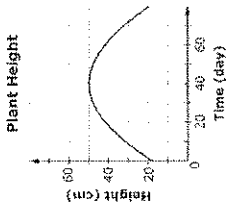


SAT Warm-Up Packet
Includes Algebra 1, Geometry, and Algebra 2 Problems

Mathematics Grade 11 Sample Items

Question 15                

The height of a plant, in centimeters, is modeled as a function of time, in days. Consider this graph of the function.



Enter the average rate of change for the height of the plant, measured in centimeters per day, between day 0 and day 20.

Mathematics Grade 11 Sample Items

Question 16                

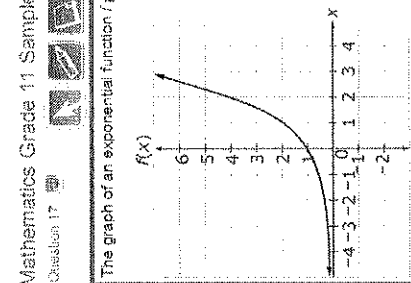
Which statement is correct about the values of x and y in the following equation?

- A The equation is true for all ordered pairs (x, y) .
- B There are no (x, y) pairs for which this equation is true.
- C For each value of x , there is one and only one value of y that makes the equation true.
- D For each value of y , there is one and only one value of x that makes the equation true.

Mathematics Grade 11 Sample Items

Question 17                

The graph of an exponential function f passes through $(0, 1)$ and $(2, 4)$, as shown.



What is the value of $f(5)$?

Mathematics Grade 11 Sample Items

Question 18                

Which statement is correct about the values of x and y in the following equation?

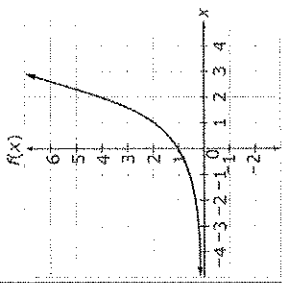
- A The equation is true for all ordered pairs (x, y) .
- B There are no (x, y) pairs for which this equation is true.
- C For each value of x , there is one and only one value of y that makes the equation true.
- D For each value of y , there is one and only one value of x that makes the equation true.

CALCULATOR PORTION

Mathematics Grade 11 Sample Items

Question 19                

The graph of an exponential function f passes through $(0, 1)$ and $(2, 4)$, as shown.



What is the value of $f(5)$?

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

- A) 2
- B) 3
- C) 5
- D) 6



Given the formula $K = \frac{1}{2}mv^2$, where

- K represents kinetic energy.
- m represents mass and has units of kilograms (kg), and
- v represents velocity and has units of meters per second (m/s).

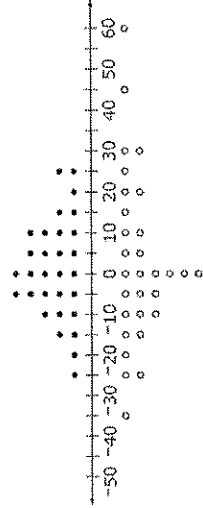
Select an appropriate measurement unit for kinetic energy:

- (A) $\frac{kg \cdot m}{s^2}$
- (B) $\frac{kg \cdot m^2}{s}$
- (C) $\frac{kg \cdot m^2}{s^2}$
- (D) $\frac{kg^2 \cdot m^2}{s^2}$



The dot plots below compare the number of minutes 30 flights made by two airlines arrived before or after their scheduled arrival times.

Airline P



- Negative numbers represent the minutes the flight arrived before its scheduled time.
- Positive numbers represent the minutes the flight arrived after its scheduled time.
- Zero indicates the flight arrived at its scheduled time.

Assuming you want to arrive as close to the scheduled time as possible, from which airline should you buy your ticket? Use the ideas of center and spread to justify your choice.



5



Jim can paint a house in 12 hours. Alex can paint the same house in 8 hours.

Enter an equation that can be used to find the time in hours, t , it would take Jim and Alex to paint the house together.



Consider this function given in recursive form.

$f(1) = -3$
 $f(n) = 3f(n-1); n \geq 2$

Select the equivalent explicit function for $n \geq 1$.

- (A) $f(n) = -3(n)$
- (B) $f(n) = -1(3)^n$
- (C) $f(n) = -3(n-1)$
- (D) $f(n) = -1(3)^{n-1}$

8

6

11

SAMPLE 22

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

- A) Sample size
- B) Population size
- C) The number of people who refused to respond
- D) Where the survey was given

$$x^2 + y^2 = 153$$

$$y = -4x$$

If (x, y) is a solution to the system of equations above, what is the value of x^2 ?

- A) -51
- B) 3
- C) 9
- D) 144

12

SAMPLE 10

A typical image taken of the surface of Mars by a camera is 11.2 gigabits in size. A tracking station on Earth can receive data from the spacecraft at a data rate of 3 megabits per second for a maximum of 11 hours each day. If 1 gigabit equals 1,024 megabits, what is the maximum number of typical images that the tracking station could receive from the camera each day?

- A) 3
- B) 10
- C) 56
- D) 144

When a scientist dives in salt water to a depth of 9 feet below the surface, the pressure due to the atmosphere and surrounding water is 18.7 pounds per square inch. As the scientist descends, the pressure increases linearly. At a depth of 14 feet, the pressure is 20.9 pounds per square inch. If the pressure increases at a constant rate as the scientist's depth below the surface increases, which of the following linear models best describes the pressure p in pounds per square inch at a depth of d feet below the surface?

- A) $p = 0.44d + 0.77$
- B) $p = 0.44d + 14.74$
- C) $p = 2.2d - 1.1$
- D) $p = 2.2d - 9.9$

Sample Problem Set

Questions 14 and 15 refer to the following information.

A survey was conducted among a randomly chosen sample of U.S. citizens about U.S. voter participation in the November 2012 presidential election. The table below displays a summary of the survey results.

Reported Voting by Age (in thousands)

	VOTED	DID NOT VOTE	NO RESPONSE	TOTAL
18- to 34-year-olds	30,329	23,211	9,468	63,008
35- to 54-year-olds	47,085	17,721	9,476	74,282
55- to 74-year-olds	43,073	10,092	6,831	59,996
People 75 years old and over	12,459	3,508	1,827	17,794
Total	132,946	54,532	27,602	215,082

SAMPLE 14

According to the table, for which age group did the greatest percentage of people report that they had voted?

- A) 18- to 34-year-olds
- B) 35- to 54-year-olds
- C) 55- to 74-year-olds
- D) People 75 years old and over

SAMPLE 15

Of the 18- to 34-year-olds who reported voting, 500 people were selected at random to do a follow-up survey where they were asked which candidate they voted for. There were 287 people in this follow-up survey sample who said they voted for Candidate A, and the other 213 people voted for someone else. Using the data from both the follow-up survey and the initial survey, which of the following is most likely to be an accurate statement?

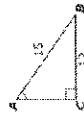
- A) About 123 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.
- B) About 76 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.
- C) About 36 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.
- D) About 17 million people 18 to 34 years old would report voting for Candidate A in the November 2012 presidential election.

Mathematics Grade 11 Sample Items

Training Student



Consider this right triangle.



Enter the measure of $\angle CAB$ to the nearest hundredth degree.

14

15

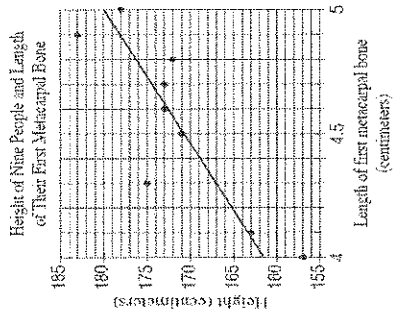
13

Question 3 of 30

3/4 Practice Question 3 of 30

Questions 3-5 refer to the following information.

The first metacarpal bone is located in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is also shown.



How many of the nine people have an arm that height that differs by more than 5 centimeters from the height predicted by the line of best fit?

Select an Answer

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

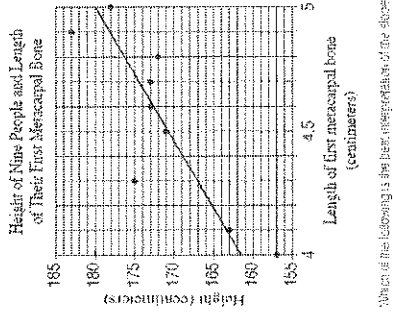
View Correct Answer

Question 4 of 30

3/4 Practice Question 4 of 30

Questions 3-5 refer to the following information.

The first metacarpal bone is located in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is also shown.



Which of the following is the best interpretation of the slope of the line of best fit in the context of the problem?

Select an Answer

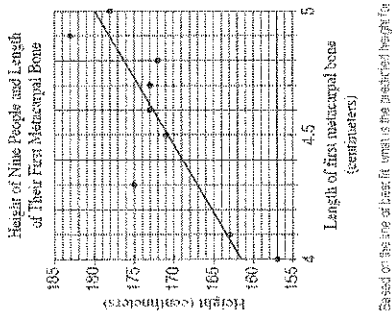
- (A) The predicted height increases by centimeters for one centimeter increase in the first metacarpal bone.
- (B) The predicted first metacarpal bone increases by centimeters for every centimeter increase in height.
- (C) The predicted height in centimeters of a person with a first metacarpal bone length of 0 centimeters.
- (D) The predicted first metacarpal bone length in centimeters for a person with a height of 0 centimeters.

Question 5 of 30

3/4 Practice Question 5 of 30

Questions 3-5 refer to the following information.

The first metacarpal bone is located in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is also shown.



Based on the line of best fit, what is the predicted height for someone with a first metacarpal bone that has a length of 4.45 centimeters?

Select an Answer

- (A) 159 centimeters
- (B) 158 centimeters
- (C) 170 centimeters
- (D) 171 centimeters

View Correct Answer

Question 1 of 30

3/4 Practice Question 1 of 30

The recommended daily calcium intake for a 20-year-old is 1,000 milligrams (mg). One cup of milk contains 299 mg of calcium and one cup of juice contains 261 mg of calcium. Which of the following inequalities represents the possible number of cups of milk, m , and cups of juice, j , a 20-year-old could drink in a day to meet or exceed the recommended daily calcium intake from these drinks alone?

Select an Answer

- (A) $299m + 261j \geq 1,000$
- (B) $299m + 261j > 1,000$
- (C) $\frac{299}{m} + \frac{261}{j} \geq 1,000$
- (D) $\frac{299}{m} + \frac{261}{j} > 1,000$

Question 12 of 30

SAT Practice Test Question Permitted Reasoning

A company's manager estimated that the cost C , in dollars, of producing x items is $C = 70 + 10x$. The company sells each item for \$2. The company makes a profit if the income from selling a quantity of items is greater than the total cost of producing that quantity of items. Which of the following inequalities gives all possible values of x for which the manager estimates that the company will make a profit?

Select an Answer

- (A) $x < 70$
- (B) $x < 84$
- (C) $x > 70$
- (D) $x > 84$

Question 14 of 30

SAT Question Permitted Problem Solving and Data Analysis

A researcher wanted to know if there is an association between exercise and sleep for the population of 18-year-olds in the United States. She obtained a simple random sample of 2,000 United States 18-year-olds and found the following percentages of a positive association between exercise and sleep. Which of the following conclusions is well supported by the data?

Select an Answer

- (A) There is a positive correlation between exercise and sleep for 18-year-olds in the United States.
- (B) There is a positive association between exercise and sleep for 18-year-olds in the United States.
- (C) Using exercise and sleep as defined by the study, an increase in sleep is caused by an increase in exercise for 18-year-olds in the United States.
- (D) Using exercise and sleep as defined by the study, an increase in sleep is caused by an increase in exercise for 18-year-olds in the United States.

Question 13 of 30

SAT Practice Test Question Permitted Problem Solving and Data Analysis

A company receives the mean ages of all the male employees is 15 years, and the mean age of all female employees is 19 years. Which of the following must be true about the mean age of the combined group of male and female employees at the company?

Select an Answer

- (A) $m < 17$
- (B) $m > 17$
- (C) $m < 17$
- (D) $15 < m < 19$

Question 8 of 30

SAT Practice Test Question Permitted Problem Solving and Data Analysis

The table below classifies 100 elements as metal, metalloids, or nonmetal and as solid, liquid, or gas at standard temperature and pressure.

	Solids	Liquids	Gases	Total
Metals	77	1	0	78
Metalloids	7	0	0	7
Nonmetals	6	1	11	18
Total	90	2	11	103

Which fraction of all solids and liquids in the table are metalloids?

View Correct Answer

Question 15 of 30

124 PRACTICE QUESTIONS Educator: Pamela Posselt / Alameda Hills

A biology class at Central High School predicted that a local population of animals will double in size every 12 years. The population at the beginning of 2014 was estimated to be 50 animals. If P represents the population n years after 2014, then which of the following equations represents the class's model of the population over time?

Select an Answer

- (A) $P = 12 + 50n$
- (B) $P = 50 + 12n$
- (C) $P = 50(2)^n$
- (D) $P = 50(2)^{12n}$

Question 2 of 30

127 Continue Practice Problem: Group and Data Analysis

A research assistant randomly selected 75 undergraduate students from the list of all students enrolled in the psychology program at a large university. She asked each of the 75 students how many minutes per day on average they spend reading. The overall reading time in the sample was 39 minutes, and the margin of error for this estimate was 4.28 minutes. Another research assistant wants to replicate the survey and will attempt to get a smaller margin of error. Which of the following sample sizes would likely result in a smaller margin of error for the estimated mean time students in the psychology program spend per day?

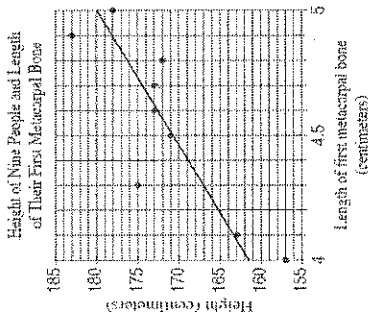
- (A) 40 students selected using a psychology-degree program directory
- (B) 40 students selected using a database of students from all degree programs at the college
- (C) 300 randomly selected undergraduate psychology-degree program students
- (D) 300 students selected using a database of students from all degree programs at the college

Question 3 of 30

128 PRACTICE QUESTIONS Educator: Pamela Posselt / Alameda Hills

Questions 3-5 refer to the following information.

The first metacarpal bones in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is shown.



How many of the nine people have an actual height that differs by more than 3 centimeters from the height predicted by the line of best fit?

Select an Answer

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

View Correct Answer

Question 1 of 30

129 PRACTICE QUESTIONS Educator: Pamela Posselt / Alameda Hills

The recommended daily calcium intake for a 20-year-old is 1,000 milligrams (mg). One cup of milk contains 299 mg of calcium and one cup of juice contains 261 mg of calcium. Which of the following inequalities represents the possible number of cups of milk m and cups of juice j a 20-year-old could drink in a day to meet or exceed the recommended daily calcium intake from these drinks alone?

Select an Answer

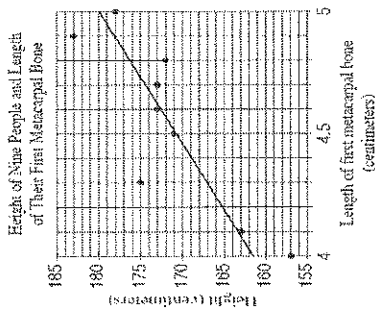
- (A) $299m + 261j \geq 1,000$
- (B) $299m + 261j > 1,000$
- (C) $\frac{299}{m} + \frac{261}{j} \geq 1,000$
- (D) $\frac{299}{m} + \frac{261}{j} > 1,000$

Question 5 of 30

GM FRANCHISES PART 19 Calculator Permitted Problem Solving and Data Analysis

Questions 3-6 refer to the following information.

The first metacarpal bone is located in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is also shown.



Based on the line of best fit, what is the predicted height for someone with a first metacarpal bone that has a length of 4.4 centimeters?

Question 8 of 30

GM FRANCHISES PART 19 Calculator Permitted Problem Solving and Data Analysis

The table below classifies 103 elements as metal, metalloids, or nonmetal and as solid, liquid, or gas at standard temperature and pressure.

	Solids	Liquids	Gases	Total
Metals	77	1	0	78
Metalloids	7	0	0	7
Nonmetals	6	1	11	18
Total	90	2	11	103

What fraction of all solids and liquids in the table are metalloids?

Question 12 of 30

GM FRANCHISES PART 19 Calculator Permitted Problem Solving

A company's manager estimated that the cost C , in dollars, of producing n items is $C = 1n + 350$. The company sells each item for \$12. The company makes a profit when total income from selling a quantity of items is greater than the total cost of producing that quantity of items. Which of the following inequalities gives all possible values of n for which the manager estimates that the company will make a profit?

- (A) $n < 70$
- (B) $n < 84$
- (C) $n > 70$
- (D) $n > 84$

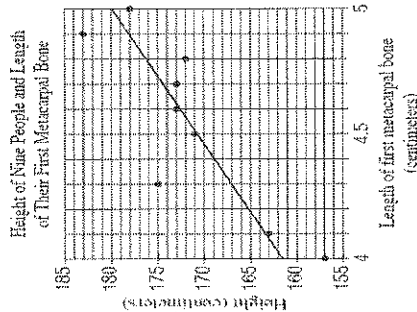
Select an Answer

Question 4 of 30

GM FRANCHISES PART 19 Calculator Permitted Problem Solving

Questions 3-5 refer to the following information.

The first metacarpal bone is located in the wrist. The scatterplot below shows the relationship between the length of the first metacarpal bone and height for 9 people. The line of best fit is also shown.



Which of the following is the best interpretation of the slope of the line of best fit in the context of this problem?

- (A) The predicted height increase in centimeters for one centimeter increase in the length of the first metacarpal bone is 185 centimeters.
- (B) The predicted first metacarpal bone length increase in centimeters for every centimeter increase in height is 185 centimeters.
- (C) The predicted height in centimeters of a person with a first metacarpal bone length of 0 centimeters is 185 centimeters.
- (D) The predicted first metacarpal bone length in centimeters for a person with a height of 0 centimeters is 185 centimeters.

Select an Answer

Question 15 of 30

32

SAE Practice Problems

A biology class at Central High School recorded data on a local population of animals with counts in size every 12 years. The population at the beginning of 2014 was estimated to be 50 animals. P represents the population t years after 2014, then which of the following equations represents the class's model of the population over time?

Select an Answer

- (A) $P = 11 + 50t$
- (B) $P = 50 + 12t$
- (C) $P = 50(1.1)^t$
- (D) $P = 50(1.1)^{12t}$

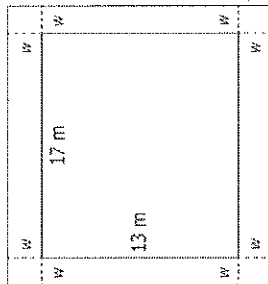
Mathematics Grade 11 Sample Items

Question 13



Training Student

A rectangular garden measures 13 meters by 17 meters and has a cement walkway around its perimeter, as shown. The width of the walkway remains constant on all four sides. The garden and walkway have a combined area of 306 square meters.



Part A

Enter an equation that could be used to help determine the width, w , of the walkway in the first response box.

Part B

Determine the width, in meters, of the walkway. Enter your answer in the second response box.

EQ

EQ

Question 14 of 30

SAE Calculator Permitted

A researcher wanted to study if there is an association between exercise and sleep for the population of 16-year-olds in the United States. She conducted survey responses from a random sample of 2000 United States 16-year olds and found a negative association of a negative association between exercise and sleep. Which city's (highest) correlation is well supported by the data?

Select an Answer

- (A) There is a positive association between exercise and sleep for 16-year-olds in the United States.
- (B) There is a positive association between exercise and sleep for 16-year-olds in the United States.
- (C) Using exercise and sleep to predict the sleep, an increase in sleep is caused by an increase of exercise for 16-year-olds in the United States.
- (D) Using exercise and sleep as defined by the sleep, an increase in sleep is caused by an increase of exercise for 16-year-olds in the United States.

Question 13 of 30

SAE Practice Problems

Ale a prime reserve. The mean age of all the male primates is 15 years, and the mean age of all the female primates is 19 years. Which of the following must be true about the absolute age of the combined group of male and female primates at the primate reserve?

Select an Answer

- (A) $m = 17$
- (B) $m = 17$
- (C) $m = 17$
- (D) $15 < m < 19$

33

35

31

$l = 24 + 3.5m$

One end of a spring is attached to a ceiling. When an object of mass m kilograms is attached to the other end of the spring, the spring stretches to a length of l centimeters as shown in the equation above. What is m when l is 73?

- A) 14
- B) 27.7
- C) 73
- D) 279.5

Mathematics Grade 11 Sample Items

Question 14

Training Student

The radius of sphere Y is twice the radius of sphere X. A student claims that the volume of sphere Y must be exactly twice the volume of sphere X.

Part A: Drag numbers into the boxes to create one example to evaluate the student's claim.

Part B: Decide whether the student's claim is true, false, or cannot be determined. Select the correct option.

Part A:

Radius = in

Volume = $\frac{4}{3}\pi$ in³

Part B:

True False Cannot be determined

38

SAMPLE 1

Aaron is staying at a hotel that charges \$99.95 per night plus tax for a room. A tax of 8% is applied to the room rate, and an additional one-time untaxed fee of \$5.00 is charged by the hotel. Which of the following represents Aaron's total charge, in dollars, for staying x nights?

- A) $(99.95 + 0.08x) + 5$
- B) $1.08(99.95x) + 5$
- C) $1.08(99.95x + 5)$
- D) $1.08(99.95 + 5)x$

37

SAMPLE 2

39

The gas mileage for Peter's car is 21 miles per gallon when the car travels at an average speed of 56 miles per hour. The car's gas tank has 17 gallons of gas at the beginning of a trip. If Peter's car travels at an average speed of 50 miles per hour, which of the following functions f models the number of gallons of gas remaining in the tank t hours after the trip begins?

- A) $f(t) = 17 - \frac{21}{50}t$
- B) $f(t) = 17 - \frac{50}{21}t$
- C) $f(t) = \frac{17 - 21t}{50}$
- D) $f(t) = \frac{17 - 50t}{21}$

40

2

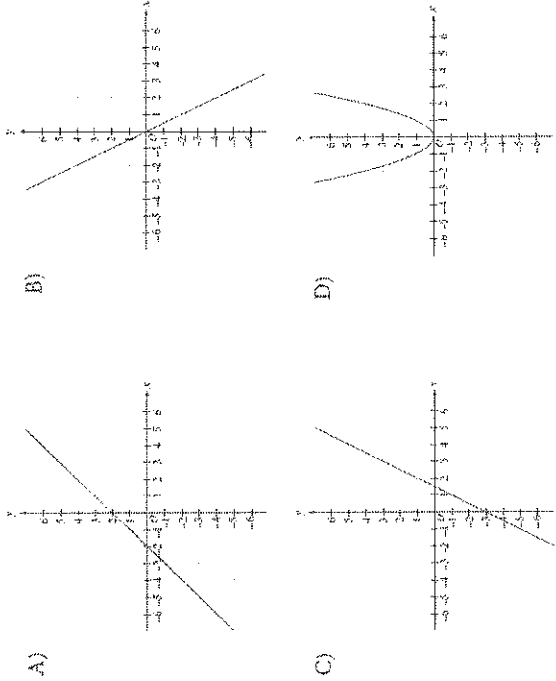
A quality control manager at a factory selects 7 lightbulbs at random for inspection out of every 400 lightbulbs produced. At this rate, how many lightbulbs will be inspected if the factory produces 20,000 lightbulbs?

- A) 300
- B) 350
- C) 400
- D) 450

SAMPLE 8

41

If k is a positive constant different from 1, which of the following could be the graph of $y - x = k(x + y)$ in the xy -plane?



42

4

Questions 4 and 5 refer to the following information.

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

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

- A) \$960
- B) \$480
- C) \$300
- D) \$240

43

5

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

- A) \$51.60
- B) \$57.00
- C) \$68.40
- D) \$77.00

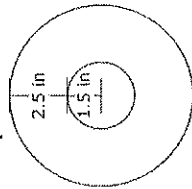
AA

Question 22

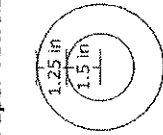


The diagram shows the end view of a roll of paper towels when it is full and the end view of the roll after some of the paper towels have been used.

Full Roll of Paper Towels



Partial Roll of Paper Towels



When the full roll of paper towels is unrolled, it has a length of 528 inches of paper towels of uniform width and thickness. Enter the length, in inches, of the paper towels remaining on the partial roll.

Question 23



At a local fair, the price of admission includes the opportunity for a person to spin a wheel for five rice tickets.

- Each spin of the wheel is a random event.
- The result from each spin of the wheel is independent of the results of previous spins.
- Each spin of the wheel awards tickets according to the probabilities shown below.

Spin the Wheel	
1 ticket	35%
2 tickets	25%
3 tickets	20%
5 tickets	15%
10 tickets	5%

Let X be the number of tickets a person wins based on 2 spins. There are 13 possible values for X .

Some values of X are more common than others. For example, winning only 2 tickets in 2 spins is a somewhat common occurrence with probability 0.1225; it means the person wins 1 ticket on the first spin and 1 ticket on the second spin ($0.35 \cdot 0.35$). A list of the possible values of X and the corresponding probabilities for most values of X is shown below.

Fill in the three missing probability values in the table.

X	Probability
2	0.1225
3	0.1750

Question 25



Someone invented a new outdoor game. The game requires attaching a rope between the tops of two poles of different heights. Read the instructions. Sketch the ropes created. Use all the given information to determine the maximum allowable distance between the bases of pole A and the base of pole B.

Game Instructions

Materials needed: Pole A, Pole B, 10 feet of rope

Setup:

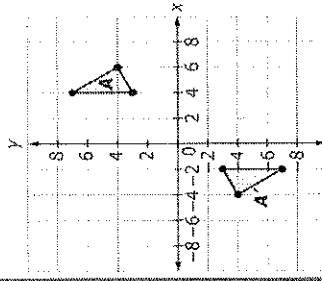
- Place pole A perpendicular to the ground so that its height is 3 feet.
- Place pole B perpendicular to the ground so that its height is 7 feet.
- The length of the rope must extend at least 6 inches past the top of each pole for proper assembly.
- Attach the rope to the top of the two poles.

Enter the maximum distance between the base of pole A and the base of pole B to the nearest whole foot.

Question 27



José and Tina are studying geometric transformations.



José is able to move triangle A to triangle A' using the following sequence of basic transformations:

- Reflection across the x-axis
- Reflection across the y-axis
- Translation two units to the right

Tina claims that the same three transformations, done in any order, will always produce the same result. Explain why Tina's claim is incorrect.

AS

A7

7

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

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

- A) $y - 8 = x^2 - 6x$
- B) $y + 1 = (x - 3)^2$
- C) $y = x(x - 6) + 8$
- D) $y = (x - 2)(x - 4)$

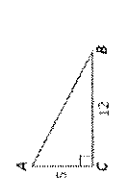
Mathematics Grade 11 Sample Items



Training Student

?

Question 27



Determine if each expression is equivalent to the length of \overline{AC} . Select Yes or No for each expression.

	Yes	No
$13\sin(B)$		
$13\cos(A)$		
$12\sin(A)$		
$12\cos(B)$		

8

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

- A) 0
- B) 150
- C) 250
- D) 400

6

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

- A) -1
- B) 5
- C) 8
- D) 9

1

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

- A) $0.002d + 0.09s$
- B) $0.002d - 0.09s$
- C) $0.09d + 0.002s$
- D) $0.09d - 0.002s$

17

53

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

- A) 8
- B) 20
- C) 32
- D) 48

55

15

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

- A) 66,000
- B) 93,000
- C) 210,000
- D) 420,000

18

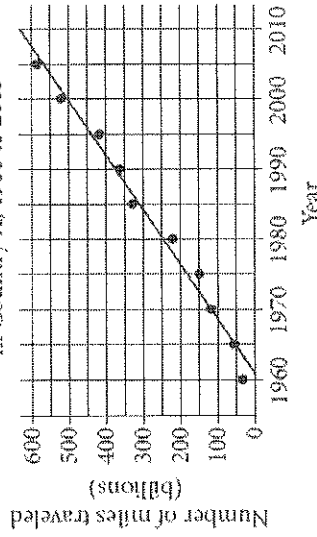
54

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

- A) The homes have values that are close to each other.
- B) There are a few homes that are valued much less than the rest.
- C) There are a few homes that are valued much more than the rest.
- D) Many of the homes have values between \$125,000 and \$165,000.

14

Miles Traveled by Air Passengers in Country X, 1960 to 2005



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

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

Results on the Bar Exam of Law School Graduates

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

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

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

SAMPLE 3

If $-\frac{9}{5} < -3M + 1 < -\frac{7}{4}$, what is one possible value of $9M - 3$?

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

- A) $325,000 - 7,500 \leq y$
- B) $325,000 \leq 7,500y$
- C) $150,000 \geq 7,500y$
- D) $175,000 + 7,500y \geq 325,000$

Mathematics Grade 11 Sample Items

Question 29



Training Student

There is a traffic jam on a highway. From an aerial view, a reporter is trying to estimate the number of vehicles stuck in the traffic jam.

Select all information that will help the reporter make a reasonable estimate of the number of vehicles in the traffic jam.

- the cause of the traffic jam
- the average length of a vehicle
- the number of lanes on the highway
- the average distance between vehicles
- the average number of people in each vehicle
- the distance from the beginning to the end of the traffic jam

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

62

- A) The total number of students with 4 siblings is expected to be equal at the two schools.
- B) The total number of students with 4 siblings at Lincoln School is expected to be 30 more than at Washington School.
- C) The total number of students with 4 siblings at Washington School is expected to be 30 more than at Lincoln School.
- D) The total number of students with 4 siblings at Washington School is expected to be 900 more than at Lincoln School.

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

63

- A) $\begin{cases} 40x + 65y \leq 2,400 \\ x + y \leq 45 \end{cases}$
- B) $\begin{cases} \frac{x}{40} + \frac{y}{65} \leq 2,400 \\ x + y \leq 45 \end{cases}$
- C) $\begin{cases} 40x + 65y \leq 45 \\ x + y \leq 2,400 \end{cases}$
- D) $\begin{cases} x + y \leq 2,400 \\ 40x + 65y \leq 2,400 \end{cases}$

Questions 19 and 20 refer to the following information.

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

Students' Sibling Survey

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

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

61

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

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

A project manager estimates that a project will take x hours to complete, where $x > 100$. The goal is for the estimate to be within 10 hours of the time it will actually take to complete the project. If the manager meets the goal and it takes y hours to complete the project, which of the following inequalities represents the relationship between the estimated time and the actual completion time?

- A) $x + y < 10$
 B) $y > x + 10$
 C) $y < x - 10$
 D) $-10 < y - x < 10$

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

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

- A) 6
 B) 8
 C) 23
 D) 324

The graph of the linear function f has intercepts at $(a, 0)$ and $(0, b)$ in the xy -plane. If $a + b = 0$ and $a = b$, which of the following is true about the slope of the graph of f ?

- A) It is positive.
 B) It is negative.
 C) It equals zero.
 D) It is undefined.

SAMPLE 7

The toll rates for crossing a bridge are \$6.50 for a car and \$10 for a truck. During a two-hour period, a total of 187 cars and trucks crossed the bridge, and the total collected in tolls was \$1,338. Solving which of the following systems of equations yields the number of cars, x , and the number of trucks, y , that crossed the bridge during the two hours?

- A) $x + y = 1,338$
 $6.5x + 10y = 187$
 B) $x + y = 187$
 $6.5x + 10y = \frac{1,338}{2}$
 C) $x + y = 187$
 $6.5x + 10y = 1,338$
 D) $x + y = 187$
 $6.5x + 10y = 1,338 \times 2$

Questions 22 and 23 refer to the following information.

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

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

22

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

- A) $r^2 = \frac{IP}{4\pi}$
- B) $r^2 = \frac{P}{4\pi I}$
- C) $r^2 = \frac{4\pi I}{P}$
- D) $r^2 = \frac{I}{4\pi P}$

68

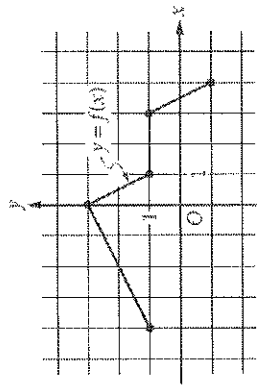
23

For the same signal emitted by a radio antenna, Observer A measures its intensity to be 16 times the intensity measured by Observer B. The distance of Observer A from the radio antenna is what fraction of the distance of Observer B from the radio antenna?

- A) $\frac{1}{4}$
- B) $\frac{1}{16}$
- C) $\frac{1}{64}$
- D) $\frac{1}{256}$

70

26



71

The complete graph of the function f is shown in the xy -plane above. Which of the following are equal to 1?

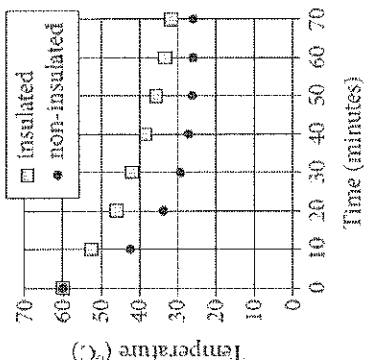
- I. $f(-4)$
 - II. $f\left(\frac{3}{2}\right)$
 - III. $f(3)$
- A) III only
 - B) I and III only
 - C) II and III only
 - D) I, II, and III

32

If h hours and 30 minutes is equal to 450 minutes, what is the value of h ?

69

112

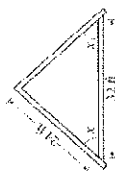


Two samples of water of equal mass are heated to 60 degrees Celsius (°C). One sample is poured into an insulated container, and the other sample is poured into a non-insulated container. The samples are then left for 70 minutes to cool in a room having a temperature of 25°C. The graph above shows the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

- A) In every 10-minute interval, the magnitude of the rate of change of temperature of the insulated sample is greater than that of the non-insulated sample.
- B) In every 10-minute interval, the magnitude of the rate of change of temperature of the non-insulated sample is greater than that of the insulated sample.
- C) In the intervals from 0 to 10 minutes and from 10 to 20 minutes, the rates of change of temperature of the insulated sample are of greater magnitude, whereas in the intervals from 40 to 50 minutes and from 50 to 60 minutes, the rates of change of temperature of the non-insulated sample are of greater magnitude.
- D) In the intervals from 0 to 10 minutes and from 10 to 20 minutes, the rates of change of temperature of the non-insulated sample are of greater magnitude, whereas in the intervals from 40 to 50 minutes and from 50 to 60 minutes, the rates of change of temperature of the insulated sample are of greater magnitude.

- SAT
- Calculator Permitted
- No Subscore
- Adaptive Topic in Math

An architect drew the sketch below while designing a house roof. The dimensions shown are for the interior of the triangle.

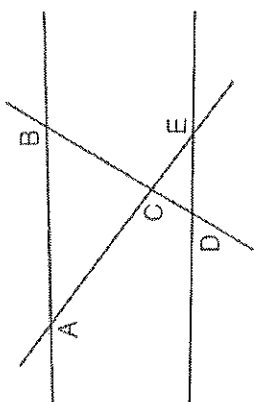


Note: Figure not drawn to scale. What is the value of $\cos X$?

View Correct Answer

Question 16 of 30

- SAT
- PSAT/NCAQT
- PSAT
- PSAT/NCAQT
- Calculator Permitted
- No Subscore
- Adaptive Topic in Math



Note: Figure not drawn to scale.

In the figure above, $\triangle ABC \sim \triangle EDC$. Which of the following must be true?

- Select an Answer
- A) $AE \parallel ED$
 - B) $AE \perp ED$
 - C) $AE \parallel DE$
 - D) $AE \perp DE$

75

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

33

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

79

34

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

77

35

$$x^2 + y^2 + 4x - 2y = -1$$

The equation of a circle in the xy -plane is shown above. What is the radius of the circle?

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

77

80

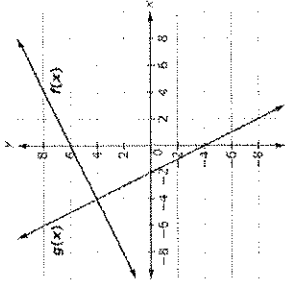
$$a = 18t + 15$$

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

35



This graph shows linear equations $y = f(x)$ and $y = g(x)$.



Enter the solution to the equation $f(x) - g(x) = 0$.

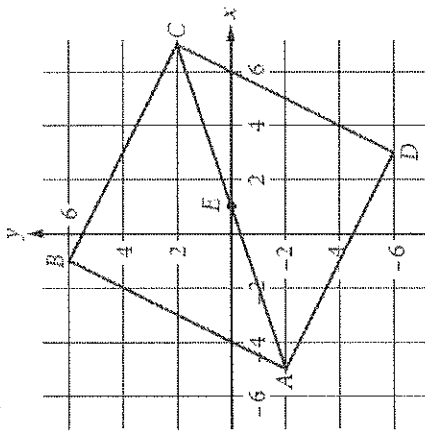


81

If the expression $\frac{4x^2}{2x-1}$ is written in the equivalent form $\frac{1}{2x-1} + A$, what is A in terms of x ?

- A) $2x + 1$
- B) $2x - 1$
- C) $4x^2$
- D) $4x^2 - 1$

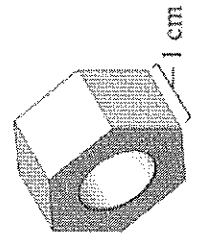
93



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

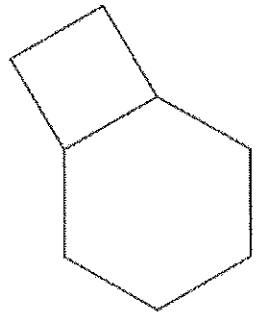
- A) $y = -3x - 1$
- B) $y = -3(x - 1)$
- C) $y = -\frac{1}{3}x + 4$
- D) $y = -\frac{1}{3}x - 1$

82



The figure above shows a metal hex nut with two regular hexagonal faces and a thickness of 1 cm. The length of each side of a hexagonal face is 2 cm. A hole with a diameter of 2 cm is drilled through the nut. The density of the metal is 7.9 grams per cubic cm. What is the mass of this nut, to the nearest gram? (Density is mass divided by volume.)

84



The figure above shows a regular hexagon with sides of length a and a square with sides of length a . If the area of the hexagon is $384\sqrt{3}$ square inches, what is the area, in square inches, of the square?

- A) 256
- B) 192
- C) $64\sqrt{3}$
- D) $16\sqrt{3}$

87

85

$$y = 3$$

$$y = ax^2 + b$$

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

- A) $a = -2, b = 2$
- B) $a = -2, b = 4$
- C) $a = 2, b = 4$
- D) $a = 4, b = 3$

Questions 37 and 38 refer to the following information.

A botanist is cultivating a rare species of plant in a controlled environment and currently has 3000 of these plants. The population of this species that the botanist expects to grow next year, $N_{\text{next year}}$, can be estimated from the number of plants this year, $N_{\text{this year}}$, by the equation below.

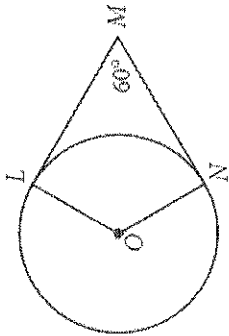
$$N_{\text{next year}} = N_{\text{this year}} + 0.2 \left(N_{\text{this year}} \right) \left(1 - \frac{N_{\text{this year}}}{K} \right)$$

The constant K in this formula is the number of plants the environment is able to support.

According to the formula, what will be the number of plants two years from now if $K = 4000$? (Round your answer to the nearest whole number.)

The botanist would like to increase the number of plants that the environment can support so that the population of the species will increase more rapidly. If the botanist's goal is that the number of plants will increase from 3000 this year to 3360 next year, how many plants must the modified environment support?

87



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

87

SAMPLE 18

The function f is defined by $f(x) = 2x^3 + 3x^2 + cx + 8$, where c is a constant. In the xy -plane, the graph of f intersects the x -axis at the three points $(-1, 0)$, $(\frac{1}{2}, 0)$ and $(p, 0)$. What is the value of c ?

- A) -18
- B) -2
- C) 2
- D) 10

88

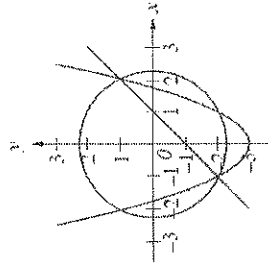
SAMPLE 19

Ashley claims that when you multiply two different square roots together, the product is always rational. For example, $\sqrt{2} \cdot \sqrt{18} = \sqrt{36} = 6$ and $\sqrt{3} \cdot \sqrt{27} = \sqrt{81} = 9$.

She also claims that when you multiply two different cube roots together, the product is always irrational. For example, $\sqrt[3]{2} \cdot \sqrt[3]{18} = \sqrt[3]{36} \approx 3.3019$ and $\sqrt[3]{3} \cdot \sqrt[3]{27} = \sqrt[3]{81} \approx 4.3267$.

Which statement correctly classifies Ashley's claims and provides appropriate reasoning?

- (A) Ashley is correct because her examples support both claims.
- (B) Ashley is correct about the product of square roots always being rational, but the product of cube roots can sometimes be rational.
- (C) Ashley is incorrect about the product of square roots always being rational, but she is correct that the product of cube roots is always irrational.
- (D) Ashley is incorrect because sometimes the product of square roots can be irrational and sometimes the product of cube roots can be rational.



$$\begin{aligned} x^2 + y^2 &= 5 \\ y &= x^2 - 3 \\ x - y &= 1 \end{aligned}$$

A system of three equations and their graphs in the xy -plane are shown above. How many solutions does the system have?

- A) One
- B) Two
- C) Three
- D) Four

90

NON CALCULATOR PORTION

SAMPLE 20

What is one possible solution to the equation $\frac{24}{x+1} - \frac{12}{x-1} = 1$?

91

93

SAMPLE 21

$$\frac{1}{x} + \frac{2}{x} = \frac{1}{5}$$

Anise needs to complete a printing job using both of the printers in her office. One of the printers is twice as fast as the other, and together the printers can complete the job in 5 hours. The equation above represents the situation described. Which of the following describes what the expression $\frac{1}{x}$ represents in this equation?

92

- A) The time, in hours, that it takes the slower printer to complete the printing job alone
- B) The portion of the job that the slower printer would complete in one hour
- C) The portion of the job that the faster printer would complete in two hours
- D) The time, in hours, that it takes the slower printer to complete $\frac{1}{5}$ of the printing job



Suppose $\angle A$ is an angle such that $\cos A < \sin A$.

- 25°
- 35°
- 45°
- 55°
- 65°
- 75°



Determine whether each expression is equivalent to $(x^3 + 8)$. Select Yes or No for each expression.

	Yes	No
$(x+8)^3$		
$(x-2)(x^2+2x+4)$		
$(x+2)(x^2-2x+4)$		



Solve the following equation for n .

$$18n^2 - 50 = 0$$

Enter one solution in the first box. If there are two solutions, enter the second solution in the second box.

97



The graphs of $y = g(x)$ and $y = f(x)$ are shown.

Add a point that will satisfy each given condition.

- A point on the graph of g where $x = 0$
- A point on the graph of g where $f(x) > g(x)$
- A point on the graph of f where $f(x) = 0$

95



Multiply and combine like terms to determine the product of these polynomials.

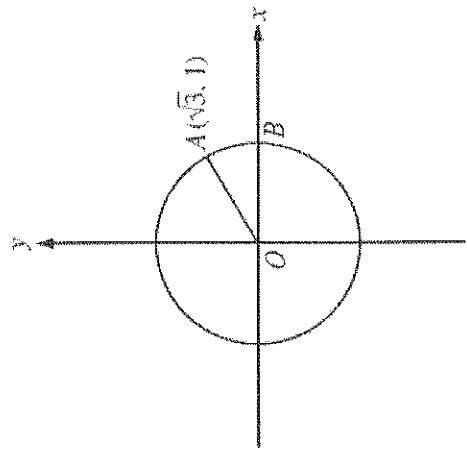
$$(2x - 3)(5x + 6)$$

96

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

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

98



99

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

SAMPLE 5

$$4x - y = 3y + 7$$

$$x + 8y = 4$$

Based on the system of equations above, what is the value of the product xy ?

- A) $-\frac{5}{2}$
- B) $\frac{1}{4}$
- C) $\frac{1}{2}$
- D) $\frac{11}{9}$

100

Mathematics Grade 11 Sample Items

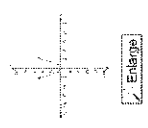


Question 1

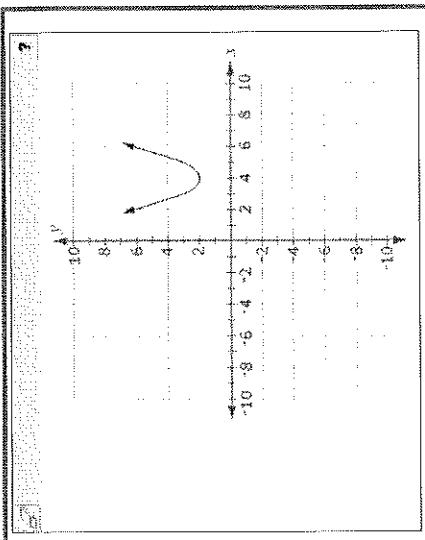
Training Student



The graph of $y = x^2$ is shown on the grid below.



Drag the graph on the right to show the graph of $y = (x - 4)^2 + 2$.



101

17

102

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

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

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

105

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

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

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

18

103

What is the sum of all values of m that satisfy

$$2m^2 - 16m + 8 = 0?$$

- A) -8
- B) $-4\sqrt{3}$
- C) $4\sqrt{3}$
- D) 8

106

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

- A) 8
- B) 14
- C) 16
- D) 18

15

101

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

- A) $\frac{5 - 2}{3}$
- B) $5 - \frac{2}{3}$
- C) $5 - \frac{2}{x + 3}$
- D) $5 - \frac{17}{x + 3}$

107

Which of the following complex numbers is

equivalent to $\frac{3 - 5i}{8 + 2i}$? (Note: $i = \sqrt{-1}$)

- A) $\frac{3}{8} - \frac{5i}{2}$
- B) $\frac{3}{8} + \frac{5i}{2}$
- C) $\frac{7}{34} - \frac{23i}{34}$
- D) $\frac{7}{34} + \frac{23i}{34}$

14

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

- A) $f(t) = 325(0.87)^t$
- B) $f(t) = 325(0.13)^t$
- C) $f(t) = 0.87(325)^t$
- D) $f(t) = 0.13(325)^t$

12

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

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

- A) $F = \frac{RN}{R - 1}$
- B) $F = \frac{RN}{1 - R}$
- C) $F = \frac{N}{1 - R}$
- D) $F = \frac{N}{R - 1}$

20

$$\begin{aligned} ax + by &= 12 \\ 2x + 8y &= 60 \end{aligned}$$

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

9

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

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

16

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

110

111

112

108

109

1

If $5x + 6 = 10$, what is the value of $10x + 3$?

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

116

3

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

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

8

$$nA = 360$$

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

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

117

2

$$\begin{aligned} x + y &= 0 \\ 3x - 2y &= 10 \end{aligned}$$

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

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

117

4

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

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

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

115

118

120 SAMPLE 17

Mathematics Grade 11 Sample Items

Training Student



7

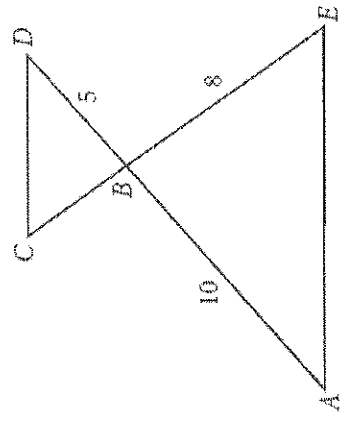
Click on two numbers whose product is irrational.

Numbers	-5	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3\sqrt{2}}{3}$	$\sqrt{8}$
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18

If $a^2 + 14a = 5$ and $a > 0$, what is the value of $a + 7$?

18



121

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

119

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8

Select all equations that have at least one integer solution.

- $\sqrt{4x} = 5$
- $\sqrt{3x} = 75$
- $\sqrt{x} = \frac{\sqrt{16}}{8}$
- $\sqrt{x} = x - 12$
- $\sqrt{10-x} = x - 2$

121
SAMPLE 4

$$\frac{5(k+2)-7}{6} = \frac{13-(4-k)}{9}$$

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

- A) $\frac{9}{17}$
- B) $\frac{9}{13}$
- C) $\frac{33}{17}$
- D) $\frac{33}{13}$

123

Mathematics Grade 11 Sample Items

Question 9



Training Student



Enter the value of x such that $3^5 \cdot 3^x = 5\sqrt{3}$ is true.

125
SAMPLE 9

$$\begin{aligned} \frac{1}{2}x - \frac{1}{4}y &= 5 \\ ax - 3y &= 20 \end{aligned}$$

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

- A) $\frac{1}{2}$
- B) 2
- C) 6
- D) 12

124
SAMPLE 26

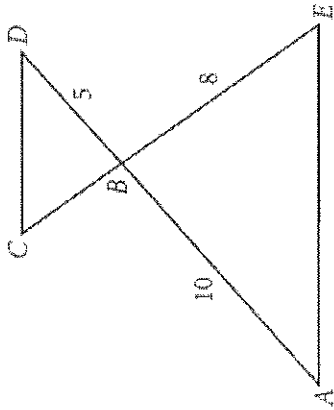
It is given that $\sin x = a$, where x is the radian measure of an angle and

$$\frac{\pi}{3} < x < \pi.$$

If $\sin w = -a$, which of the following could be the value of w ?

- A) $\pi - x$
- B) $x - \pi$
- C) $2\pi + x$
- D) $x - 2\pi$

18



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

If $\frac{1}{2}x + \frac{1}{3}y = 4$, what is the value of $3x + 2y$?