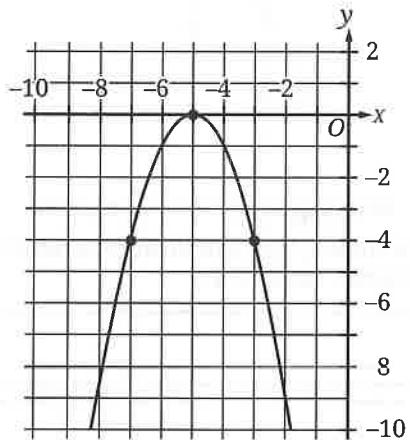
(B) $7a(2 + b^2)$

(C) $7a(a + 14b)$

(D) $7b(2ab)$

8 Mark for Review

Rectangle A has a length of 80 and a width of 24. What is the perimeter of rectangle A?

6 Mark for Review

The graph shown intercepts the x -axis at $(x, 0)$. What is the value of x ?

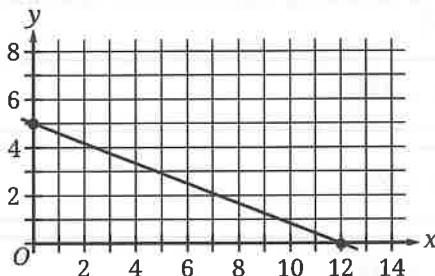
CONTINUE

Section 2, Module 2—Easier: Math

WEEK 1.6

9

Mark for Review



The point with coordinates $(3, n)$ lies on the line shown. What is the value of n ?

(A) $\frac{13}{4}$

(B) $\frac{15}{4}$

(C) $\frac{19}{5}$

(D) $\frac{24}{7}$

10

Mark for Review

A magician has a hat with 18 cards inside. The face of each card has a number from 1 to 18 written on it, with a different number on each card. If the magician takes out a single card, what is the probability that the number written on it is not 6?

(A) $\frac{1}{18}$

(B) $\frac{6}{18}$

(C) $\frac{12}{18}$

(D) $\frac{17}{18}$

11

Mark for Review

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

(A) -18

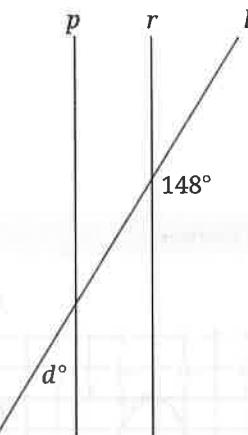
(B) -12

(C) -10

(D) -6

12

Mark for Review



Note: Figure not drawn to scale.

In the figure shown, line b intersects parallel lines p and r . What is the value of d ?

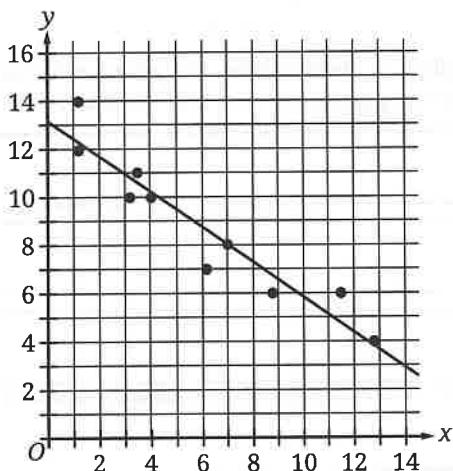
(A) 16

(B) 32

(C) 74

(D) 148

13

 Mark for Review

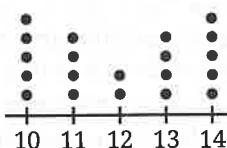
Which of the following equations could define the line of best fit for the scatterplot shown?

- (A) $y = -13 - 0.7x$
- (B) $y = -13 + 0.7x$
- (C) $y = 13 - 0.7x$
- (D) $y = 13 + 0.7x$

14

 Mark for Review

Data Set R



There are 20 values in data set R, represented by the dot plot shown. Data set S is created by subtracting 8 from each of the values in data set R. Which of the following correctly compares the ranges and the means of data sets R and S?

- (A) The range of data set S is less than the range of data set R, and the mean of data set S is equal to the mean of data set R.
- (B) The range of data set S is less than the range of data set R, and the mean of data set S is less than the mean of data set R.
- (C) The range of data set S is equal to the range of data set R, and the mean of data set S is equal to the mean of data set R.
- (D) The range of data set S is equal to the range of data set R, and the mean of data set S is less than the mean of data set R.

CONTINUE

Section 2, Module 2—Easier: Math

15 **Mark for Review**

During a video game session, a player scored a total of 1,000 points for c cooperative missions and s solo missions. The equation $20c + 25s = 1,000$ represents this situation. Which of the following is the best interpretation of the number 25 in this context?

- (A) The player completed 25 cooperative missions during this session.
- (B) The player scored 25 points for each cooperative mission during this session.
- (C) The player completed 25 solo missions during this session.
- (D) The player scored 25 points for each solo mission during this session.

16 **Mark for Review**

$$g(x) = \frac{\sqrt{x}}{2}$$

The function g is defined by the given equation. If $g(x) = 5$, what is the value of x ?

- (A) 10
- (B) 25
- (C) 50
- (D) 100

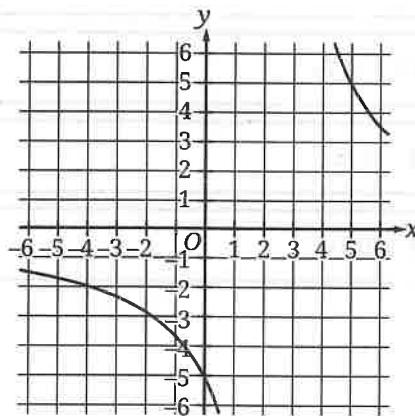
17 **Mark for Review**

$$\begin{aligned}y &= x^2 - 7 \\x &= -7\end{aligned}$$

When graphed in the xy -plane, the given equations intersect at the point (x, y) . What is the value of y ?

- (A) -21
- (B) -7
- (C) 42
- (D) 49

18 **Mark for Review**



A partial graph of $y = f(x)$ in the xy -plane is shown. Which of the following is the value of $f(0)$?

- (A) -5
- (B) $-\frac{1}{4}$
- (C) 0
- (D) 5

19 Mark for Review

Which of the following equations defines a line in the xy -plane that has a slope of $\frac{1}{6}$ and passes through the point $(12, -7)$?

(A) $y = \frac{x}{6} - 9$

(B) $y = \frac{x}{6} - 7$

(C) $y = -9x + \frac{1}{6}$

(D) $y = 12x - 7$

21 Mark for Review

A jar contains a total of 37 red and blue tokens used to play a game. The mass of one red token is 90 grams, and the mass of one blue token is 120 grams. If the combined mass of the tokens is 3,810 grams, how many of the tokens in the jar are blue?

(A) 5

(B) 16

(C) 21

(D) 32

20 Mark for Review

How many distinct real solutions does the equation $4x^2 - 8x - 5 = 0$ have?

(A) Exactly one

(B) Exactly two

(C) Infinitely many

(D) Zero

22 Mark for Review

Circle R is defined by the equation $(x + 3)^2 + y^2 = 64$. If circle S is the result of shifting the graph of circle R to the right 7 units in the xy -plane, what is the equation of circle S?

(A) $(x + 3)^2 + (y - 7)^2 = 64$

(B) $(x + 3)^2 + (y + 7)^2 = 64$

(C) $(x - 4)^2 + y^2 = 64$

(D) $(x + 10)^2 + y^2 = 64$

STOP

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.

SAT Prep Test 1—Math

Module 2—Harder

Turn to Section 2 of your answer sheet (p. 76) to answer the questions in this section.

DIRECTIONS

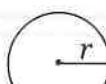
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NOTES

Unless otherwise indicated:

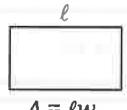
- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

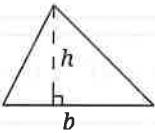


$$A = \pi r^2$$

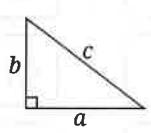
$$C = 2\pi r$$



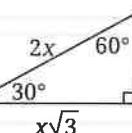
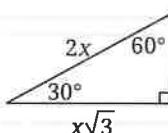
$$A = lw$$



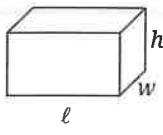
$$A = \frac{1}{2}bh$$



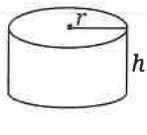
$$c^2 = a^2 + b^2$$



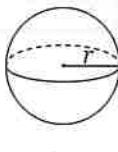
Special Right Triangles



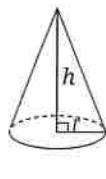
$$V = lwh$$



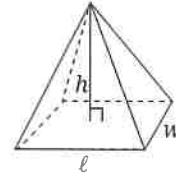
$$V = \pi r^2 h$$



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



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



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

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

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 ($7/2$) or its decimal equivalent (3.5).
- Don't enter **symbols** such as a percent sign, comma, or dollar sign in your circled answer.

CONTINUE ➔

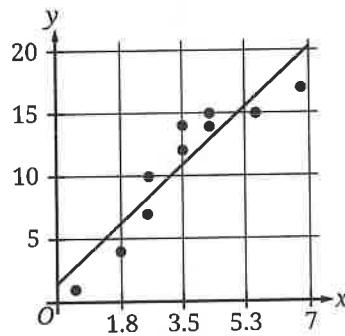
Section 2, Module 2—Harder: Math

1 Mark for Review

A fruit stand sells a total of 200 apples and bananas. The apples are sold in bags of 4 apples per bag, and the bananas are sold in bunches of 6 bananas each. Which of the following equations best represents the number of bags of apples, a , and bunches of bananas, b , that could be sold at the fruit stand?

- (A) $(a + b)(4 + 6) = 200$
- (B) $(4 + a)(6 + b) = 200$
- (C) $4a + 6b = 200$
- (D) $6a + 4b = 200$

2 Mark for Review



The relationship between two variables, x and y , is shown on the scatterplot, and a line of best fit is also shown. Which of the following equations best represents the line of best fit?

- (A) $y = -1.5 - 2.7x$
- (B) $y = -1.5 + 2.7x$
- (C) $y = 1.5 - 2.7x$
- (D) $y = 1.5 + 2.7x$

3 Mark for Review

A random sample of the 120 members of a cycling club was given a survey. The survey asked the cycling club members whether they plan to compete in an upcoming race. Of those surveyed, 45% responded that they do not plan to compete in the upcoming race. Which of the following is the best estimate of the total number of cycling club members who do not plan to compete in the upcoming race, based on the survey?

- (A) 45
- (B) 54
- (C) 66
- (D) 120

4 Mark for Review

x	$g(x)$
-1	-11
0	-5
1	-7
2	-17

The table shows four values of x and their corresponding values of $g(x)$ for the quadratic function g . Which of the following equations defines function g ?

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

CONTINUE ➔

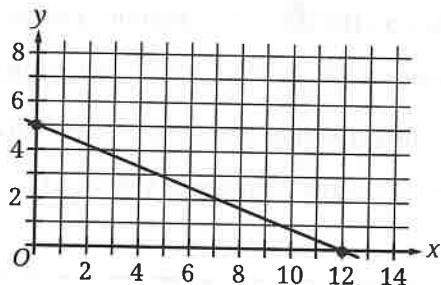
Section 2, Module 2—Harder Math

5 Mark for Review

$$f(x) = \frac{x-12}{8}$$

The equation given defines function f . If c is a constant, for which value of c does $f(c) = 20$?

- (A) 1
- (B) 20
- (C) 148
- (D) 172

6 Mark for Review

The point with coordinates $(3, n)$ lies on the line shown. What is the value of n ?

- (A) $\frac{13}{4}$
- (B) $\frac{15}{4}$
- (C) $\frac{19}{5}$
- (D) $\frac{24}{7}$

7 Mark for Review

Line l is graphed in the xy -plane and is defined by $7 + 4y = -16x$. If line m is parallel to line l , what is the slope of line m ?

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

8 Mark for Review

A concrete block in the shape of a rectangular solid has a mass of 1,690 kilograms. The block has a length of 1.1 meters, a width of 0.8 meters, and a height of 0.8 meters. To the nearest whole number, what is the density, in kilograms per cubic meter, of the concrete block?

- (A) 1,082
- (B) 1,190
- (C) 2,401
- (D) 2,641

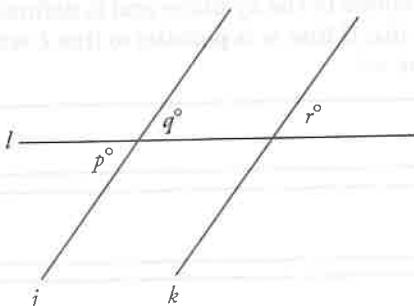
CONTINUE

Section 2, Module 2—Harder: Math

WEEK 1.6

9

Mark for Review



Note: Figure not drawn to scale.

In the figure shown, line l intersects parallel lines j and k . If $q = 10c - 11$ and $r = 15c + 41$, what is the value of p ?

- (A) 6
- (B) 49
- (C) 115
- (D) 131

10

Mark for Review

$$-7(px + q) = \frac{42}{23}x + \frac{35}{9}$$

The given equation, where p and q are constants, has infinitely many solutions. If $p < 0$, what is the value of q ?

11

Mark for Review

During the last business quarter, the number of unique visitors to a small e-commerce website decreased by 25% from its previous average of 620 unique visitors each day. At the start of the upcoming quarter, the website will launch a promotion, and the resulting number of unique visitors per day is projected to be 180% of the number of visitors last quarter. What is the projected average number of unique visitors per day the website will receive during its promotion?

12

Mark for Review

The amount, in micrograms, of a certain radioactive isotope b hours after its initial creation is modeled by the function $M(b) = 302(0.87)^{\left(\frac{4}{5}\right)b}$. According to the model, the amount of the isotope is predicted to decrease by $d\%$ every 75 minutes. What is the value of d ?

- (A) 0.87
- (B) 13
- (C) 16.25
- (D) 87

CONTINUE ➔

Section 2, Module 2—Harder Math

13 Mark for Review

Packages in a warehouse are split into two groups. Group X contains 40 packages, and group Y contains 110 packages. If the mean mass of the packages in group X is 24 kilograms (kg), and the mean mass of the packages in group Y is 9 kg, what is the mean mass, in kg, of all 150 packages?

15 Mark for Review

The equation $3x^2 - 36x + k = 0$ has exactly two real solutions. If k is a constant and $k < m$, what is the least possible value of m ?

14 Mark for Review

$$11x^2 - kx + 63$$

The given expression, where k is a constant, can be rewritten as $(px - q)(x - r)$, where p , q , and r are integer constants. Which of the following must be an integer?

(A) $\frac{63}{r}$

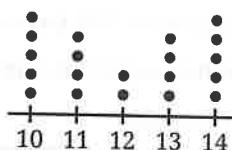
(B) $\frac{63}{p}$

(C) $\frac{k}{r}$

(D) $\frac{k}{p}$

16 Mark for Review

Data Set R



There are 20 values in data set R, represented by the dot plot shown. Data set S is created by subtracting 8 from each of the values in data set R. Which of the following correctly compares the ranges and the means of data sets R and S?

(A) The range of data set S is less than the range of data set R, and the mean of data set S is equal to the mean of data set R.

(B) The range of data set S is less than the range of data set R, and the mean of data set S is less than the mean of data set R.

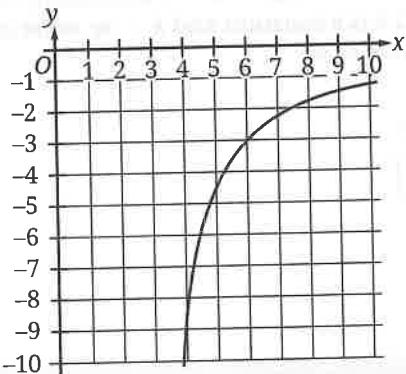
(C) The range of data set S is equal to the range of data set R, and the mean of data set S is equal to the mean of data set R.

(D) The range of data set S is equal to the range of data set R, and the mean of data set S is less than the mean of data set R.

CONTINUE

Section 2, Module 2—Harder: Math

17

Mark for Review

The function g is defined by the equation $g(x) = \frac{c}{x-d}$, where c and d are constants. The partial graph of $y = g(x)$ is shown. Which equation could define function h if $h(x) = g(x-3)$?

(A) $h(x) = -\frac{9}{x-6}$

(B) $h(x) = -\frac{9}{x-3}$

(C) $h(x) = \frac{-9}{x}$

(D) $h(x) = \frac{-9(x-3)}{x-3}$

18 **Mark for Review**

$$y = x^2 - 6x - c$$

$$y = 3.5$$

If the given system of equations has exactly one real solution, and c is a negative constant, what is the value of c ?

19

Mark for Review

A circle with the equation $x^2 - \frac{1}{2}x + y^2 - \frac{1}{2}y = \frac{7}{8}$ is graphed in the xy -plane. What is the length of the radius of this circle?

20

Mark for Review

In the equation $18x^2 - (18n - m)x - mn = 0$, m and n are positive constants. If the product of the solutions to the given equation is kmn , where k is a constant, what is the value of k ?

(A) -18

(B) $-\frac{1}{18}$

(C) $\frac{1}{9}$

(D) 1

Section 2, Module 2—Harder: Math**21** **Mark for Review**

The equation of a parabola is written in the form $y = ax^2 + bx + c$, where a , b , and c are constants. When graphed in the xy -plane, the parabola has vertex $(-1, 4)$ and does not intersect the x -axis. Which of the following could be the value of $a - b - c$?

(A) -5

(B) -4

(C) 0

(D) 4

22 **Mark for Review**

A rectangular prism has a height of 50 centimeters (cm). The base of the prism is a square and the surface area of the prism is $S \text{ cm}^2$. If the prism is divided into two identical rectangular prisms by making a cut parallel to the square base, each resulting prism has a surface area of $\frac{31}{56}S \text{ cm}^2$. What is the side length, in cm, of each square base?

(A) 5

(B) 6

(C) 12

(D) 24

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.