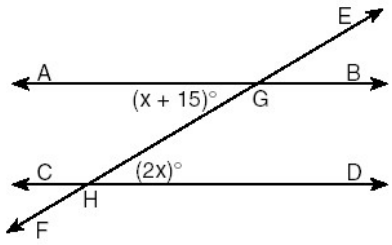
pennsylvania
DEPARTMENT OF EDUCATION

SAS Standards Aligned System

Name: Date:

1

In the accompanying diagram, parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are intersected by transversal $\overleftrightarrow{EF}$ at points G and H, respectively, $m\angle AGH = x + 15$, and $m\angle GHD = 2x$.



Which equation can be used to find the value of x?

(1) $2x = x + 15$
(2) $2x + x + 15 = 180$
(3) $2x + x + 15 = 90$
(4) $2x(x + 15) = 0$

2

The number 8.375×10^{-3} is equivalent to

(1) 0.0008375
(2) 0.008375
(3) 0.08375
(4) 8,375

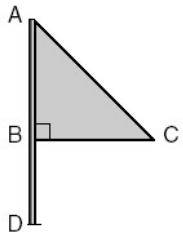
3

Which statement about quadrilaterals is true?

(1) All quadrilaterals have four right angles.
(2) All quadrilaterals have equal sides.
(3) All quadrilaterals have four sides.
(4) All quadrilaterals are parallelograms.

4

Triangle ABC represents a metal flag on pole AD, as shown in the accompanying diagram. On a windy day the triangle spins around the pole so fast that it looks like a three-dimensional shape.

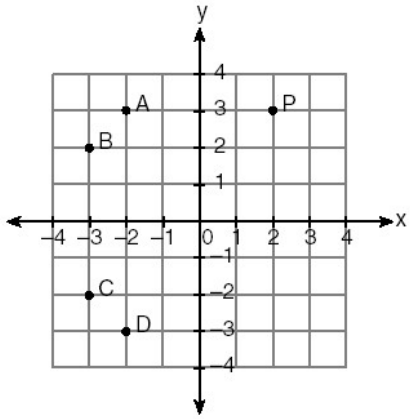


Which shape would the spinning flag create?

(1) sphere
(2) pyramid
(3) right circular cylinder
(4) cone

5

In the accompanying graph, if point P has coordinates (a,b), which point has coordinates $(-b,a)$?



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

6

If $2ax - 5x = 2$, then x is equivalent to

(1) $\frac{2 + 5a}{2a}$
(2) $\frac{1}{a - 5}$
(3) $\frac{2}{2a - 5}$
(4) $7 - 2a$

7

Which expression represents the number of yards in x feet?

(1) $\frac{x}{12}$

(2) $\frac{x}{3}$

(3) $3x$

(4) $12x$

8

What is the solution set of the equation $3x^2 - 34x - 24 = 0$?

(1) $\{-2,6\}$

(2) $\{-12,\frac{2}{3}\}$

(3) $\{-\frac{2}{3},12\}$

(4) $\{-6,2\}$

9

The inequality $\frac{1}{2}x + 3 < 2x - 6$ is equivalent to

(1) $x < -\frac{5}{6}$

(2) $x > -\frac{5}{6}$

(3) $x < 6$

(4) $x > 6$

10

Delroy's sailboat has two sails that are similar triangles. The larger sail has sides of 10 feet, 24 feet, and 26 feet. If the shortest side of the smaller sail measures 6 feet, what is the perimeter of the *smaller* sail?

(1) 15 ft

(2) 36 ft

(3) 60 ft

(4) 100 ft

11

The ratio of two supplementary angles is 2:7. What is the measure of the *smaller* angle?

(1) 10°

(2) 14°

(3) 20°

(4) 40°

12

Melissa is walking around the outside of a building that is in the shape of a regular polygon. She determines that the measure of one exterior angle of the building is 60°. How many sides does the building have?

(1) 6

(2) 9

(3) 3

(4) 12

13

At the beginning of her mathematics class, Mrs. Reno gives a warm-up problem. She says, "I am thinking of a number such that 6 less than the product of 7 and this number is 85." Which number is she thinking of?

(1) $11\frac{2}{7}$
(2) 13
(3) 84
(4) 637

14

The number of people on the school board is represented by x. Two subcommittees with an equal number of members are formed, one with $\frac{2}{3}x - 5$ members and the other with $\frac{x}{4}$ members. How many people are on the school board?

(1) 20
(2) 12
(3) 8
(4) 4

15

The line $3x - 2y = 12$ has

(1) a slope of $\frac{3}{2}$ and a y-intercept of -6
(2) a slope of $-\frac{3}{2}$ and a y-intercept of 6
(3) a slope of 3 and a y-intercept of -2
(4) a slope of -3 and a y-intercept of -6

16

If $(x - 4)$ is a factor of $x^2 - x - w = 0$, then the value of w is

(1) 12
(2) -12
(3) 3
(4) -3

17

Tara buys two items that cost d dollars each. She gives the cashier \$20. Which expression represents the change she should receive?

(1) $20 - 2d$
(2) $20 - d$
(3) $20 + 2d$
(4) $2d - 20$

18

If $3(x - 2) = 2x + 6$, the value of x is

(1) 0
(2) 5
(3) 12
(4) 20

19

The graphs of the equations y = 2x and y = -2x + a intersect in Quadrant I for which values of a?

(1) 0 < a < 1
(2) a < 1
(3) a ≥ 1
(4) a > 1

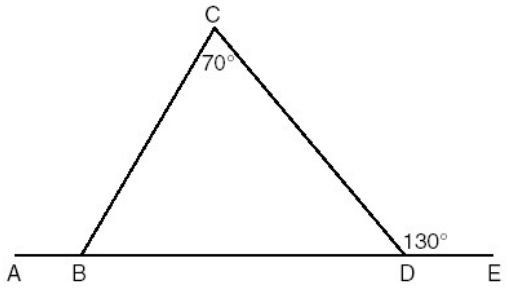
20

Factored, the expression $16x^2 - 25y^2$ is equivalent to

(1) $(4x - 5y)(4x + 5y)$
(2) $(4x - 5y)(4x - 5y)$
(3) $(8x - 5y)(8x + 5y)$
(4) $(8x - 5y)(8x - 5y)$

21

In the accompanying diagram of $\triangle BCD$, $m\angle C = 70$, $m\angle CDE = 130$, and side $\overline{BD}$ is extended to A and to E. Find $m\angle CBA$.

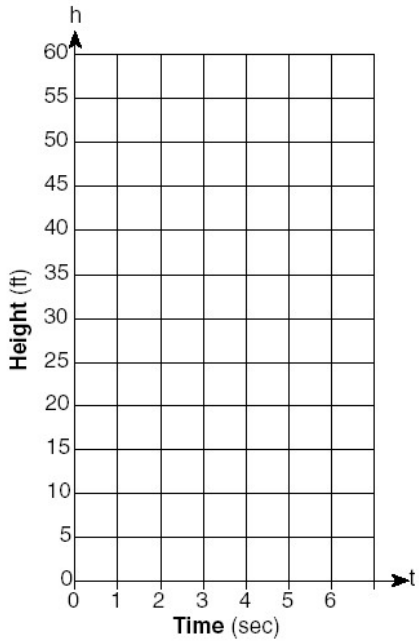


22

Tom throws a ball into the air. The ball travels on a parabolic path represented by the equation $h = -8t^2 + 40t$, where h is the height, in feet, and t is the time, in seconds.

a On the accompanying set of axes, graph the equation from $t = 0$ to $t = 5$ seconds, including all integral values of t from 0 to 5.

b What is the value of t at which h has its greatest value?

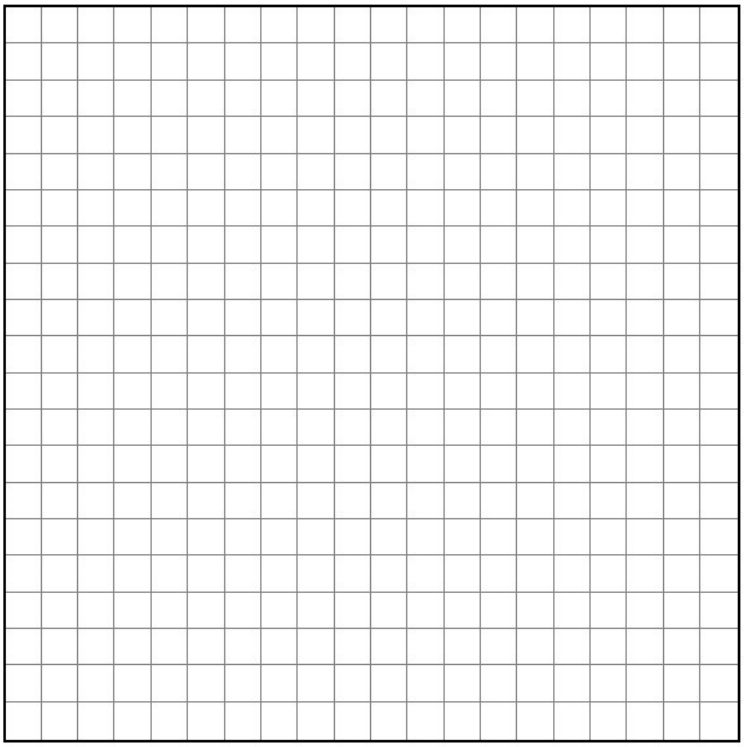


23

Solve the following system of equations algebraically or graphically:

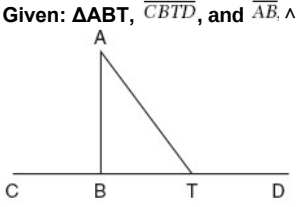
$$x^2 + y^2 = 25$$
$$3y - 4x = 0$$

[The use of the accompanying grid is optional.]



24

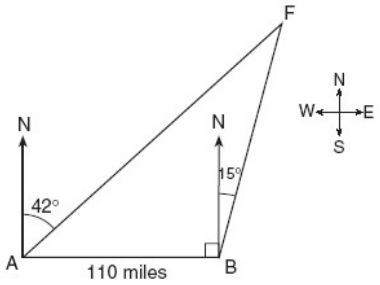
Given: ΔABT, $\overline{CBTD}$, and $\overline{AB} \perp \overline{CD}$.



Write an indirect proof to show that $\overline{AT}$ is not perpendicular to $\overline{CD}$.

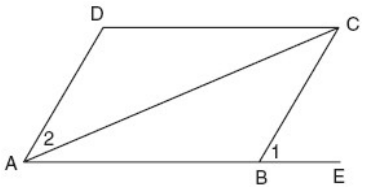
25

As shown in the accompanying diagram, two tracking stations, A and B, are on an east-west line 110 miles apart. A forest fire is located at F, on a bearing 42° northeast of station A and 15° northeast of station B. How far, to the *nearest mile*, is the fire from station A?



26

Given: parallelogram ABCD, diagonal $\overline{AC}$, and $\overline{ABE}$



Prove: m∠1 > m∠2

27

Jack bought 3 slices of cheese pizza and 4 slices of mushroom pizza for a total cost of $12.50. Grace bought 3 slices of cheese pizza and 2 slices of mushroom pizza for a total cost of $8.50. What is the cost of one slice of mushroom pizza?

(1) $1.50
(2) $2.00
(3) $3.00
(4) $3.50

28

What is the product of $-3x^2y$ and $(5xy^2 + xy)$?

(1) $-15x^3y^3 - 3x^3y^2$
(2) $-15x^3y^3 - 3x^3y$
(3) $-15x^2y^2 - 3x^2y$
(4) $-15x^3y^3 + xy$

29

Which ordered pair is a solution to the system of equations $y = x$ and $y = x^2 - 2$?

(1) (-2,-2)
(2) (-1,1)
(3) (0,0)
(4) (2,2)

30

Pam is playing with red and black marbles. The number of red marbles she has is three more than twice the number of black marbles she has. She has 42 marbles in all. How many red marbles does Pam have?

(1) 13
(2) 15
(3) 29
(4) 33

31

What is half of 2^6?

(1) 1^3
(2) 1^6
(3) 2^3
(4) 2^5

32

Which equation represents a line that is parallel to the line $y = -4x + 5$?

(1) $y = -4x + 3$
(2) $y = -\frac{1}{4}x + 5$
(3) $y = \frac{1}{4}x + 3$
(4) $y = 4x + 5$

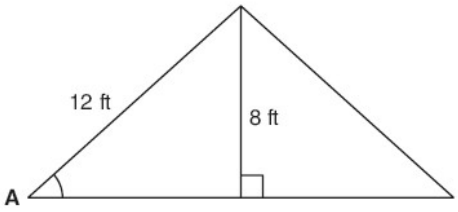
33

What is the product of $\frac{x^2-1}{x+1}$ and $\frac{x+3}{3x-3}$ expressed in simplest form?

(1) x
(2) $\frac{x}{3}$
(3) $x + 3$
(4) $\frac{x+3}{3}$

34

The center pole of a tent is 8 feet long, and a side of the tent is 12 feet long as shown in the diagram below.



If a right angle is formed where the center pole meets the ground, what is the measure of angle *A* to the *nearest degree*?

(1) 34

(2) 42

(3) 48

(4) 56

35

Which value of *x* makes the expression $\frac{x+4}{x-3}$ undefined?

(1) -4
(2) -3
(3) 3
(4) 0

36

Consider the set of integers greater than -2 and less than 6. A subset of this set is the positive factors of 5. What is the complement of this subset?

(1) {0, 2, 3, 4}
(2) {-1, 0, 2, 3, 4}
(3) {-2, -1, 0, 2, 3, 4, 6}
(4) {-2, -1, 0, 1, 2, 3, 4, 5, 6}

37

What is the slope of the line that passes through the points (- 6,1) and (4,- 4)?

(1) -2

(2) 2

(3) $-\frac{1}{2}$

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

38

Students in a ninth grade class measured their heights, *h*, in centimeters. The height of the shortest student was 155 cm, and the height of the tallest student was 190 cm. Which inequality represents the range of heights?

(1) $155 < h < 190$
(2) $155 \leq h \leq 190$
(3) $h \geq 155$ or $h \leq 190$
(4) $h > 155$ or $h < 190$

39

Mr. Turner bought *x* boxes of pencils. Each box holds 25 pencils. He left 3 boxes of pencils at home and took the rest to school. Which expression represents the total number of pencils he took to school?

(1) 22*x*
(2) 25*x* - 3
(3) 25 - 3*x*
(4) 25*x* - 75

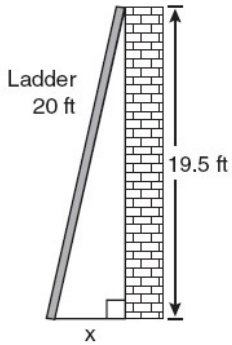
40

Which expression represents $\frac{2x^2 - 12x}{x - 6}$ in simplest form?

(1) 0
(2) 2*x*
(3) 4*x*
(4) 2*x* + 2

41

Don placed a ladder against the side of his house as shown in the diagram below.



Which equation could be used to find the distance, *x*, from the foot of the ladder to the base of the house?

(1) $x = 20 - 19.5$
(2) $x = 20^2 - 19.5^2$
(3) $x = \sqrt{20^2 - 19.5^2}$
(4) $x = \sqrt{20^2 + 19.5^2}$

42

Which value of *x* is a solution of $\frac{5}{x} = \frac{x+13}{6}$?

(1) - 2
(2) - 3
(3) - 10
(4) - 15

43

Kathy plans to purchase a car that depreciates (loses value) at a rate of 14% per year. The initial cost of the car is $21,000. Which equation represents the value, *v*, of the car after 3 years?

(1) $v = 21{,}000(0.14)^3$
(2) $v = 21{,}000(0.86)^3$
(3) $v = 21{,}000(1.14)^3$
(4) *v* = 21,000(0.86)(3)

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.

44

A contractor needs 54 square feet of brick to construct a rectangular walkway. The length of the walkway is 15 feet more than the width.

Write an equation that could be used to determine the dimensions of the walkway. Solve this equation to find the length and width, in feet, of the walkway.

45

Sophie measured a piece of paper to be 21.7 cm by 28.5 cm. The piece of paper is actually 21.6 cm by 28.4 cm.

Determine the number of square centimeters in the area of the piece of paper using Sophie's measurements.

Determine the number of square centimeters in the actual area of the piece of paper.

Determine the relative error in calculating the area. Express your answer as a decimal to the *nearest thousandth*.

Sophie does not think there is a significant amount of error. Do you agree or disagree? Justify your answer.

46

The prices of seven race cars sold last week are listed in the table below.

Price per Race Car	Number of Race Cars
$126,000	1
$140,000	2
$180,000	1
$400,000	2
$819,000	1

What is the mean value of these race cars, in dollars?

What is the median value of these race cars, in dollars?

State which of these measures of central tendency best represents the value of the seven race cars. Justify your answer.

Answer all questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.

47

Peter begins his kindergarten year able to spell 10 words. He is going to learn to spell 2 new words every day.

Write an inequality that can be used to determine how many days, *d*, it takes Peter to be able to spell *at least* 75 words.

Use this inequality to determine the minimum number of whole days it will take for him to be able to spell *at least* 75 words.

48

The Hudson Record Store is having a going-out-of-business sale. CDs normally sell for $18.00. During the first week of the sale, all CDs will sell for $15.00.

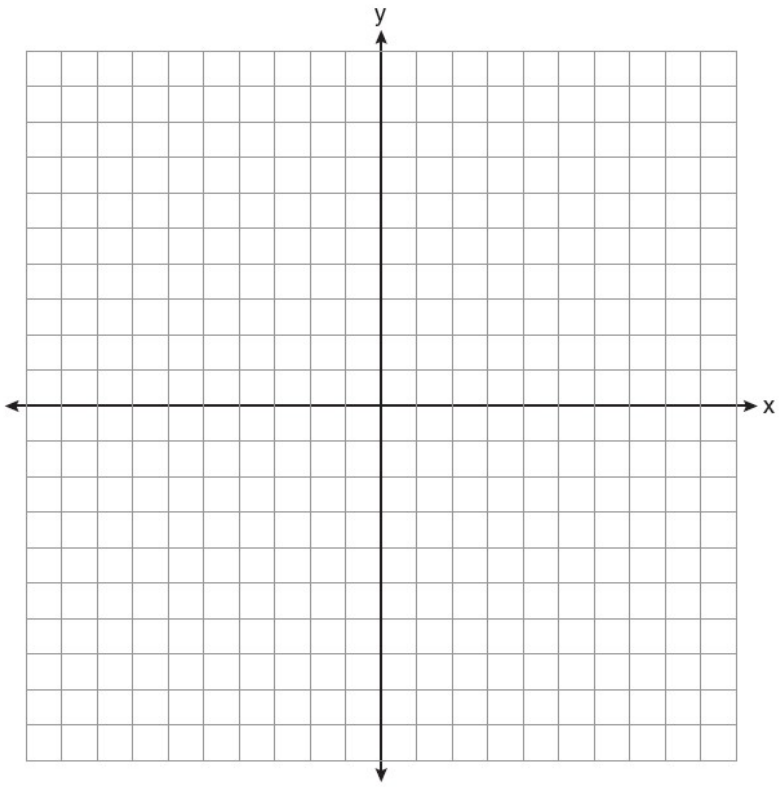
Written as a fraction, what is the rate of discount?

What is this rate expressed as a percent? Round your answer to the *nearest hundredth of a percent*.

During the second week of the sale, the same CDs will be on sale for 25% off the *original* price. What is the price of a CD during the second week of the sale?

49

Graph the equation $y = x^2 - 2x - 3$ on the accompanying set of axes.
Using the graph, determine the roots of the equation $x^2 - 2x - 3 = 0$.



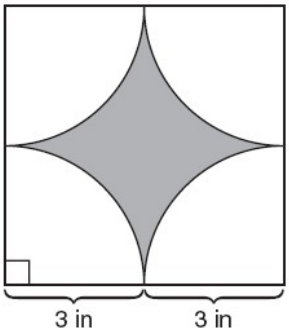
Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.

50

Tom drove 290 miles from his college to home and used 23.2 gallons of gasoline. His sister, Ann, drove 225 miles from her college to home and used 15 gallons of gasoline. Whose vehicle had better gas mileage? Justify your answer.

51

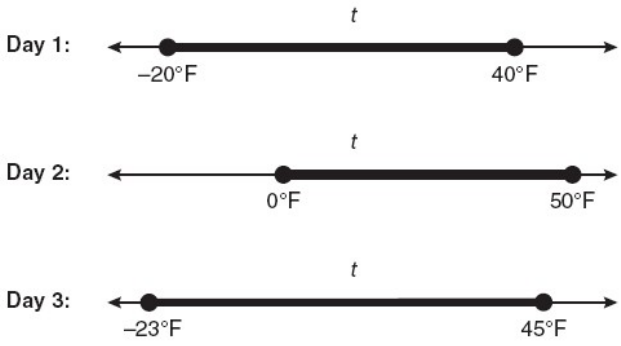
A designer created the logo shown below. The logo consists of a square and four quarter-circles of equal size.



Express, in terms of π, the exact area, in square inches, of the shaded region.

52

Maureen tracks the range of outdoor temperatures over three days. She records the following information.



Express the intersection of the three sets as an inequality in terms of temperature, *t*.

53

Which value of *p* is the solution of $5p - 1 = 2p + 20$?

(1) $\frac{19}{7}$

(2) $\frac{19}{3}$

(3) 3

(4) 7

54

Mrs. Smith wrote "Eight less than three times a number is greater than fifteen" on the board. If *x* represents the number, which inequality is a correct translation of this statement?

(1) $3x - 8 > 15$

(2) $3x - 8 < 15$

(3) $8 - 3x > 15$

(4) $8 - 3x < 15$

55

Which value of *x* is in the solution set of the inequality $-4x + 2 > 10$?

(1) - 2
(2) 2
(3) 3
(4) - 4

56

Factored completely, the expression $2x^2 + 10x - 12$ is equivalent to

(1) $2(x - 6)(x + 1)$
(2) $2(x + 6)(x - 1)$
(3) $2(x + 2)(x + 3)$
(4) $2(x - 2)(x - 3)$

57

If $3ax + b = c$, then *x* equals

(1) $c - b + 3a$

(2) $c + b - 3a$

(3) $\frac{c - b}{3a}$

(4) $\frac{b - c}{3a}$

58

The length of the hypotenuse of a right triangle is 34 inches and the length of one of its legs is 16 inches. What is the length, in inches, of the other leg of this right triangle?

(1) 16
(2) 18
(3) 25
(4) 30

59

Which equation represents a line parallel to the *x*-axis?

(1) $x = 5$
(2) $y = 10$
(3) $x = \frac{1}{3}y$
(4) $y = 5x + 17$

60

Sam and Odel have been selling frozen pizzas for a class fundraiser. Sam has sold half as many pizzas as Odel. Together they have sold a total of 126 pizzas. How many pizzas did Sam sell?

(1) 21
(2) 42
(3) 63
(4) 84

61

Which ordered pair is in the solution set of the system of equations $y = -x + 1$ and $y = x^2 + 5x + 6$?

(1) (-5, -1)
(2) (-5, 6)
(3) (5,- 4)
(4) (5, 2)

62

A rectangle has an area of 24 square units. The width is 5 units less than the length. What is the length, in units, of the rectangle?

(1) 6
(2) 8
(3) 3
(4) 19

63

When $3g^2 - 4g + 2$ is subtracted from $7g^2 + 5g - 1$, the difference is

(1) $-4g^2 - 9g + 3$
(2) $4g^2 + g + 1$
(3) $4g^2 + 9g - 3$
(4) $10g^2 + g + 1$

64

Which value of x is the solution of $\frac{2x}{5} + \frac{1}{3} = \frac{7x-2}{15}$?

(1) $\frac{3}{5}$
(2) $\frac{31}{26}$
(3) 3
(4) 7

65

Which expression represents $\frac{25x-125}{x^2-25}$ in simplest form?

(1) $\frac{5}{x}$

(2) $\frac{-5}{x}$

(3) $\frac{25}{x-5}$

(4) $\frac{25}{x+5}$

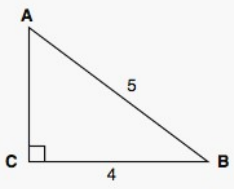
66

In a linear equation, the independent variable increases at a constant rate while the dependent variable decreases at a constant rate. The slope of this line is

(1) zero
(2) negative
(3) positive
(4) undefined

67

Which equation could be used to find the measure of one acute angle in the right triangle shown below?



(1) $\sin A = \frac{4}{5}$

(2) $\tan A = \frac{5}{4}$

(3) $\cos B = \frac{5}{4}$

(4) $\tan B = \frac{4}{5}$

68

Which ordered pair is in the solution set of the following system of inequalities?

$$y < \frac{1}{2}x + 4$$
$$y \geq -x + 1$$

(1) (-5,3)
(2) (0,4)
(3) (3,-5)
(4) (4,0)

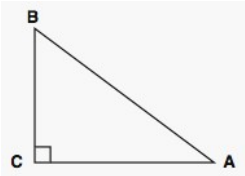
69

Which expression is equivalent to $(3x^2)^3$?

(1) $9x^5$
(2) $9x^6$
(3) $27x^5$
(4) $27x^6$

70

In the diagram of triangle ABC shown below, BC = 10 and AB = 16.



To the *nearest tenth of a degree*, what is the measure of the largest acute angle in the triangle?

(1) 32.0
(2) 38.7
(3) 51.3
(4) 90.0

71

Twelve players make up a high school basketball team. The team jerseys are numbered 1 through 12. The players wearing the jerseys numbered 3, 6, 7, 8, and 11 are the only players who start a game. Using set notation, list the complement of this subset.

72

Write an equation that represents the line that passes through the points (5,4) and (-5,0).

73

The cost of 3 markers and 2 pencils is $1.80. The cost of 4 markers and 6 pencils is $2.90. What is the cost of *each* item? Include appropriate units in your answer.