

Released Questions for the

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# Summative Mathematics CST

1. Which equation is equivalent to

$$5x - 2(7x + 1) = 14x?$$

- A  $-9x - 2 = 14x$
- B  $-9x + 1 = 14x$
- C  $-9x + 2 = 14x$
- D  $12x - 1 = 14x$

2. Which equation is equivalent to  $4(2 - 5x) = 6 - 3(1 - 3x)$ ?

- A  $8x = 5$
- B  $8x = 17$
- C  $29x = 5$
- D  $29x = 17$

3. The total cost ( $c$ ) in dollars of renting a sailboat for  $n$  days is given by the equation

$$c = 120 + 60n.$$

If the total cost was \$360, for how many days was the sailboat rented?

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

4. Solve:  $3(x + 5) = 2x + 35$

- Step 1:  $3x + 15 = 2x + 35$
- Step 2:  $5x + 15 = 35$
- Step 3:  $5x = 20$
- Step 4:  $x = 4$

Which is the first *incorrect* step in the solution shown above?

- A Step 1
- B Step 2
- C Step 3
- D Step 4

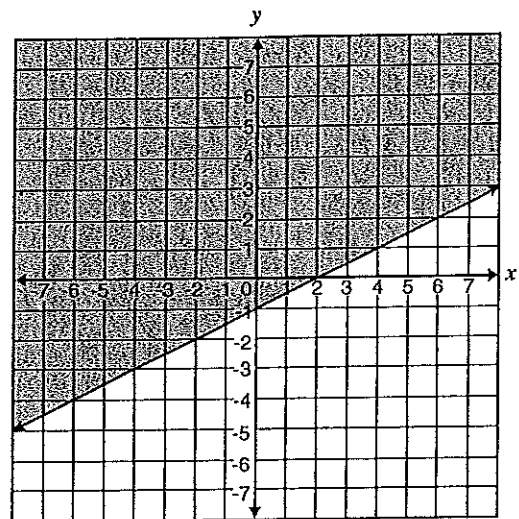
5. A 120-foot-long rope is cut into 3 pieces. The first piece of rope is twice as long as the second piece of rope. The third piece of rope is three times as long as the second piece of rope. What is the length of the longest piece of rope?

- A 20 feet
- B 40 feet
- C 60 feet
- D 80 feet

6. What is the  $y$ -intercept of the graph of  $4x + 2y = 12$ ?

- A -4
- B -2
- C 6
- D 12

7. Which inequality is shown on the graph below?



- A  $y < \frac{1}{2}x - 1$
- B  $y \leq \frac{1}{2}x - 1$
- C  $y > \frac{1}{2}x - 1$
- D  $y \geq \frac{1}{2}x - 1$

8. Which point lies on the line defined by  $3x + 6y = 2$ ?

- A (0, 2)
- B (0, 6)
- C  $(1, -\frac{1}{6})$
- D  $(1, -\frac{1}{3})$

9. What is the equation of the line that has a slope of 4 and passes through the point  $(3, -10)$ ?

- A  $y = 4x - 22$
- B  $y = 4x + 22$
- C  $y = 4x - 43$
- D  $y = 4x + 43$

10. The data in the table show the cost of renting a bicycle by the hour, including a deposit.

Renting a Bicycle

Hours ( $h$ )	Cost in dollars ( $c$ )
2	15
5	30
8	45

If hours,  $h$ , were graphed on the horizontal axis and cost,  $c$ , were graphed on the vertical axis, what would be the equation of a line that fits the data?

- A  $c = 5h$
- B  $c = \frac{1}{5}h + 5$
- C  $c = 5h + 5$
- D  $c = 5h - 5$

11. The equation of line  $l$  is  $6x + 5y = 3$ , and the equation of line  $q$  is  $5x - 6y = 0$ . Which statement about the two lines is true?

- A Lines  $l$  and  $q$  have the same  $y$ -intercept.
- B Lines  $l$  and  $q$  are parallel.
- C Lines  $l$  and  $q$  have the same  $x$ -intercept.
- D Lines  $l$  and  $q$  are perpendicular.

12. Which equation represents a line that is parallel to  $y = -\frac{5}{4}x + 2$ ?

- A  $y = -\frac{5}{4}x + 1$
- B  $y = -\frac{4}{5}x + 2$
- C  $y = \frac{4}{5}x + 3$
- D  $y = \frac{5}{4}x + 4$

13.

$$\frac{5x^3}{10x^7} =$$

- A  $2x^4$
- B  $\frac{1}{2x^4}$
- C  $\frac{1}{5x^4}$
- D  $\frac{x^4}{5}$

14.  $(4x^2 - 2x + 8) - (x^2 + 3x - 2) =$

- A  $3x^2 + x + 6$
- B  $3x^2 + x + 10$
- C  $3x^2 - 5x + 6$
- D  $3x^2 - 5x + 10$

15. What is the factored form of  $3a^2 - 24ab + 48b^2$ ?

- A  $(3a - 8b)(a - 6b)$
- B  $(3a - 16b)(a - 3b)$
- C  $3(a - 4b)(a - 4b)$
- D  $3(a - 8b)(a - 8b)$

16. Which is a factor of  $x^2 - 11x + 24$ ?

- A  $x + 3$
- B  $x - 3$
- C  $x + 4$
- D  $x - 4$

17. Which of the following shows  $9t^2 + 12t + 4$  factored completely?

- A  $(3t + 2)^2$
- B  $(3t + 4)(3t + 1)$
- C  $(9t + 4)(t + 1)$
- D  $9t^2 + 12t + 4$

18. If  $x^2$  is added to  $x$ , the sum is 42. Which of the following could be the value of  $x$ ?

- A  $-7$
- B  $-6$
- C  $14$
- D  $42$

19. What quantity should be added to both sides of this equation to complete the square?

$$x^2 - 8x = 5$$

- A  $4$
- B  $-4$
- C  $16$
- D  $-16$

20. What are the solutions for the quadratic equation  $x^2 + 6x = 16$ ?

- A  $-2, -8$
- B  $-2, 8$
- C  $2, -8$
- D  $2, 8$

21. Which is one of the solutions to the equation

$$2x^2 - x - 4 = 0?$$

A  $\frac{1}{4} - \sqrt{33}$

B  $-\frac{1}{4} + \sqrt{33}$

C  $\frac{1 + \sqrt{33}}{4}$

D  $\frac{-1 - \sqrt{33}}{4}$

22. Which statement *best* explains why there is no real solution to the quadratic equation

$$2x^2 + x + 7 = 0?$$

- A The value of  $1^2 - 4 \cdot 2 \cdot 7$  is positive.
- B The value of  $1^2 - 4 \cdot 2 \cdot 7$  is equal to 0.
- C The value of  $1^2 - 4 \cdot 2 \cdot 7$  is negative.
- D The value of  $1^2 - 4 \cdot 2 \cdot 7$  is not a perfect square.

23. What is the solution set of the quadratic equation  $8x^2 + 2x + 1 = 0$ ?

A  $\left\{-\frac{1}{2}, \frac{1}{4}\right\}$

B  $\{-1 + \sqrt{2}, -1 - \sqrt{2}\}$

C  $\left\{\frac{-1 + \sqrt{7}}{8}, \frac{-1 - \sqrt{7}}{8}\right\}$

D no real solution

24. An object that is projected straight downward with initial velocity  $v$  feet per second travels a distance  $s = vt + 16t^2$ , where  $t =$  time in seconds. If Ramón is standing on a balcony 84 feet above the ground and throws a penny straight down with an initial velocity of 10 feet per second, in how many seconds will it reach the ground?

A 2 seconds

B 3 seconds

C 6 seconds

D 8 seconds

25. The height of a triangle is 4 inches greater than twice its base. The area of the triangle is 168 square inches. What is the base of the triangle?

A 7 in.

B 8 in.

C 12 in.

D 14 in.

26. What is  $\frac{x^2 - 4xy + 4y^2}{3xy - 6y^2}$  reduced to lowest terms?

A  $\frac{x-2y}{3}$

B  $\frac{x-2y}{3y}$

C  $\frac{x+2y}{3}$

D  $\frac{x+2y}{3y}$

27. Simplify  $\frac{6x^2 + 21x + 9}{4x^2 - 1}$  to lowest terms.

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

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

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

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

28. A pharmacist mixed some 10%-saline solution with some 15%-saline solution to obtain 100 mL of a 12%-saline solution. How much of the 10%-saline solution did the pharmacist use in the mixture?

A 60 mL

B 45 mL

C 40 mL

D 25 mL

29. Andy's average driving speed for a 4-hour trip was 45 miles per hour. During the first 3 hours he drove 40 miles per hour. What was his average speed for the last hour of his trip?

A 50 miles per hour

B 60 miles per hour

C 65 miles per hour

D 70 miles per hour

30. "Two lines in a plane always intersect in exactly one point."

Which of the following best describes a counterexample to the assertion above?

- A coplanar lines
- B parallel lines
- C perpendicular lines
- D intersecting lines

CSG00320

31. Which figure can serve as a counterexample to the conjecture below?

If one pair of opposite sides of a quadrilateral is parallel, then the quadrilateral is a parallelogram.

- A rectangle
- B rhombus
- C square
- D trapezoid

CSG10194

32. Given:  $TRAP$  is an isosceles trapezoid with diagonals  $\overline{RP}$  and  $\overline{TA}$ . Which of the following must be true?

- A  $\overline{RP} \perp \overline{TA}$
- B  $\overline{RP} \parallel \overline{TA}$
- C  $\overline{RP} \cong \overline{TA}$
- D  $\overline{RP}$  bisects  $\overline{TA}$

CSG00360

33. Which triangles must be similar?

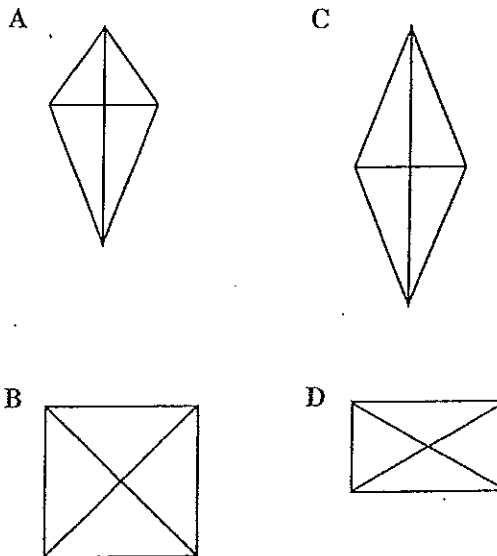
- A two obtuse triangles
- B two scalene triangles with congruent bases
- C two right triangles
- D two isosceles triangles with congruent vertex angles

CSG00576

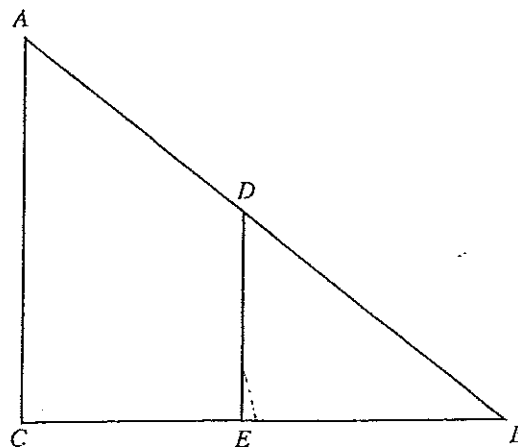
34. A conditional statement is shown below.

If a quadrilateral has perpendicular diagonals, then it is a rhombus.

Which of the following is a counterexample to the statement above?

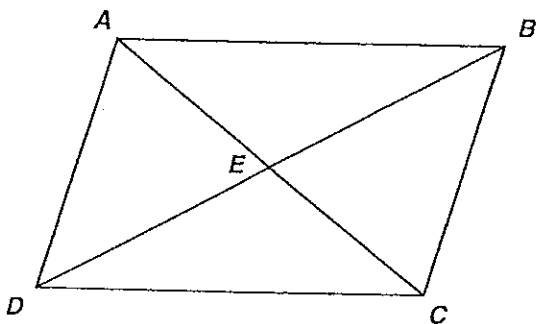


35. Which of the following facts would be sufficient to prove that triangles  $ABC$  and  $DBE$  are similar?



- A  $\overline{CE}$  and  $\overline{BE}$  are congruent.
- B  $\angle ACE$  is a right angle.
- C  $\overline{AC}$  and  $\overline{DE}$  are parallel.
- D  $\angle A$  and  $\angle B$  are congruent.

36. Parallelogram  $ABCD$  is shown below.



Which pair of triangles can be established to be congruent to prove that  $\angle DAB \cong \angle BCD$ ?

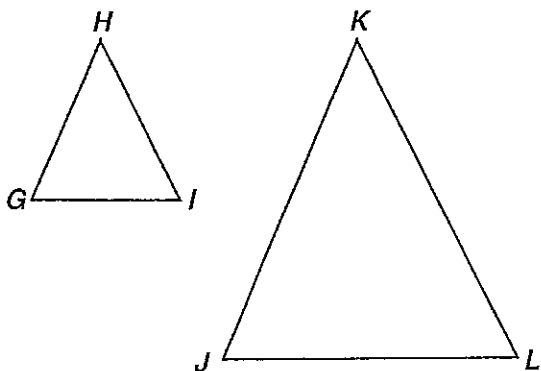
- A  $\triangle ADC$  and  $\triangle BCD$
- B  $\triangle AED$  and  $\triangle BEC$
- C  $\triangle DAB$  and  $\triangle BCD$
- D  $\triangle DEC$  and  $\triangle BEA$

CSC10146

37. If  $\triangle ABC$  and  $\triangle XYZ$  are two triangles such that  $\frac{AB}{XY} = \frac{BC}{YZ}$ , which of the following would be sufficient to prove the triangles are similar?

- A  $\angle A \cong \angle X$
- B  $\angle B \cong \angle Y$
- C  $\angle C \cong \angle Z$
- D  $\angle X \cong \angle Y$

38. Which of the following statements must be true if  $\triangle GHI \sim \triangle JKL$ ?



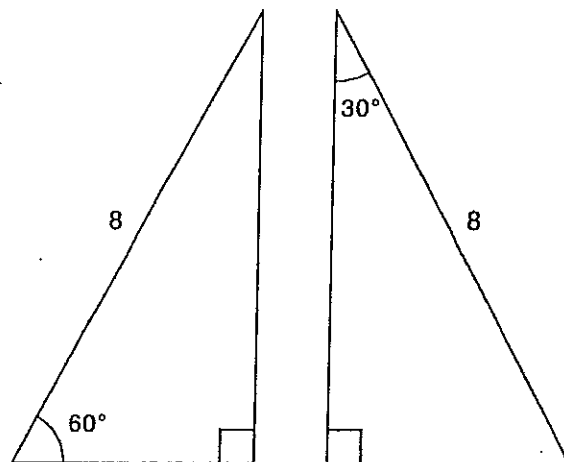
- A The two triangles must be scalene.  
The two triangles must have exactly one acute angle.
- C At least one of the sides of the two triangles must be parallel.
- D The corresponding sides of the two triangles must be proportional.

39. In parallelogram  $FGHI$ , diagonals  $\overline{IG}$  and  $\overline{FH}$  are drawn and intersect at point  $M$ . Which of the following statements *must* be true?

- A  $\triangle FGI$  must be an obtuse triangle.
- B  $\triangle HIG$  must be an acute triangle.
- C  $\triangle FMG$  must be congruent to  $\triangle HMG$ .
- D  $\triangle GMH$  must be congruent to  $\triangle IMF$ .

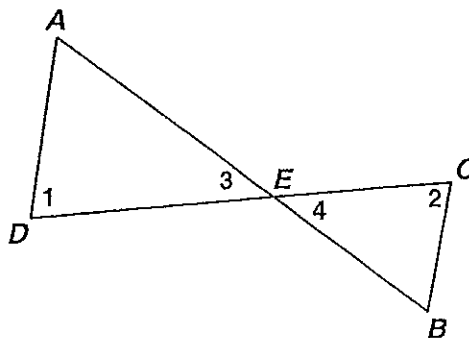
CSC0059

40. Which of the following *best* describes the triangles shown below?



- A both similar and congruent
- B similar but not congruent
- C congruent but not similar
- D neither similar nor congruent

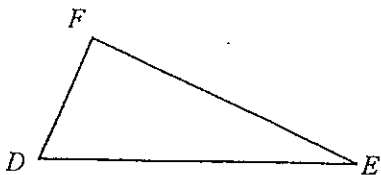
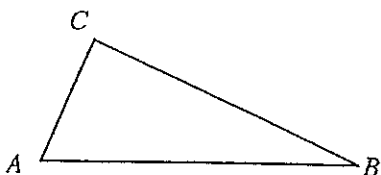
41. Given:  $\overline{AB}$  and  $\overline{CD}$  intersect at point  $E$ ;  
 $\angle 1 \cong \angle 2$



Which theorem or postulate can be used to prove  $\triangle AED \sim \triangle BEC$ ?

- A AA
- B SSS
- C ASA
- D SAS

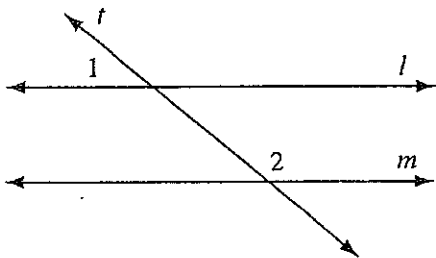
42. In the figure below,  $\overline{AC} \cong \overline{DF}$  and  $\angle A \cong \angle D$ .



Which additional information would be enough to prove that  $\triangle ABC \cong \triangle DEF$ ?

- A  $\overline{AB} \cong \overline{DE}$
- B  $\overline{AB} \cong \overline{BC}$
- C  $\overline{BC} \cong \overline{EF}$
- D  $\overline{BC} \cong \overline{DE}$

43. In the accompanying diagram, parallel lines  $l$  and  $m$  are cut by transversal  $t$ .



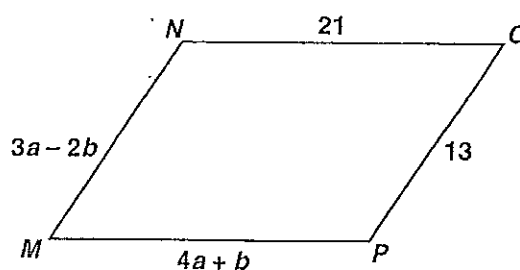
Which statement about angles 1 and 2 *must* be true?

- A  $\angle 1 \cong \angle 2$ .
- B  $\angle 1$  is the complement of  $\angle 2$ .
- C  $\angle 1$  is the supplement of  $\angle 2$ .
- D  $\angle 1$  and  $\angle 2$  are right angles.

44. If a cylindrical barrel measures 22 inches in diameter, how many inches will it roll in 8 revolutions along a smooth surface?

- A  $121\pi$  in.
- B  $168\pi$  in.
- C  $176\pi$  in.
- D  $228\pi$  in.

45. What values of  $a$  and  $b$  make quadrilateral  $MNOP$  a parallelogram?



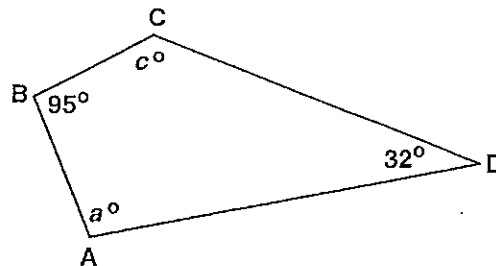
- A  $a = 1, b = 5$
- B  $a = 5, b = 1$
- C  $a = \frac{11}{7}, b = \frac{34}{7}$
- D  $a = \frac{34}{7}, b = \frac{11}{7}$

CSG10163

46. Quadrilateral  $ABCD$  is a parallelogram. If adjacent angles are congruent, which statement must be true?

- A Quadrilateral  $ABCD$  is a square.
- B Quadrilateral  $ABCD$  is a rhombus.
- C Quadrilateral  $ABCD$  is a rectangle.
- D Quadrilateral  $ABCD$  is an isosceles trapezoid.

47. For the quadrilateral shown below, what is  $m\angle a + m\angle c$ ?

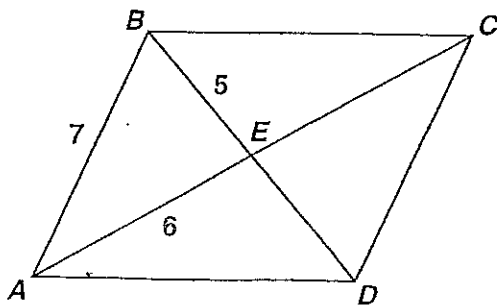


- A  $53^\circ$
- B  $137^\circ$
- C  $180^\circ$
- D  $233^\circ$

CSG10162

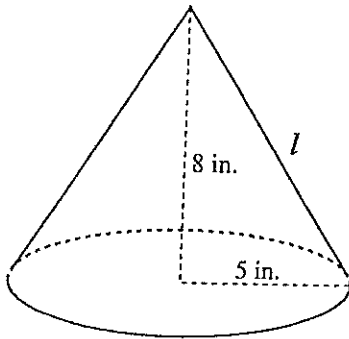


48. If  $ABCD$  is a parallelogram, what is the length of segment  $BD$ ?



- A 10
- B 11
- C 12
- D 14

49. A right circular cone has radius 5 inches and height 8 inches.



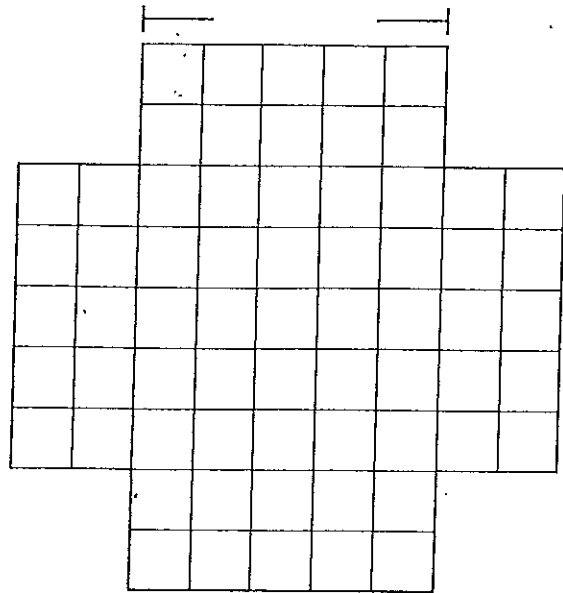
What is the lateral area of the cone? (Lateral area of cone =  $\pi r l$ , where  $l$  = slant height)

- A  $40\pi$  sq in.
- B  $445\pi$  sq in.
- C  $5\pi\sqrt{39}$  sq in.
- D  $5\pi\sqrt{89}$  sq in.

50. A sewing club is making a quilt consisting of 25 squares with each side of the square measuring 30 centimeters. If the quilt has five rows and five columns, what is the perimeter of the quilt?

- A 150 cm
- B 300 cm
- 600 cm
- D 900 cm

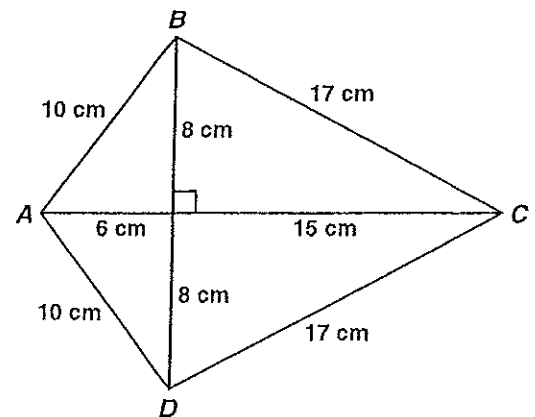
51. The four sides of this figure will be folded up and taped to make an open box.



What will be the volume of the box?

- A  $50 \text{ cm}^3$
- B  $75 \text{ cm}^3$
- C  $100 \text{ cm}^3$
- D  $125 \text{ cm}^3$

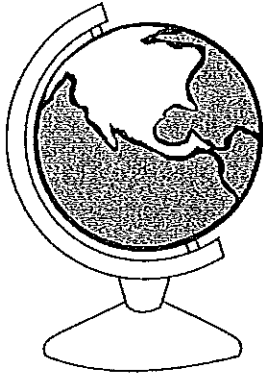
52. Figure  $ABCD$  is a kite.



What is the area of figure  $ABCD$ , in square centimeters?

- A 120
- B 154
- C 168
- D 336

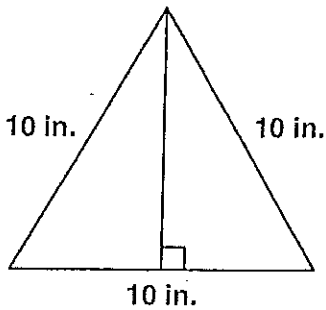
53. A classroom globe has a diameter of 18 inches.



Which of the following is the approximate surface area, in square inches, of the globe?  
(Surface Area =  $4\pi r^2$ )

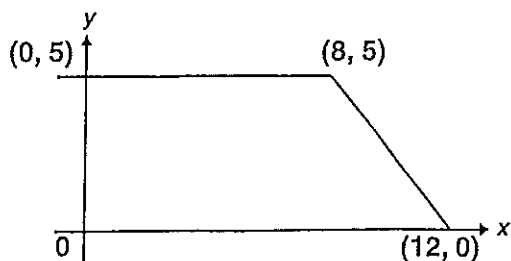
- A 113.0
- B 226.1
- C 254.3
- D 1017.4

54. What is the area, in square inches (in.), of the triangle below?



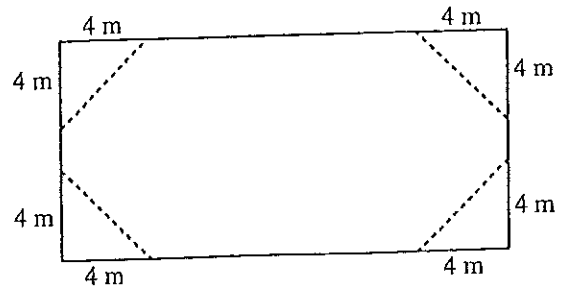
- A 25
- B  $25\sqrt{3}$
- C 50
- D  $50\sqrt{3}$

55. What is the area, in square units, of the trapezoid shown below?



- A 37.5
- B 42.5
- C 50
- D 100

56. The rectangle shown below has length 20 meters and width 10 meters.

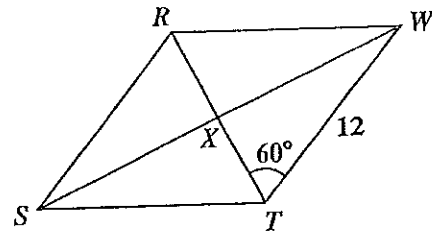


If four triangles are removed from the rectangle as shown, what will be the area of the remaining figure?

- A  $136 \text{ m}^2$
- B  $144 \text{ m}^2$
- C  $168 \text{ m}^2$
- D  $184 \text{ m}^2$

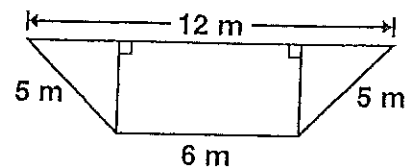
CSG00012

57. If  $RSTW$  is a rhombus, what is the area of  $\triangle WXT$ ?



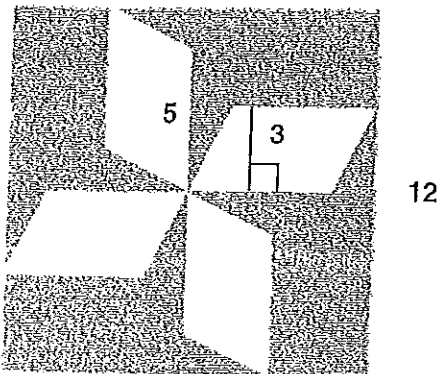
- A  $18\sqrt{3}$
- B  $36\sqrt{3}$
- C 36
- D 48

58. What is the area, in square meters (m), of the trapezoid shown below?



- A 28
- B 36
- C 48
- D 72

59. The figure below is a square with four congruent parallelograms inside.



What is the area, in square units, of the shaded portion?

- A 60
- B 84
- C 114
- D 129

60. Lea made two candles in the shape of right rectangular prisms. The first candle is 15 cm high, 8 cm long, and 8 cm wide. The second candle is 5 cm higher but has the same length and width. How much additional wax was needed to make the taller candle?

- A  $320 \text{ cm}^3$
- B  $640 \text{ cm}^3$
- C  $960 \text{ cm}^3$
- D  $1280 \text{ cm}^3$

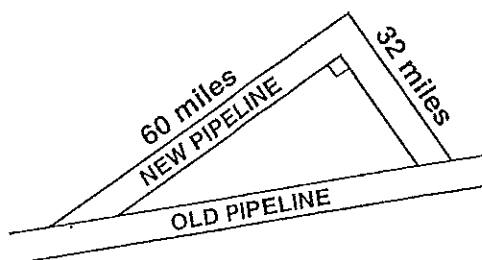
61. The perimeters of two squares are in a ratio of 4 to 9. What is the ratio between the areas of the two squares?

- A 2 to 3
- B 4 to 9
- C 16 to 27
- D 16 to 81

62. A right triangle's hypotenuse has length 5. If one leg has length 2, what is the length of the other leg?

- A 3
- B  $\sqrt{21}$
- C  $\sqrt{29}$
- D 7

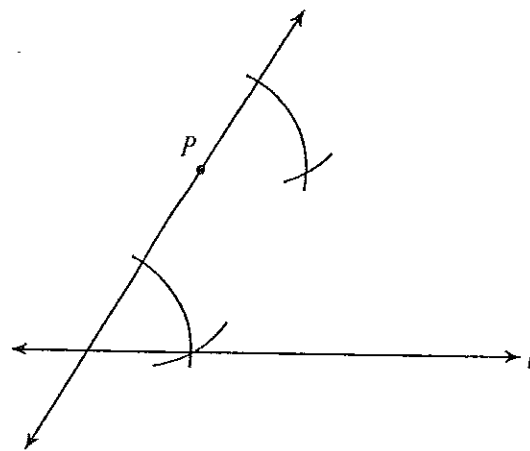
63. A new pipeline is being constructed to re-route its oil flow around the exterior of a national wildlife preserve. The plan showing the old pipeline and the new route is shown below.



About how many extra miles will the oil flow once the new route is established?

- A 24
- B 68
- C 92
- D 160

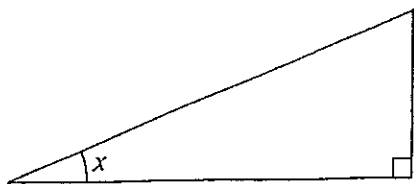
64. Marsha is using a straightedge and compass to do the construction shown below.



Which *best* describes the construction Marsha is doing?

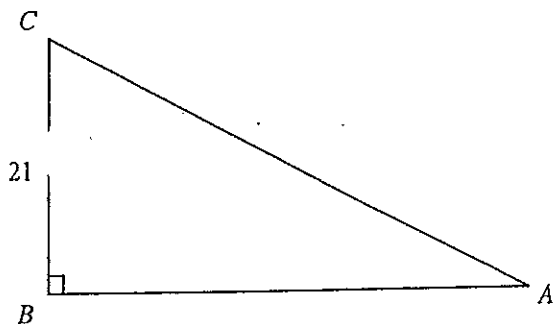
- A a line through  $P$  parallel to line  $l$
- B a line through  $P$  intersecting line  $l$
- C a line through  $P$  congruent to line  $l$
- D a line through  $P$  perpendicular to line  $l$

65. In the figure below, if  $\sin x = \frac{5}{13}$ , what are  $\cos x$  and  $\tan x$ ?



- A  $\cos x = \frac{12}{13}$  and  $\tan x = \frac{5}{12}$   
 B  $\cos x = \frac{12}{13}$  and  $\tan x = \frac{12}{5}$   
 C  $\cos x = \frac{13}{12}$  and  $\tan x = \frac{5}{12}$   
 D  $\cos x = \frac{13}{12}$  and  $\tan x = \frac{13}{5}$

66. In the figure below,  $\sin A = 0.7$ .



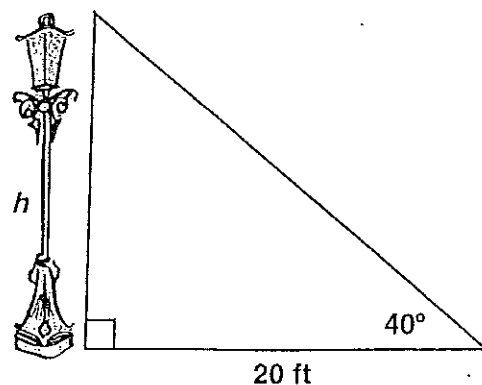
What is the length of  $\overline{AC}$ ?

- A 14.7  
 B 21.7  
 C 30  
 D 32

67. A square is circumscribed about a circle. What is the ratio of the area of the circle to the area of the square?

- A  $\frac{1}{4}$   
 B  $\frac{1}{2}$   
 C  $\frac{2}{\pi}$   
 D  $\frac{\pi}{4}$

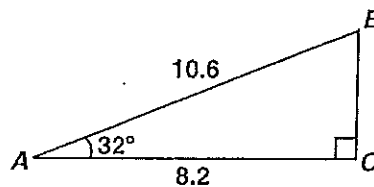
68. Approximately how many feet tall is the streetlight?



$\sin 40^\circ \approx 0.64$ $\cos 40^\circ \approx 0.77$ $\tan 40^\circ \approx 0.84$
--

- A 12.8  
 B 15.4  
 C 16.8  
 D 23.8

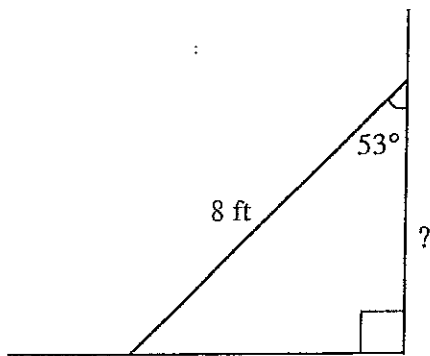
69. Right triangle  $ABC$  is pictured below.



Which equation gives the correct value for  $BC$ ?

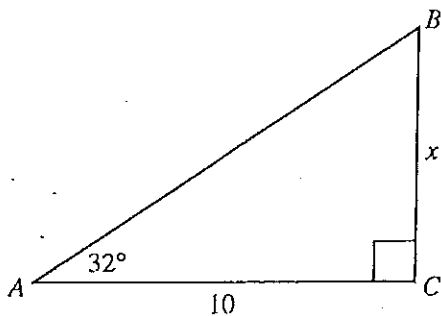
- A  $\sin 32^\circ = \frac{BC}{8.2}$   
 B  $\cos 32^\circ = \frac{BC}{10.6}$   
 C  $\tan 58^\circ = \frac{8.2}{BC}$   
 D  $\sin 58^\circ = \frac{BC}{10.6}$

70. The diagram shows an 8-foot ladder leaning against a wall. The ladder makes a  $53^\circ$  angle with the wall. Which is closest to the distance up the wall the ladder reaches?



$\sin 53^\circ \approx 0.80$ $\cos 53^\circ \approx 0.60$ $\tan 53^\circ \approx 1.33$
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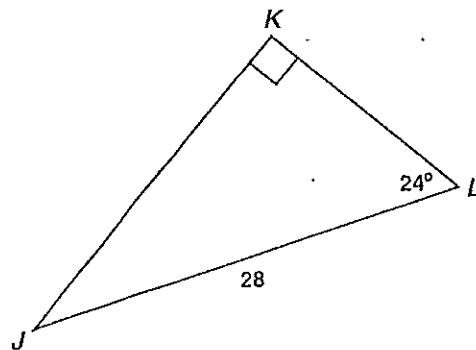
- A 3.2 ft  
 B 4.8 ft  
 C 6.4 ft  
 D 9.6 ft
71. In the accompanying diagram,  $m\angle A = 32^\circ$  and  $\angle C = 90^\circ$ . Which equation could be used to find  $x$  in  $\triangle ABC$ ?



- A  $x = 10 \sin 32^\circ$   
 B  $x = 10 \cos 32^\circ$   
 C  $x = 10 \tan 32^\circ$

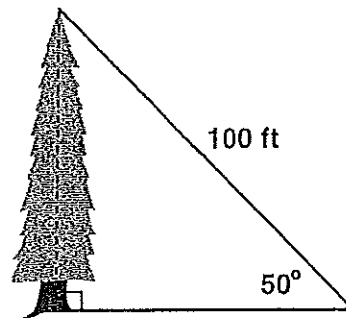
$$x = \frac{10}{\cos 32^\circ}$$

72. Triangle  $JKL$  is shown below.



Which equation should be used to find the length of  $\overline{JK}$ ?

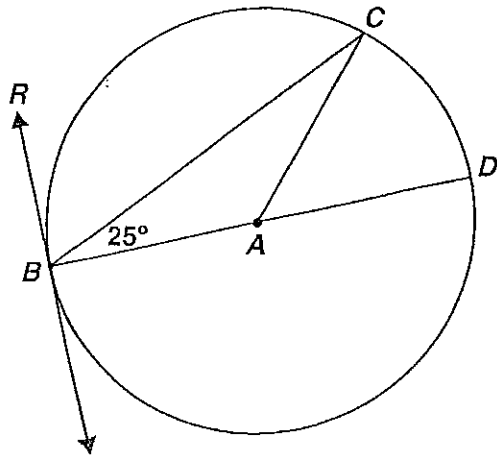
- A  $\sin 24^\circ = \frac{JK}{28}$   
 B  $\sin 24^\circ = \frac{28}{JK}$   
 C  $\cos 24^\circ = \frac{JK}{28}$   
 D  $\cos 24^\circ = \frac{28}{JK}$
73. What is the approximate height, in feet, of the tree in the figure below?



$\sin 50^\circ \approx 0.766$ $\cos 50^\circ \approx 0.643$ $\tan 50^\circ \approx 1.192$
---

- A 64.3  
 B 76.6  
 C 119.2  
 D 130.5

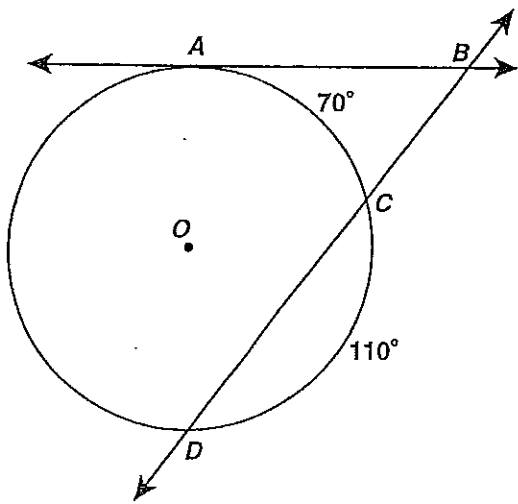
74.  $\overline{RB}$  is tangent to a circle, whose center is  $A$ , at point  $B$ .  $\overline{BD}$  is a diameter.



What is  $m\angle CBR$ ?

- A  $50^\circ$
- B  $65^\circ$
- C  $90^\circ$
- D  $130^\circ$

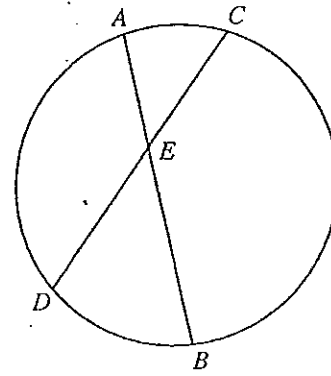
75. In the figure below,  $\overline{AB}$  is tangent to circle  $O$  at point  $A$ , secant  $\overline{BD}$  intersects circle  $O$  at points  $C$  and  $D$ ,  $m\widehat{AC} = 70^\circ$ , and  $m\widehat{CD} = 110^\circ$ .



What is  $m\angle ABC$ ?

- A  $20^\circ$
- B  $40^\circ$
- C  $55^\circ$
- D  $70^\circ$

76. In the circle below,  $\overline{AB}$  and  $\overline{CD}$  are chords intersecting at  $E$ .



If  $AE = 5$ ,  $BE = 12$ , and  $CE = 6$ , what is the length of  $\overline{DE}$ ?

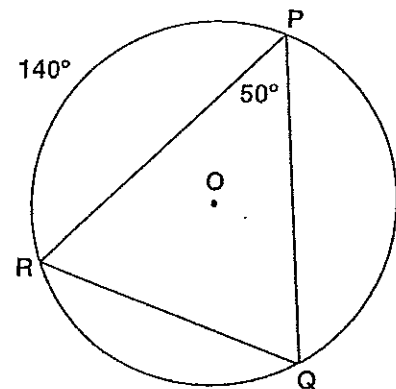
- A 7
- B 9
- C 10
- D 13

CSG00012

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77. In the circle shown below, the measure of  $\widehat{PR} = 140^\circ$  and the measure of  $\angle RPQ = 50^\circ$ .



What is the measure of  $\widehat{PQ}$ ?

- A  $50^\circ$
- B  $60^\circ$
- C  $70^\circ$
- D  $120^\circ$

78. What is the complete solution to the equation  $|3 - 6x| = 15$ ?

- A  $x = 2; x = 3$
- B  $x = -2; x = 3$
- C  $x = 2; x = -3$
- D  $x = -2; x = -3$

79. For a wedding, Shereda bought several dozen roses and several dozen carnations. The roses cost \$15 per dozen, and the carnations cost \$8 per dozen. Shereda bought a total of 17 dozen flowers and paid a total of \$192. How many roses did she buy?

- A 6 dozen
- B 7 dozen
- C 8 dozen
- D 9 dozen

80. What is the solution to the system of equations shown below?

$$\begin{cases} 2x - y + 3z = 8 \\ x - 6y - z = 0 \\ -6x + 3y - 9z = 24 \end{cases}$$

- A  $(0, 4, 4)$
- B  $\left(1, 4, \frac{10}{3}\right)$
- C no solution
- D infinitely many solutions

81.  $(-2x^2 + 6x + 1) - 2(4x^2 - 3x + 1)$

- A  $6x^2 - 1$
- B  $-10x^2 - 1$
- C  $6x^2 + 12x - 1$
- D  $-10x^2 + 12x - 1$

82.  $2x + 7 \overline{) 2x^4 + 21x^3 + 35x^2 - 37x + 46}$

- A  $x^3 + 7x^2 - 7x + 6 - \frac{4}{2x+7}$
- B  $2x^3 + 14x^2 - 14x + 12 - \frac{4}{2x+7}$
- C  $x^3 - 7x^2 + 7x - 6 + \frac{4}{2x+7}$
- D  $x^3 + 7x^2 - 7x + 6 + \frac{4}{2x+7}$

83.  $8a^3 + c^3 =$

- A  $(2a + c)(2a + c)(2a + c)$
- B  $(2a - c)(4a^2 + 2ac + c^2)$
- C  $(2a - c)(4a^2 + 4ac + c^2)$
- D  $(2a + c)(4a^2 - 2ac + c^2)$

84. Which polynomial represents  $(3x^2 + x - 4)(2x - 5)$ ?

- A  $6x^3 - 13x^2 - 13x - 20$
- B  $6x^3 - 13x^2 - 13x + 20$
- C  $6x^3 + 13x^2 + 3x - 20$
- D  $6x^3 + 13x^2 + 3x + 20$

85.  $\frac{x+3}{x+5} + \frac{6}{x^2+3x-10} =$

- A  $\frac{x^2 + x}{x^2 + 3x - 10}$
- B  $\frac{7x - 9}{x^2 + 3x - 10}$
- C  $\frac{x^2 + x + 12}{x^2 + 3x - 10}$
- D  $\frac{x^2 + x + 1}{x^2 + 3x - 10}$

86. The total area of a rectangle is  $4x^4 - 9y^2$ . Which factors could represent the length times width?

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

87. Which is a simplified form of  $\frac{3a^2b^3c^{-2}}{(a^{-1}b^2c)^3}$ ?

- A  $\frac{3a^5}{b^3c^5}$
- B  $\frac{3ab}{c^5}$
- C  $\frac{3}{b^2c^5}$
- D  $\frac{3}{ab^3c^5}$

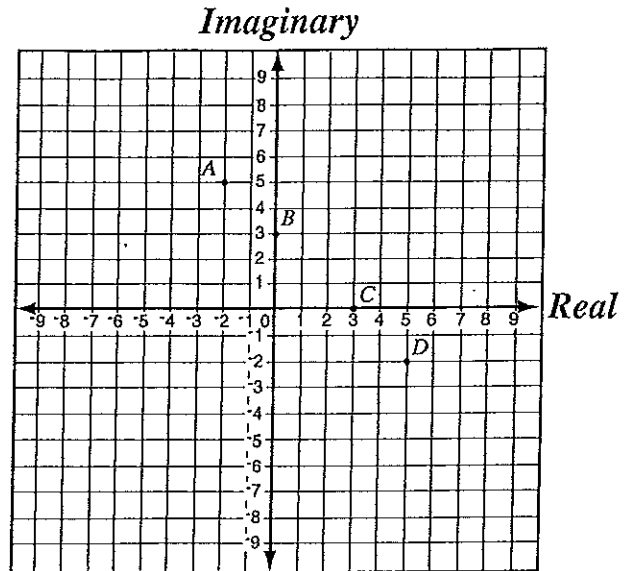
88. What is  $\frac{20x^{-4}}{27y^2} \div \frac{8x^{-3}}{15y^{-5}}$ ?

- A  $\frac{32y^3}{81x}$
- B  $\frac{32}{81xy^7}$
- C  $\frac{25y^3}{18x}$
- D  $\frac{25}{18xy^7}$

89. If  $i = \sqrt{-1}$ , what is the value of  $i^4$ ?

- A  $i$
- B  $-i$
- C  $1$
- D  $-1$

90. If  $i = \sqrt{-1}$ , which point shows the location of  $5 - 2i$  on the plane?



- A point A
- B point B
- C point C
- D point D

91. If  $i = \sqrt{-1}$ , then  $4i(6i) =$

- A 48
- B 24
- C -24
- D -48

92. What is an equivalent form of  $\frac{2}{3+i}$ ?

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



93. What is the product of the complex numbers  $(3+i)$  and  $(3-i)$ ?

- A 8
- B 10
- C  $9-i$
- D  $10-6i$

94. What are the solutions to the equation  $x^2 + 2x + 2 = 0$ ?

- A  $x=0; x=-2$
- B  $x=0; x=-2i$
- C  $x=-1+i; x=-1-i$
- D  $x=-1+2\sqrt{2}; x=-1-2\sqrt{2}$

95. What are the solutions to the equation

$$1 + \frac{1}{x^2} = \frac{3}{x}?$$

- A  $x = \frac{3}{2} + \frac{\sqrt{5}}{2}; x = \frac{3}{2} - \frac{\sqrt{5}}{2}$
- B  $x = 3 + \frac{\sqrt{5}}{2}; x = 3 - \frac{\sqrt{5}}{2}$
- C  $x = \frac{3}{2} + \frac{\sqrt{13}}{2}; x = \frac{3}{2} - \frac{\sqrt{13}}{2}$
- D  $x = 3 + \frac{\sqrt{13}}{2}; x = 3 - \frac{\sqrt{13}}{2}$

96. There are two numbers with the following properties.

- 1) The second number is 3 more than the first number.
- 2) The product of the two numbers is 9 more than their sum.

Which of the following represents possible values of these two numbers?

- A  $-6, -3$
- B  $-4, -1$
- C  $-1, 4$
- D  $-3, 6$

97. The graph of  $\left(\frac{x}{2}\right)^2 - \left(\frac{y}{3}\right)^2 = 1$  is a hyperbola.

Which set of equations represents the asymptotes of the hyperbola's graph?

- A  $y = \frac{3}{2}x, y = -\frac{3}{2}x$
- B  $y = \frac{2}{3}x, y = -\frac{2}{3}x$
- C  $y = \frac{1}{2}x, y = -\frac{1}{2}x$
- D  $y = \frac{1}{3}x, y = -\frac{1}{3}x$

98.  $4x^2 - 5y^2 - 16x - 30y - 9 = 0$

What is the standard form of the equation of the conic given above?

- A  $\frac{(x-4)^2}{11} - \frac{(y-3)^2}{4} = 1$
- B  $\frac{(y+3)^2}{4} - \frac{(x-2)^2}{5} = 1$
- C  $\frac{(y-3)^2}{6} - \frac{(x+2)^2}{9} = 1$
- D  $\frac{(x-4)^2}{11} + \frac{(y-3)^2}{4} = 1$

99. What is the solution to the equation  $5^x = 17$ ?

- A  $x = 2$
- B  $x = \log_{10} 2$
- C  $x = \log_{10} 17 + \log_{10} 5$
- D  $x = \frac{\log_{10} 17}{\log_{10} 5}$

100. If  $\log_{10} x = -2$ , what is the value of  $x$ ?

A  $x = -\sqrt{\frac{1}{10}}$

B  $x = \sqrt{\frac{1}{10}}$

C  $x = \frac{1}{100}$

D  $x = 100$

101. Which equation is equivalent to  $\log_3 \frac{1}{9} = x$ ?

A  $\frac{1^3}{9} = x^3$

B  $\left(\frac{1}{9}\right)^3 = x$

C  $3^x = \frac{1}{9}$

D  $3^9 = x$

102. What are the  $x$ -intercepts of the graph of  $y = 12x^2 - 5x - 2$ ?

A 1 and  $-\frac{1}{6}$

B -1 and  $\frac{1}{6}$

C  $\frac{2}{3}$  and  $-\frac{1}{4}$

D  $-\frac{2}{3}$  and  $\frac{1}{4}$

103. Given the equation  $y = x^n$  where  $x > 0$  and  $n < 0$ , which statement is valid for real values of  $y$ ?

A  $y > 0$

B  $y = 0$

C  $y < 0$

D  $y \leq 0$

104. A certain radioactive element decays over time according to the equation  $y = A\left(\frac{1}{2}\right)^{\frac{t}{300}}$ ,

where  $A$  = the number of grams present initially and  $t$  = time in years. If 1000 grams were present initially, how many grams will remain after 900 years?

A 500 grams

B 250 grams

C 125 grams

D 62.5 grams

105. Bacteria in a culture are growing exponentially with time, as shown in the table below.

Bacteria Growth

Day	Bacteria
0	100
1	200
2	400

Which of the following equations expresses the number of bacteria,  $y$ , present at any time,  $t$ ?

A  $y = 100 + 2^t$

B  $y = (100) \cdot (2)^t$

C  $y = 2^t$

D  $y = (200) \cdot (2)^t$

106. If the equation  $y = 2^x$  is graphed, which of the following values of  $x$  would produce a point closest to the  $x$ -axis?

A  $\frac{1}{4}$

B  $\frac{3}{4}$

C  $\frac{5}{3}$

D  $\frac{8}{3}$

107. What is the value of  $\log_3 27$ ?

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

108. If  $\log 2 \approx 0.301$  and  $\log 3 \approx 0.477$ , what is the approximate value of  $\log 72$ ?

- A 0.051
- B 0.778
- C 0.861
- D 1.857

109. If  $x$  is a real number, for what values of  $x$  is the equation  $\frac{3x-9}{3} = x-3$  true?

- A all values of  $x$
- B some values of  $x$
- C no values of  $x$
- D impossible to determine

110. On a recent test, Jeremy wrote the equation

$$\frac{x^2 - 16}{x - 4} = x + 4.$$

Which of the following statements is correct about the equation he wrote?

- A The equation is always true.
- B The equation is always true, except when  $x = 4$ .
- C The equation is never true.
- D The equation is sometimes true when  $x = 4$ .

111. Abelardo wants to create several different 7-character screen names. He wants to use arrangements of the first 3 letters of his first name (abe), followed by arrangements of 4 digits in 1984, the year of his birth. How many different screen names can he create in this way?

- A 72
- B 144
- C 288
- D 576

112. Teresa and Julia are among 10 students who have applied for a trip to Washington, D.C. Two students from the group will be selected at random for the trip. What is the probability that Teresa and Julia will be the 2 students selected?

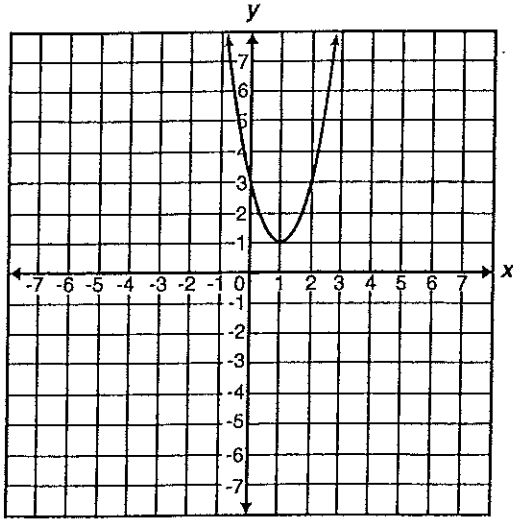
- A  $\frac{1}{45}$
- B  $\frac{2}{45}$
- C  $\frac{1}{5}$
- D  $\frac{2}{5}$

113. What is the sum of the infinite geometric series

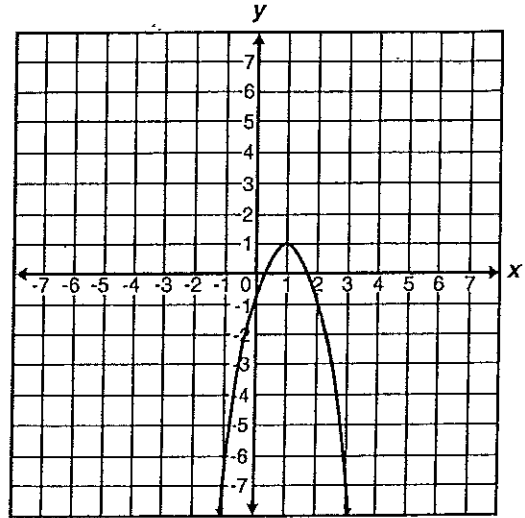
$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots?$$

- A 1
- B 1.5
- C 2
- D 2.5

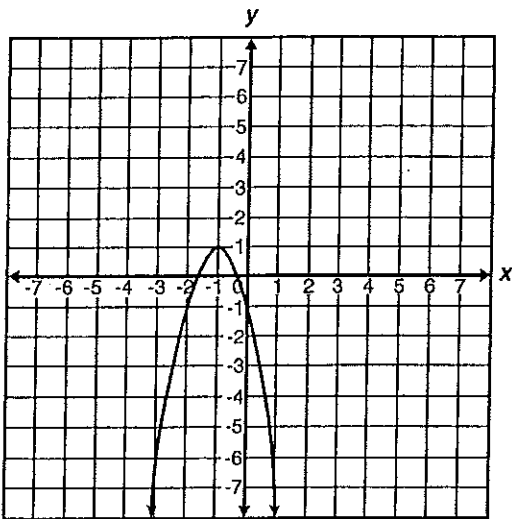
114. Which is the graph of  $y = -2(x-1)^2 + 1$ ?



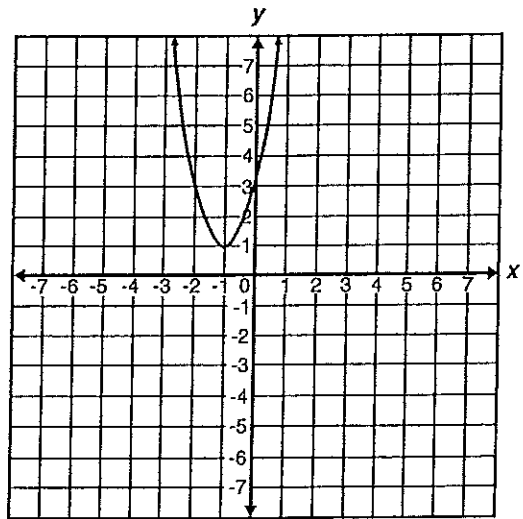
A



C



B



D

115. Which expression represents  $f(g(x))$  if  $f(x) = x^2 - 1$  and  $g(x) = x + 3$ ?

- A  $x^3 + 3x^2 - x - 3$
- B  $x^2 + 6x + 8$
- C  $x^2 + x + 2$
- D  $x^2 + 8$

116. A box contains 7 large red marbles, 5 large yellow marbles, 3 small red marbles, and 5 small yellow marbles. If a marble is drawn at random, what is the probability that it is yellow, given that it is one of the large marbles?

A  $\frac{5}{12}$

B  $\frac{7}{20}$

C  $\frac{5}{8}$

D  $\frac{1}{5}$

117. A small-business owner must hire seasonal workers as the need arises. The following list shows the number of employees hired monthly for a 5-month period.

4, 13, 5, 6, 9

If the mean of these data is approximately 7, what is the population standard deviation for these data? (Round the answer to the nearest tenth.)

A 3.3

B 7.4

C 10.8

D 13.5

118. A math teacher is randomly distributing 15 rulers with centimeter labels and 10 rulers without centimeter labels. What is the probability that the first ruler she hands out will have centimeter labels and the second ruler will *not* have labels?

A  $\frac{1}{24}$

B  $\frac{1}{4}$

C  $\frac{2}{5}$

D  $\frac{23}{25}$