

March 2018

Math Tests

The SAT

Question- and-Answer Service

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What's inside:

- Test questions
- The Essay prompt administered on your test day



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Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

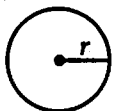
DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 16-20, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

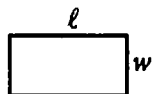
1. The use of a calculator is not permitted.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE

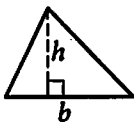


$$A = \pi r^2$$

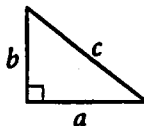
$$C = 2\pi r$$



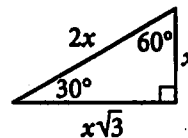
$$A = \ell w$$



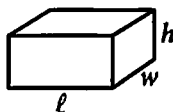
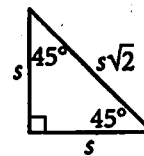
$$A = \frac{1}{2}bh$$



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



Special Right Triangles



$$V = \ell wh$$



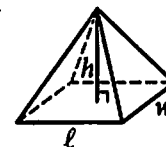
$$V = \pi r^2 h$$



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



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



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

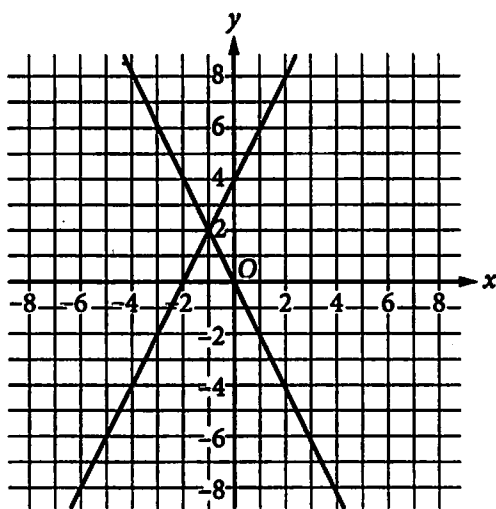
The number of degrees of arc in a circle is 360.

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

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



1



The lines in the xy -plane above are the graphs of two linear equations. What is the solution (x, y) to the system formed by the equations?

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

2

A checkers enthusiast is customizing a checkers set by painting a design on each of the 24 checkers in the set. It takes the enthusiast 35 minutes to paint the design on each checker. If c of the checkers are already painted, which of the following represents the number of additional minutes needed to finish painting the set of checkers?

- A) $24(35 - c)$
- B) $24(c - 35)$
- C) $35(24 - c)$
- D) $35(c - 24)$

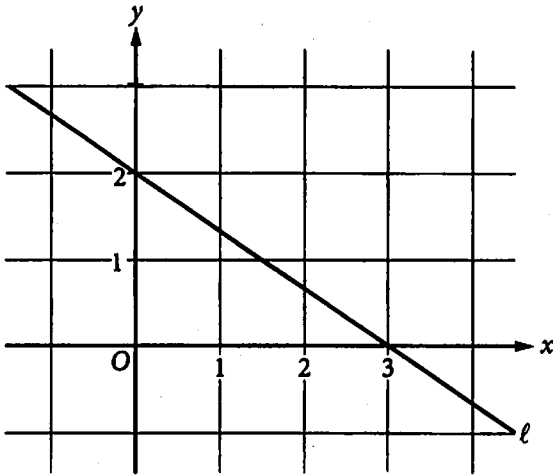
3

What is the sum of $(3x^5 + 4x^2 + 8)$ and $(12x^3 - 2x^2 + 6)$?

- A) $15x^8 + 2x^2 + 14$
- B) $3x^5 + 12x^3 + 2x^2 + 14$
- C) $3x^5 + 12x^3 + 6x^2 + 14$
- D) $3x^5 + 12x^3 + 4x^2 - 2x + 14$



4



Line ℓ is shown in the xy -plane above. Line m (not shown) is parallel to line ℓ and passes through the point $(0, 3)$. Which of the following is an equation of line m ?

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

5

What are the slope and the y -intercept of the graph in the xy -plane of the equation $5x + 4y + 3 = 0$?

- A) The slope is $-\frac{5}{4}$, and the y -intercept is $(0, -\frac{3}{4})$.
 B) The slope is $-\frac{5}{4}$, and the y -intercept is $(0, \frac{3}{4})$.
 C) The slope is $\frac{5}{4}$, and the y -intercept is $(0, -\frac{3}{4})$.
 D) The slope is $\frac{5}{4}$, and the y -intercept is $(0, \frac{3}{4})$.

6

$$\frac{1}{4}x - 2 = 3 - x$$

What value of x satisfies the equation above?

- A) $\frac{4}{3}$
 B) 4
 C) 5
 D) $\frac{20}{3}$



7

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

What is the solution set to the equation above?

- A) $\left\{\frac{1}{2}, -2\right\}$
- B) $\left\{-\frac{1}{2}, 2\right\}$
- C) $\left\{\frac{1}{2}, -2, 2\right\}$
- D) $\left\{-\frac{1}{2}, -2, 2\right\}$

8

$$(3 + 4i) - (2 + 3i)$$

In the complex number system, which of the following is equivalent to the expression above?

(Note: $i = \sqrt{-1}$)

- A) 0
- B) $1 + i$
- C) $-1 - i$
- D) $-5 - 7i$

9

$$\frac{x-1}{3} = \frac{x+1}{2}$$

What is the solution to the equation shown?

- A) -5
- B) -2
- C) 0
- D) 1

10

$$P(x) = x^2 - 11x + k$$

In the function above, k is a constant. If 2 is a zero of the function, what is the value of k ?

- A) -18
- B) -2
- C) 3
- D) 18



11

$$\frac{2}{3x^2} - \frac{1}{6x^2}$$

Which of the following expressions is equivalent to the expression above for $x > 0$?

- A) $-\frac{1}{2x^2}$
- B) $-\frac{1}{3x^2}$
- C) $\frac{1}{3x^2}$
- D) $\frac{1}{2x^2}$

12

$$\frac{x-2}{x-3} = \frac{1}{x} + \frac{1}{x-3}$$

What is the solution set of the equation above?

- A) {1}
- B) {0, 3}
- C) {1, 2}
- D) {1, 3}

13

$$P(t) = 60(3)^{\frac{t}{2}}$$

The number of microscopic organisms in a petri dish grows exponentially with time. The function P above models the number of organisms after growing for t days in the petri dish. Based on the function, which of the following statements is true?

- A) The predicted number of organisms in the dish triples every two days.
- B) The predicted number of organisms in the dish doubles every three days.
- C) The predicted number of organisms in the dish triples every day.
- D) The predicted number of organisms in the dish doubles every day.



14

In the xy -plane, the graph of the equation $y = 9x - 8$ intersects the graph of the equation $y = x^2$ at two points. What is the sum of the x -coordinates of the two points?

- A) -9
- B) -7
- C) 7
- D) 9

15

Which of the following expressions is equivalent to $(-4x^3)^{\frac{2}{3}}$?

- A) $-2x^3 \cdot \sqrt[3]{2}$
- B) $-x^3 \cdot \sqrt[3]{16}$
- C) $2x^2 \cdot \sqrt{2}$
- D) $2x^2 \cdot \sqrt[3]{16}$

**DIRECTIONS**

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If $\begin{array}{|c|c|c|c|} \hline 3 & 1 & / & 2 \\ \hline \bullet & \bullet & / & \bullet \\ \hline \end{array}$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer in boxes. →

Grid in result. ←

← Fraction line

← Decimal point

Answer: $\frac{7}{12}$

	7	/	1	2
•	•	•	•	•
	0	0	0	
1	1	•	1	
2	2	2	•	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
•	7	7	7	
8	8	8	8	
9	9	9	9	

Answer: 2.5

	2	.	5	
•	•	•	•	•
	0	0	0	
1	1	1	1	
2	•	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	•	
6	6	6	6	
7	7	7	7	
8	8	8	8	
9	9	9	9	

Acceptable ways to grid $\frac{2}{3}$ are:

	2	/	3	
•	•	•	•	•
	0	0	0	
1	1	1	1	
2	•	2	2	
3	3	3	•	
4	4	4	4	
5	5	5	5	
6	6	6	6	
7	7	7	7	

.	6	6	6	
•	•	•	•	•
	0	0	0	
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	•	•	•	
7	7	7	7	

.	6	6	7	
•	•	•	•	•
	0	0	0	
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	•	•	6	
7	7	7	•	

Answer: 201 – either position is correct

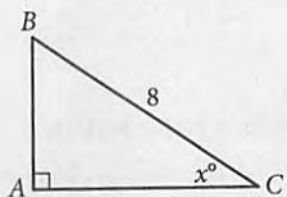
	2	0	1	
•	•	•	•	•
	0	•	0	
1	1	1	•	
2	•	2	2	
3	3	3	3	

	2	0	1	
•	•	•	•	•
	•	0	0	
1	1	•	1	
2	•	2	2	
3	3	3	3	

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



16



Note: Figure not drawn to scale.

In right triangle ABC above, $BC = 8$. If the cosine of x° is $\frac{\sqrt{3}}{2}$, what is the length of \overline{AB} ?

17

$$\frac{1}{x} + \frac{1}{x-1} = 0$$

What value of x satisfies the equation above?

18

For a function f , $f(-1) = 12$ and $f(1) = 16$. If the graph of $y = f(x)$ is a line in the xy -plane, what is the slope of the line?

19

An angle measure of 540 degrees was written in radians as $x\pi$. What is the value of x ?

20

Tamika is ordering desktop computers for her company. The desktop computers cost \$375 each, and tax is an additional 6% of the total cost of the computers. If she can spend no more than \$40,000 on the desktop computers, including tax, what is the maximum number of computers that Tamika can purchase?

STOP

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



Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

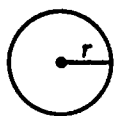
DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 31-38, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

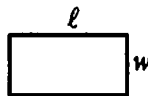
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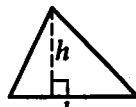


$$A = \pi r^2$$

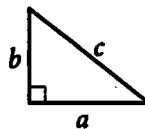
$$C = 2\pi r$$



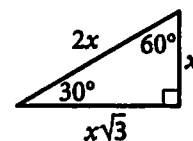
$$A = \ell w$$



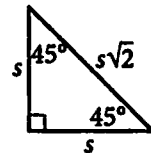
$$A = \frac{1}{2}bh$$



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



Special Right Triangles



$$V = \ell wh$$



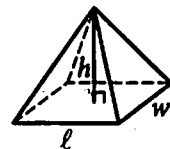
$$V = \pi r^2 h$$



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



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



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

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

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

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



$$(3x + 2)(2x + 3)$$

Which of the following is equivalent to the expression above?

- A) $3x^2 + 10x + 5$
- B) $5x^2 + 13x + 5$
- C) $6x^2 + 13x + 6$
- D) $6x^2 + 15x + 9$

$$f(x) = 2x - 11$$

The function f is defined above. What is the value of $f(-2)$?

- A) -15
- B) -7
- C) 15
- D) 30

Number of Flight Arrivals at Centerville Airport in a Month

	On time	Delayed	Total
Airline A	2,029	861	2,890
Airline B	1,150	700	1,850
Total	3,179	1,561	4,740

Based on the table above, what fraction of the flights for Airline A were delayed?

- A) $\frac{700}{1,850}$
- B) $\frac{861}{1,561}$
- C) $\frac{861}{2,890}$
- D) $\frac{2,029}{2,890}$

A political scientist wants to predict how the residents of New Jersey will react to a new bill proposed in the state senate. Which of the following study designs is most likely to provide reliable results for the political scientist?

- A) Mailing a questionnaire to each of 200 randomly selected residents of New Jersey
- B) Surveying a group of 300 randomly selected New Jersey residents
- C) Interviewing a group of students randomly selected from a large public university in New Jersey
- D) Surveying a group of 1,500 randomly selected US residents



5

If the ratio of $0.5 : x$ is equivalent to $1.5 : 2.25$, what is the value of x ?

- A) 0.75
- B) 1.6875
- C) 3
- D) 3.25

6

$$8ax - 4 = 24$$

Based on the equation above, what is the value of $2ax - 1$?

- A) 3
- B) 6
- C) 8
- D) 12

7

$$P = 2,000x$$

$$P = 500(2^x)$$

A website administrator is considering using one of the two models above to predict the total number of purchases, P , made x weeks after the website's advertising campaign begins. How many more purchases are predicted by the exponential model than by the linear model 5 weeks after the advertising campaign begins?

- A) 6,000
- B) 8,000
- C) 10,000
- D) 16,000

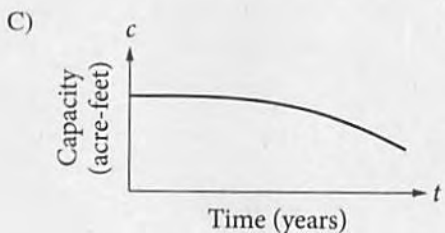
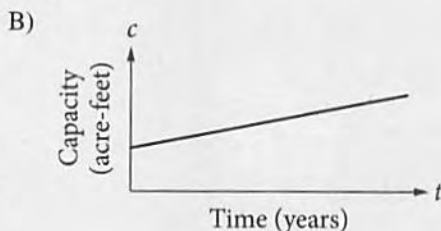
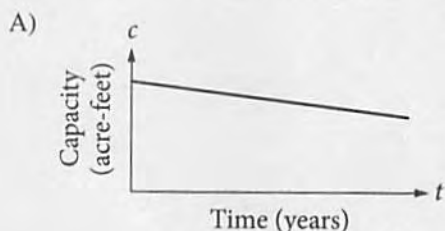


Questions 8-10 refer to the following information.

The Conowingo Reservoir had an original storage capacity of 300,000 acre-feet at the end of 1928, the year in which it was built. Starting in 1929, sediment carried downstream by the Susquehanna River collected in the reservoir and began reducing the reservoir's storage capacity at the approximate rate of 1,700 acre-feet per year.

8

Which of the following could be a graph of the reservoir's capacity c , in acre-feet, as a function of time t , in years, after 1928?



9

What was the approximate storage capacity, in acre-feet, of the reservoir at the end of 1993?

- A) 300,000
- B) 189,500
- C) 175,000
- D) 159,500

10

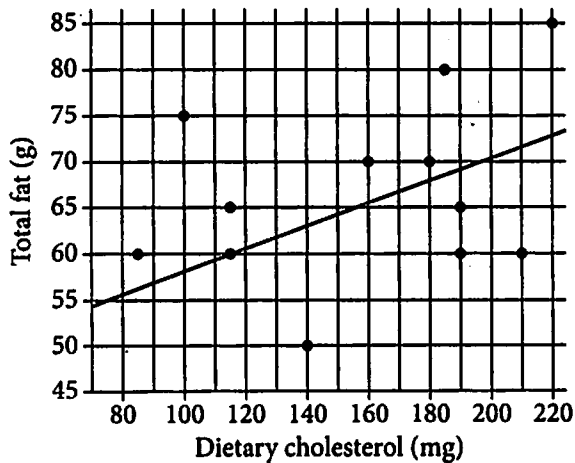
If the reservoir's capacity t years after 1928 was between 290,000 and 292,000 acre-feet, which of the following must be true?

- A) $t < 2$
- B) $2 < t < 4$
- C) $4 < t < 6$
- D) $6 < t < 8$



11

Total Fat and Dietary Cholesterol of Sandwiches



The scatterplot above shows the relationship between the amount of dietary cholesterol, in milligrams (mg), and the amount of total fat, in grams (g), in the 12 sandwiches offered by a certain restaurant. The line of best fit predicts the amount of total fat a sandwich has based on the amount of dietary cholesterol in the sandwich. How many grams of total fat are in the sandwich for which this prediction is the most accurate?

- A) 140
- B) 115
- C) 85
- D) 60

12

Which of the following is a solution to the equation

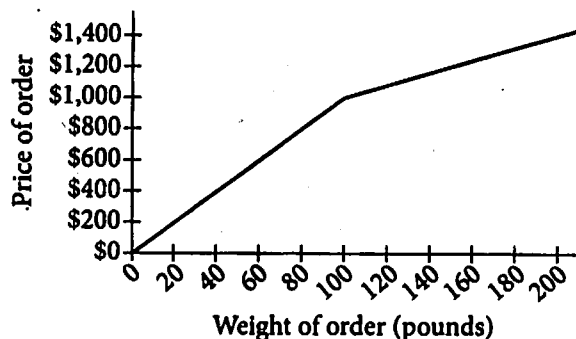
$$\sqrt{14 - x} + 2 = x ?$$

- I. -2
 - II. 1
 - III. 5
- A) I only
 - B) II only
 - C) III only
 - D) I and III



13

Fragrance Oil Price



The graph above shows the price that a chemical company charges for an order of fragrance oil, depending on the weight of the order. Based on the graph, which of the following statements must be true?

- A) The company charges more per pound for orders greater than 100 pounds than for orders less than 100 pounds.
- B) The company charges less per pound for orders greater than 100 pounds than for orders less than 100 pounds.
- C) The company charges less per pound for orders greater than 1,000 pounds than for orders less than 1,000 pounds.
- D) The company charges the same price per pound, regardless of order size.

14

If $2x + 3 = x - 4$, what is the value of $x + 8$?

- A) -7
- B) -1
- C) 1
- D) 7

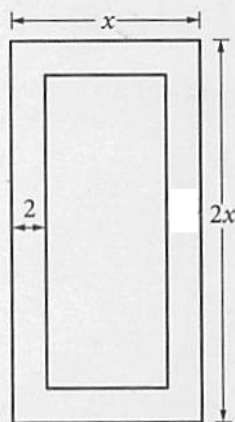
15

A group of 10 students played a certain game. Every player received a score equal to an integer from 1 to 10, inclusive. For the 10 players, the mean score was 4. If more than half of the players received a score greater than 5, which of the following is true about the mean score of the remaining players?

- A) It must be less than 4.
- B) It must be equal to 4.
- C) It must be between 4 and 5.
- D) It must be greater than 5.



16



The figure above represents a rectangular painting with a frame that is 2 inches wide. The expression $2x^2 - (x - 4)(2x - 4)$ represents the area of the frame, in square inches. What does the quantity $(x - 4)(2x - 4)$ in the expression represent?

- A) The width of the painting, in inches
- B) The height of the frame, in inches
- C) The area, in square inches, of the inner rectangle
- D) The combined area, in square inches, of the frame and painting

17

$$f(x) = x(x + 5)$$

The function f is defined above. If the function g is defined by $g(x) = f(x) + 5$, what is the value of $g(3)$?

- A) 8
- B) 15
- C) 24
- D) 29

18

A sample of 600 ninth graders was selected at random and asked how much time they spend on homework each day. Of the ninth graders selected, 220 spend less than 2 hours on homework each day. If the conclusion was drawn that “approximately 1.35 million ninth graders spend less than 2 hours on homework each day,” which of the following is closest to the population, in millions, of ninth graders?

- A) 0.495
- B) 1.35
- C) 3.68
- D) 5.84

19

$$\begin{aligned} y &= -2 \\ y + 11 &= x^2 \end{aligned}$$

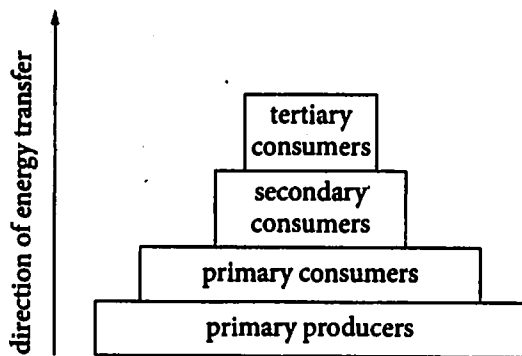
If (x_1, y_1) and (x_2, y_2) are solutions to the system of equations above, what are the values of x_1 and x_2 ?

- A) $-\sqrt{13}$ and $\sqrt{13}$
- B) $-\sqrt{11}$ and $\sqrt{11}$
- C) -2 and 2
- D) -3 and 3



20

The energy pyramid below shows four trophic levels in an ecosystem and the direction of energy transfer between those levels.



On average, 10% of the net energy of one trophic level is transferred to the next trophic level in an ecosystem. Based on the energy pyramid, if primary producers have 5,000 joules (J) of energy, approximately how much of this energy, in calories, is transferred to the secondary consumers in this ecosystem? (1 calorie = 4.18 J)

- A) 11.96
- B) 20.90
- C) 119.6
- D) 209.0

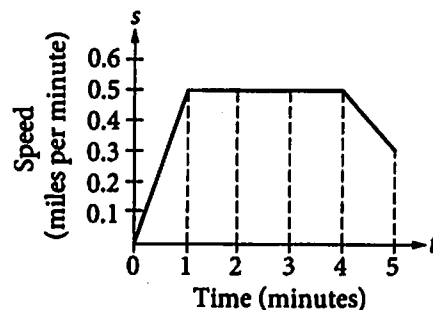
21

$$\sqrt[a]{x^b}$$

Which of the following is equivalent to the expression above for all $x > 0$, where a and b are positive integers?

- A) x^{ab}
- B) $x^{\frac{a}{b}}$
- C) $x^{\frac{b}{a}}$
- D) x^{a-b}

22

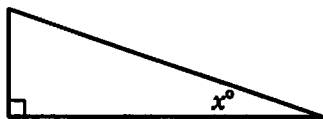


The graph above models the speed, s , of an automobile during the first 5 minutes of travel time, t . What was the total distance traveled from $t = 1$ to $t = 4$?

- A) 0.5 mile
- B) 1.5 miles
- C) 2.0 miles
- D) 2.5 miles



23



Note: Figure not drawn to scale.

In the figure above, $\sin(90^\circ - x^\circ) = \frac{12}{13}$. What is the value of $\sin x^\circ$?

- A) $\frac{12}{13}$
- B) $\frac{5}{13}$
- C) $\frac{5}{12}$
- D) $\frac{13}{12}$

24

$$s = 9.8t$$

The equation above can be used to approximate the speed s , in meters per second (m/s), of an object t seconds after being dropped into a free fall. Which of the following is the best interpretation of the number 9.8 in this context?

- A) The speed, in m/s, of the object when it hits the ground
- B) The increase in speed, in m/s, of the object for each second after it is dropped
- C) The speed, in m/s, of the object t seconds after it is dropped
- D) The initial speed, in m/s, of the object when it is dropped

25

A magazine article on video game habits in the United States reported that in 2012 gamers spent an average of 5.6 hours per week playing games. The article also reported the average for 2013 to be 6.3 hours per week. Based on the article, how did the average number of hours that gamers spent playing games per week change from 2012 to 2013?

- A) It decreased by 12.5%.
- B) It increased by 7.0%.
- C) It increased by 11.1%.
- D) It increased by 12.5%.



26

$$\begin{aligned}5x + y &= a \\ -3x - 2y &= 5\end{aligned}$$

In the system of equations above, a is a constant. What is the y -value of the solution to the system in terms of a ?

- A) $\frac{-3a - 25}{7}$
B) $\frac{a - 1}{7}$
C) $\frac{2a + 5}{7}$
D) $\frac{10a + 5}{7}$

27

$$y = x^2 - 6x - 16$$

The graph of the equation above in the xy -plane is a parabola. Which of the following equivalent forms of the equation includes the x - and y -coordinates of the vertex as constants?

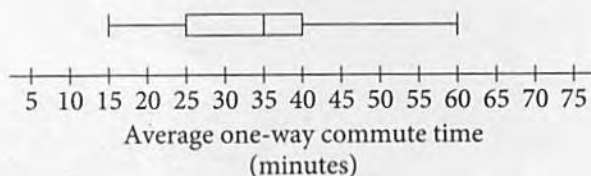
- A) $y = (x - 3)^2 - 25$
B) $y = x(x - 6) - 16$
C) $y = x^2 - 2(3x + 8)$
D) $y + 16 = x(x - 6)$



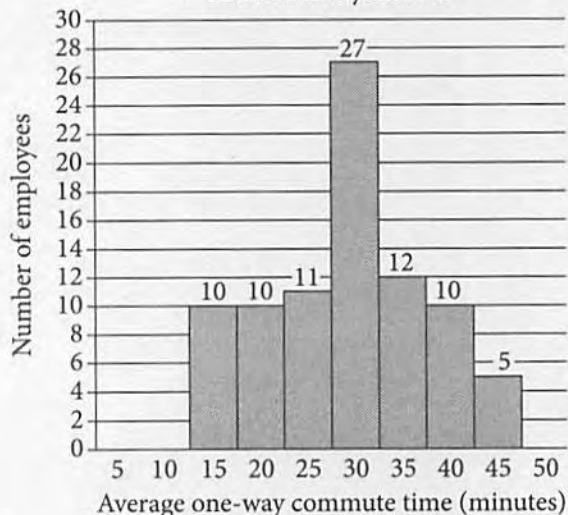
Questions 28 and 29 refer to the following information.

For a particular office building with 1,420 employees, Tia and Amir each conducted a survey about the average one-way commute times, in minutes, between the employees' home and office. Both Tia and Amir selected employees at random, mailed out surveys, and collected data from the returned surveys. For both surveys, respondents were asked to report their average commute times to the nearest 5 minutes. Tia collected data from 150 employees, and Amir collected data from 85 employees. The results from Tia's and Amir's returned surveys are summarized below.

Tia's Survey Results



Amir's Survey Results



28

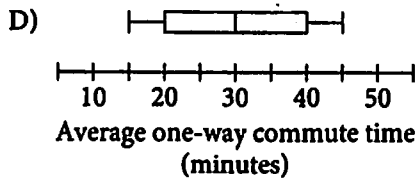
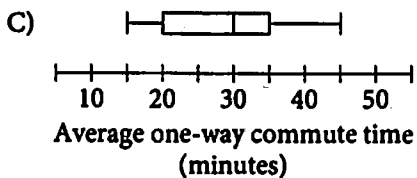
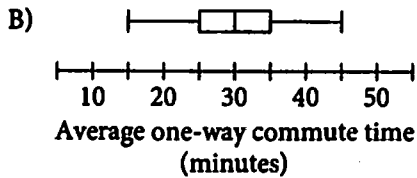
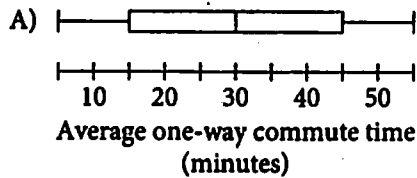
If T is the median commute time of the employees who responded to Tia's survey and A is the median commute time of the employees who responded to Amir's survey, what is the value of $T - A$?

- A) 10
- B) 8
- C) 5
- D) 0

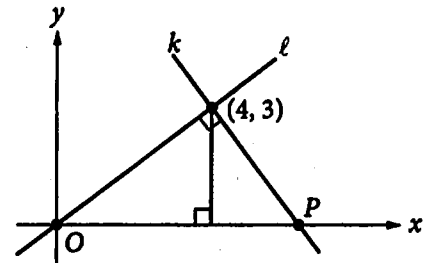


29

Which of the following box plots could represent Amir's survey data?



30



In the xy -plane above, lines k and l are perpendicular. What is the x -coordinate of point P ?

- A) 5.25
- B) 5.75
- C) 6
- D) 6.25

**DIRECTIONS**

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.

- Mixed numbers** such as $3\frac{1}{2}$ must be gridded

as 3.5 or $7/2$. (If $\begin{array}{|c|c|c|c|} \hline 3 & 1 & / & 2 \\ \hline \bullet & \bullet & \bullet & \bullet \\ \hline \end{array}$ is entered into the grid, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)

- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer in boxes. →

Answer: $\frac{7}{12}$

7	/	1	2
•	•	•	•
0	0	0	0
1	1	•	1
2	2	2	•
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
•	7	7	7
8	8	8	8
9	9	9	9

← Fraction line

Grid in result.

Answer: 2.5

2	.	5	
•	•	•	•
0	0	0	0
1	1	1	1
2	•	2	2
3	3	3	3
4	4	4	4
5	5	5	•
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Decimal point

Acceptable ways to grid $\frac{2}{3}$ are:

2	/	3	
•	•	•	•
0	0	0	0
1	1	1	1
2	•	2	2
3	3	3	•
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7

.	6	6	6
•	•	•	•
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	•	•	•
7	7	7	7

.	6	6	7
•	•	•	•
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	•	•	6
7	7	7	•

Answer: 201 – either position is correct

2	0	1	
•	•	•	•
0	•	0	
1	1	1	•
2	•	2	2
3	3	3	3

2	0	1	
•	•	•	•
•	0	0	
1	1	•	1
•	2	2	2
3	3	3	3

NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



31

A museum built a scale model of an *Apatosaurus* dinosaur skeleton, where 1 centimeter in the model is equivalent to 16 centimeters of the actual skeleton. If the length of the femur bone of the actual skeleton is 184 centimeters, what is the length, to the nearest tenth of a centimeter, of the femur bone in the model?

32

How many cups, each with a capacity of 8 fluid ounces, can be filled with water from a cooler that contains 10 gallons of water? (1 gallon = 128 fluid ounces)

33

In triangle ABC , angle A measures 48° , angle B measures 88° , and angle C measures 44° .

Triangle ABC is similar to triangle LMN , such that

$$\frac{LM}{AB} = \frac{MN}{BC} = \frac{LN}{AC} = 3.$$

What is the measure, in degrees, of angle L ?

34

$$\begin{aligned} \frac{1}{2}y &= \frac{19}{12} - \frac{1}{3}x \\ 5y &= 3x \end{aligned}$$

In the xy -plane, the lines that correspond to the system of equations above intersect at the point (a, b) . What is the value of $\frac{a}{b}$?



35

$$z = \frac{5}{2}z - \frac{21}{8}$$

What value of z satisfies the equation above?

36

A circle in the xy -plane has a diameter with endpoints $(-1, -3)$ and $(7, 3)$. If the point $(0, b)$ lies on the circle and $b > 0$, what is the value of b ?

Questions 37 and 38 refer to the following information.

Race Summary

Split number	Race segment (meters)	Split time (seconds)	Total race time at end of split (seconds)
1	0–500	109	109
2	500–1000	112	221
3	1000–1500	111	332
4	1500–2000	108	440

A rowing team entered a 2000-meter race. The team's coach is analyzing the race based on the team's split times, as shown in the table above. A split time is the time it takes to complete a 500-meter segment of the race.

37

During the fourth split of the race, the team rowed at a rate of 28 strokes per minute. To the nearest whole number, how many strokes did it take the team to complete the final 500 meters of the race?

38

By the end of the season, the coach wants the team to reduce its mean split time by 10% as compared to this race. At the end of the season, what should the team's mean split time be, in seconds?

STOP

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

Answer Key – Determine Raw Scores

Reading Test Answers

Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer
1	C	14	C	27	B	40	B
2	D	15	D	28	B	41	A
3	B	16	B	29	C	42	A
4	D	17	B	30	A	43	A
5	B	18	D	31	D	44	C
6	B	19	B	32	A	45	B
7	C	20	D	33	D	46	C
8	D	21	D	34	C	47	D
9	A	22	B	35	C	48	C
10	C	23	A	36	C	49	A
11	C	24	B	37	D	50	A
12	A	25	D	38	A	51	A
13	B	26	D	39	B	52	D

Reading Test Raw Score
(Number of Correct Answers)

Writing and Language Test Answers

Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer
1	C	12	D	23	B	34	A
2	D	13	C	24	C	35	D
3	C	14	C	25	B	36	D
4	C	15	B	26	D	37	B
5	A	16	D	27	C	38	B
6	C	17	A	28	D	39	D
7	A	18	D	29	A	40	A
8	A	19	B	30	B	41	D
9	B	20	A	31	C	42	C
10	B	21	B	32	C	43	B
11	D	22	B	33	D	44	A

Writing and Language Test Raw Score
(Number of Correct Answers)

“U” indicates a question that did not perform as expected and has been removed from scoring.

Answer Key – Determine Raw Scores (continued)

Math Test – No Calculator Answers

Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer
1	B	5	A	9	A	13	A
2	C	6	B	10	D	14	D
3	B	7	A	11	D	15	C
4	A	8	B	12	A		
Question #	Correct Answer						
16	4						
17	1/2, 5						
18	2						
19	3						
20	100						

Math Test – No Calculator Raw Score
(Number of Correct Answers)

Math Test – Calculator Answers

Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer	Question #	Correct Answer
1	C	9	B	17	D	25	D
2	A	10	C	18	C	26	A
3	C	11	D	19	D	27	A
4	B	12	C	20	A	28	C
5	A	13	B	21	C	29	B
6	B	14	C	22	B	30	D
7	A	15	A	23	B		
8	A	16	C	24	B		
Question #	Correct Answer						
31	23/2, 11.5						
32	160						
33	48						
34	5/3, 1.66, 1.67						
35	7/4, 1.75						
36	4						
37	50						
38	99						

Math Test – Calculator Raw Score
(Number of Correct Answers)

"U" indicates a question that did not perform as expected and has been removed from scoring.

GET CROSS-TEST SCORES

The new SAT also reports two cross-test scores: Analysis in History/Social Studies and Analysis in Science. These scores are based on questions in the Reading, Writing and Language, and Math Tests that ask you to think analytically about texts and questions in these subject areas.

Cross-test scores are reported on a scale of 10–40.

Calculating Your Cross-Test Scores

You can use the cross-test score tables beginning on the next page to calculate your cross-test scores as follows:

1. Find the questions in each section that count toward each cross-test score. These are shown with a "Y" next to the question number in the tables. Refer to your QAS report to see which of those questions you answered correctly on the test, and then check the box for each correct answer.
2. Count the number of correct answers for each cross-test area and record that as your raw score for that area.
3. Use the conversion table on page 12 to determine your scaled score (10–40) for each area.

Cross-Test Scores Tables – Determine Cross-Test Raw Scores

Y = Counts toward Cross-Test score. On your QAS report, look up every question marked "Y" below to see if you answered it correctly. If so, check off the box for that question below.

Analysis in History/Social Studies (HSS)			
Reading	Writing and Language	Math Test - Calculator	Math Test - No Calculator
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39		
40	40		
41	41		
42	42		
43	43		
44	44		
45			
46			
47			
48			
49			
50			
51			
52			

HSS Raw Score

Analysis in Science (SCI)			
Reading	Writing and Language	Math Test - Calculator	Math Test - No Calculator
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39		
40	40		
41	41		
42	42		
43	43	43	43
44	44	44	44
45	45		
46	46		
47	47		
48	48		
49	49		
50	50		
51	51		
52	52		

SCI Raw Score

GET SUBSCORES

Subscores provide more detailed information about your strengths in specific areas within literacy and math.

Subscores are reported on a scale of 1–15.

- ▶ The **Command of Evidence** subscore is based on questions from both the Reading Test and the Writing and Language Test that ask you to interpret and use evidence found in a wide range of passages and informational graphics, such as graphs, tables, and charts.
- ▶ The **Words in Context** subscore is based on questions from both the Reading Test and the Writing and Language Test that address the meaning in context of words/phrases and rhetorical word choice.
- ▶ The **Expression of Ideas** subscore is based on questions from the Writing and Language Test that focus on topic development, organization, and rhetorically effective use of language.
- ▶ The **Standard English Conventions** subscore is based on questions from the Writing and Language Test that focus on sentence structure, usage, and punctuation.
- ▶ The **Heart of Algebra** subscore is based on questions from the Math Test that focus on linear equations and inequalities.
- ▶ The **Problem Solving and Data Analysis** subscore is based on questions from the Math Test that focus on quantitative reasoning, the interpretation and synthesis of data, and solving problems in rich and varied contexts.
- ▶ The **Passport to Advanced Math** subscore is based on questions from the Math Test that focus on topics central to the ability of students to progress to more advanced mathematics, such as understanding the structure of expressions, reasoning with more complex equations, and interpreting and building functions.

Calculating Your Subscores

You can use the subscore tables beginning on the next page to calculate your subscores as follows:

1. Find the questions that count toward each subscore. These are shown with a "Y" next to the question number in the tables. Refer to your QAS report to see which of those questions you answered correctly on the test, and then check the box for each correct answer.
2. Count the number of correct answers for each area and record that as your raw score for that area.
3. Finally, use the conversion table on page 13 to determine your scaled score (1–15) for each area.

Subscores Tables – Determine Subscore Raw Scores

Y= Counts toward subscore. On your QAS report, look up every question marked "Y" to see if you answered it correctly. If so, check off the box for that question.

Command of Evidence (COE)	
Reading	Writing and Language
1	1
2	2
3	3
4	4 Y <input type="checkbox"/>
5 Y <input type="checkbox"/>	5
6	6
7	7
8	8 Y <input type="checkbox"/>
9	9
10	10
11	11
12	12
13	13
14 Y <input type="checkbox"/>	14
15	15 Y <input type="checkbox"/>
16	16
17	17
18	18
19	19 Y <input type="checkbox"/>
20	20
21 Y <input type="checkbox"/>	21
22	22
23	23
24	24
25	25
26 Y <input type="checkbox"/>	26
27	27
28	28
29	29
30	30
31 Y <input type="checkbox"/>	31 Y <input type="checkbox"/>
32	32 Y <input type="checkbox"/>
33	33
34	34
35 Y <input type="checkbox"/>	35
36	36
37	37
38	38
39	39
40	40
41 Y <input type="checkbox"/>	41
42	42
43	43 Y <input type="checkbox"/>
44	44 Y <input type="checkbox"/>
45	
46 Y <input type="checkbox"/>	
47	
48	
49	
50	
51 Y <input type="checkbox"/>	
52 Y <input type="checkbox"/>	

COE Raw Score

Expression of Ideas (EOI)	
Reading	Writing and Language
1	1 Y <input type="checkbox"/>
2	2
3	3
4	4 Y <input type="checkbox"/>
5	5 Y <input type="checkbox"/>
6	6
7	7
8	8 Y <input type="checkbox"/>
9	9 Y <input type="checkbox"/>
10	10
11	11 Y <input type="checkbox"/>
12	12
13	13 Y <input type="checkbox"/>
14	14
15	15 Y <input type="checkbox"/>
16	16 Y <input type="checkbox"/>
17	17
18	18
19	19 Y <input type="checkbox"/>
20	20 Y <input type="checkbox"/>
21	21
22	22 Y <input type="checkbox"/>
23	23
24	24
25	25
26	26 Y <input type="checkbox"/>
27	27 Y <input type="checkbox"/>
28	28
29	29 Y <input type="checkbox"/>
30	30 Y <input type="checkbox"/>
31	31 Y <input type="checkbox"/>
32	32 Y <input type="checkbox"/>
33	33
34	34
35	35 Y <input type="checkbox"/>
36	36 Y <input type="checkbox"/>
37	37
38	38
39	39 Y <input type="checkbox"/>
40	40 Y <input type="checkbox"/>
41	41
42	42
43	43 Y <input type="checkbox"/>
44	44 Y <input type="checkbox"/>
45	
46	
47	
48	
49	
50	
51	
52	

EOI Raw Score

Words in Context (WIC)	
Reading	Writing and Language
1	1
2	2
3	3
4	4
5	5 Y <input type="checkbox"/>
6 Y <input type="checkbox"/>	6
7	7
8	8
9 Y <input type="checkbox"/>	9 Y <input type="checkbox"/>
10	10
11	11
12 Y <input type="checkbox"/>	12
13	13 Y <input type="checkbox"/>
14	14
15	15
16	16
17	17
18 Y <input type="checkbox"/>	18
19	19
20	20 Y <input type="checkbox"/>
21	21
22 Y <input type="checkbox"/>	22
23	23
24	24
25	25
26	26 Y <input type="checkbox"/>
27	27
28 Y <input type="checkbox"/>	28
29	29
30	30 Y <input type="checkbox"/>
31	31
32	32
33	33
34	34
35	35 Y <input type="checkbox"/>
36 Y <input type="checkbox"/>	36
37	37
38 Y <input type="checkbox"/>	38
39	39
40	40 Y <input type="checkbox"/>
41	41
42	42
43	43
44 Y <input type="checkbox"/>	44
45	
46	
47	
48	
49 Y <input type="checkbox"/>	
50	
51	
52	

WIC Raw Score

Standard English Conventions (SEC)	
Reading	Writing and Language
1	1
2	2 Y <input type="checkbox"/>
3	3 Y <input type="checkbox"/>
4	4
5	5
6	6 Y <input type="checkbox"/>
7	7 Y <input type="checkbox"/>
8	8
9	9
10	10 Y <input type="checkbox"/>
11	11
12	12 Y <input type="checkbox"/>
13	13
14	14 Y <input type="checkbox"/>
15	15
16	16
17	17 Y <input type="checkbox"/>
18	18 Y <input type="checkbox"/>
19	19
20	20
21	21 Y <input type="checkbox"/>
22	22
23	23 Y <input type="checkbox"/>
24	24 Y <input type="checkbox"/>
25	25 Y <input type="checkbox"/>
26	26
27	27
28	28 Y <input type="checkbox"/>
29	29
30	30
31	31
32	32
33	33 Y <input type="checkbox"/>
34	34 Y <input type="checkbox"/>
35	35
36	36
37	37 Y <input type="checkbox"/>
38	38 Y <input type="checkbox"/>
39	39
40	40
41	41 Y <input type="checkbox"/>
42	42 Y <input type="checkbox"/>
43	43
44	44
45	
46	
47	
48	
49	
50	
51	
52	

SEC Raw Score

Subscores Tables – Determine Subscore Raw Scores (continued)

Y = Counts toward Subscore. On your QAS report, look up every question marked "Y" to see if you answered it correctly. If so, check off the box for that question.

Heart of Algebra (HOA)	
Math Test – Calculator	Math Test – No Calculator
1	1 Y <input type="checkbox"/>
2	2 Y <input type="checkbox"/>
3	3
4	4 Y <input type="checkbox"/>
5	5 Y <input type="checkbox"/>
6	6 Y <input type="checkbox"/>
7	7
8	8
9	9 Y <input type="checkbox"/>
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18 Y <input type="checkbox"/>
19	19
20	20 Y <input type="checkbox"/>
21	
22	
23	
24	24 Y <input type="checkbox"/>
25	
26	26 Y <input type="checkbox"/>
27	
28	
29	
30	30 Y <input type="checkbox"/>
31	
32	
33	
34	34 Y <input type="checkbox"/>
35	35 Y <input type="checkbox"/>
36	
37	
38	

Problem Solving and Data Analysis (PSD)	
Math Test – Calculator	Math Test – No Calculator
1	1
2	2
3	3 Y <input type="checkbox"/>
4	4 Y <input type="checkbox"/>
5	5 Y <input type="checkbox"/>
6	6
7	7 Y <input type="checkbox"/>
8	8
9	9
10	10
11	11 Y <input type="checkbox"/>
12	12
13	13 Y <input type="checkbox"/>
14	14
15	15 Y <input type="checkbox"/>
16	16
17	17
18	18 Y <input type="checkbox"/>
19	19
20	20 Y <input type="checkbox"/>
21	
22	22 Y <input type="checkbox"/>
23	
24	
25	25 Y <input type="checkbox"/>
26	
27	
28	28 Y <input type="checkbox"/>
29	29 Y <input type="checkbox"/>
30	
31	31 Y <input type="checkbox"/>
32	32 Y <input type="checkbox"/>
33	
34	
35	
36	
37	37 Y <input type="checkbox"/>
38	38 Y <input type="checkbox"/>

Passport to Advanced Math (PAM)	
Math Test – Calculator	Math Test – No Calculator
1	1 Y <input type="checkbox"/>
2	2
3	3 Y <input type="checkbox"/>
4	4
5	5
6	6
7	7 Y <input type="checkbox"/>
8	8
9	9
10	10 Y <input type="checkbox"/>
11	11 Y <input type="checkbox"/>
12	12 Y <input type="checkbox"/>
13	13 Y <input type="checkbox"/>
14	14 Y <input type="checkbox"/>
15	15 Y <input type="checkbox"/>
16	16 Y <input type="checkbox"/>
17	17 Y <input type="checkbox"/>
18	18
19	19 Y <input type="checkbox"/>
20	20
21	21 Y <input type="checkbox"/>
22	
23	
24	
25	
26	
27	27 Y <input type="checkbox"/>
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	

HOA Raw Score

PSD Raw Score

PAM Raw Score

CONVERSION TABLES

Raw Score Conversion – Section and Test Scores

Section and Test Scores

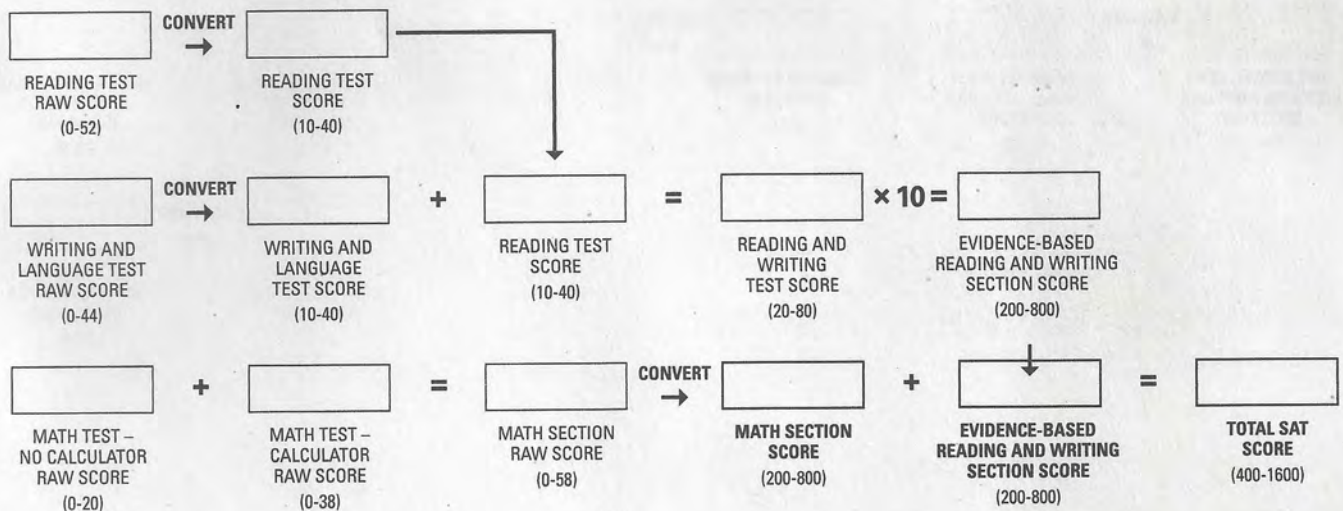
RAW SCORE CONVERSION TABLE 1

Raw Score (# of correct answers)	Math Section Score	Reading Test Score	Writing and Language Test Score
0	200	10	10
1	210	10	10
2	220	10	10
3	230	10	11
4	250	11	12
5	270	12	13
6	280	13	14
7	300	14	15
8	310	14	16
9	330	15	16
10	340	16	17
11	350	16	18
12	360	17	19
13	370	18	19
14	380	18	20
15	400	19	21
16	410	19	21
17	420	19	22
18	430	20	23
19	440	20	23
20	450	21	24
21	460	21	24
22	470	22	25
23	480	22	26
24	490	23	26
25	500	24	27
26	510	24	27
27	510	25	28
28	520	25	28
29	530	26	29

Raw Score (# of correct answers)	Math Section Score	Reading Test Score	Writing and Language Test Score
30	530	26	29
31	540	27	30
32	550	27	30
33	560	28	31
34	560	29	31
35	570	29	32
36	580	30	33
37	590	30	33
38	600	31	34
39	610	31	34
40	620	32	35
41	630	33	36
42	640	33	37
43	650	34	39
44	660	34	40
45	670	35	
46	680	36	
47	690	36	
48	700	37	
49	710	38	
50	720	39	
51	740	39	
52	750	40	
53	770		
54	780		
55	790		
56	790		
57	800		
58	800		

Section and Test Scores

CONVERSION EQUATION 1



Raw Score Conversion – Cross-Test Scores

Cross-Test Scores

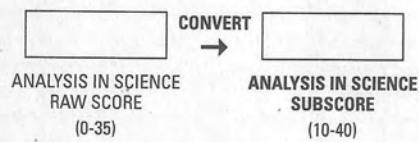
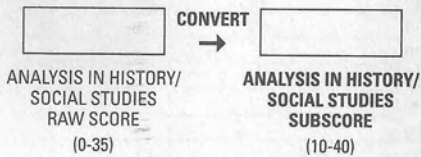
RAW SCORE CONVERSION | TABLE 2

Raw Score (# of correct answers)	Analysis in History/Social Studies Cross-Test Score	Analysis in Science Cross-Test Score
0	10	10
1	10	11
2	10	13
3	11	14
4	12	15
5	13	17
6	15	17
7	16	18
8	17	19
9	18	20
10	19	21
11	20	22
12	21	23
13	21	23
14	22	24
15	23	25
16	24	26
17	25	27

Raw Score (# of correct answers)	Analysis in History/Social Studies Cross-Test Score	Analysis in Science Cross-Test Score
18	26	27
19	26	28
20	27	29
21	28	29
22	29	30
23	29	31
24	30	31
25	31	32
26	32	33
27	33	33
28	33	34
29	34	35
30	35	35
31	36	36
32	37	37
33	38	38
34	39	39
35	40	40

Cross-Test Scores

CONVERSION EQUATION 2



Raw Score Conversion – Subscores

Subscores

RAW SCORE CONVERSION TABLE 3

Raw Score (# of correct answers)	Expression of Ideas	Standard English Conventions	Heart of Algebra	Problem Solving and Data Analysis	Passport to Advanced Math	Words in Context	Command of Evidence
0	1	1	1	1	1	1	1
1	1	1	2	1	3	1	3
2	2	1	3	2	4	1	4
3	3	2	4	3	5	1	5
4	4	3	5	4	6	2	5
5	4	4	5	5	7	3	6
6	5	4	6	6	7	4	6
7	6	5	7	7	8	5	7
8	6	6	7	8	9	6	8
9	7	6	8	9	10	7	8
10	8	7	9	9	10	8	9
11	8	8	9	10	11	9	10
12	9	8	10	11	12	10	10
13	9	9	10	12	13	10	11
14	10	10	11	13	14	11	12
15	10	10	12	14	15	12	12
16	10	11	12	15	15	13	13
17	11	12	13	15		14	14
18	11	13	14			15	15
19	12	14	15				
20	12	15					
21	13						
22	13						
23	14						
24	15						

Subscores

CONVERSION EQUATION 3

