1. Which of the following statements is true?

    ○ A   Every real number is rational.

    ○ B   Some rational numbers are integers.

    ○ C   All integers are whole numbers.

    ○ D   All non-negative real numbers are positive.
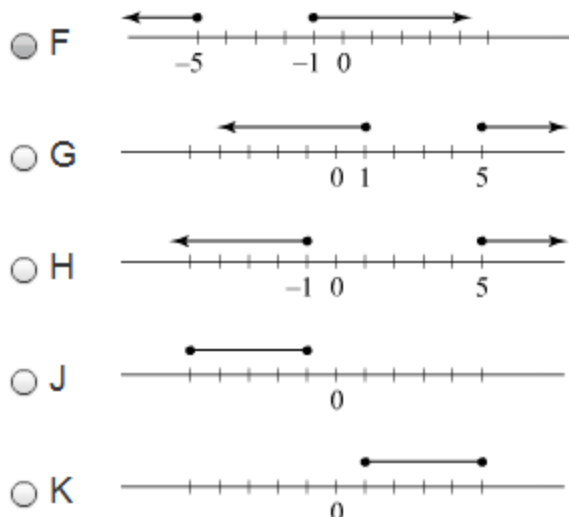
    ○ E   The number 3.1416 is irrational.

2. Which of the following is not a rational number?

    ○ F -3

    ○ G $-\sqrt{3}$

    ○ H $\sqrt{9}$

    ○ J   17%

    ○ K $\dfrac{8}{10}$

3. $2^3 - 3[5 - (4 - 3^2)] = ?$

    ○ A   8

    ○ B   6

    ○ C   50

    ○ D -22

    ○ E   5

4. Which of the following graphs corresponds to the inequality: $|x+3| \geq 2$?

○ F
$\quad$ -5 $\quad$ -1 0

○ G
$\quad$ 0 1 $\quad$ 5

○ H
$\quad$ -1 0 $\quad$ 5

○ J
$\quad$ 0

○ K
$\quad$ 0

5. Ramona bought 10 yards of fabric to make curtains. Each pair of curtains requires 2 feet 3 inches of fabric. After making the maximum number of pairs of curtains, how much fabric will remain unused?

○ A $\quad$ 3 inches

○ B $\quad$ 7 inches

○ C $\quad$ 9 inches

○ D $\quad$ 1 foot 3 inches

○ E $\quad$ All of the fabric will be used.

6. What is the domain of the function $f(x) = \dfrac{x-2}{x^2 - x - 2}$?

○ F $\quad$ All real numbers

○ G $\quad$ All real numbers except -1

○ H $\quad$ All real numbers except 2 and -1

○ J $\quad$ All real numbers except 2

○ K $\quad$ All real numbers except -2 and 1

7. Which of the following sets of numbers contains at least one number that is not prime?

○ A　{3,5,7,73}

○ B　{2,23,31,131}

○ C　{3,5,7,11,71}

○ D　{11,13,17,19,29}

○ E　{1,3,5,53}
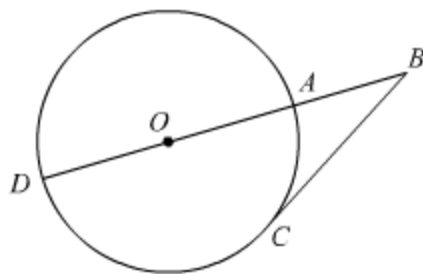
8. If $x = -4$ and $y = 3$, what is the value of $x - y(x + y)$?

○ F　7

○ G　-7

○ H　-1

○ J　1

○ K　-49

9. Which of the following is not a real number?

○ A　143%

○ B　$\dfrac{5}{5}$

○ C　$\dfrac{8}{0}$

○ D　π

○ E　$\sqrt{10}$

10.

$\overline{BC}$ is tangent to circle O at C and m $\overarc{AC} = 73°$. Find m$\angle OBC$.

- ● F 73°
- ○ G $53\frac{1}{2}°$
- ○ H 34°
- ○ J 17°
- ○ K 23°

11. At noon, Ashley starts traveling north at an average speed of 40 miles per hour. From the same place one hour later, Ricky starts traveling south at an average speed of 45 miles per hour. Which equation could be used to determine at what time they will be 210 miles apart?

- ○ A $40x + 45(x - 1) = 210$
- ○ B $40x - 45(x - 1) = 210$
- ● C $40x = 45(x - 1)$
- ○ D $40x + 45(x + 1) = 210$
- ○ E $40(x - 1) + 45x = 210$

12. What is the solution set for $5(x - 3) + 4 = 5 - 2(x + 1)$?
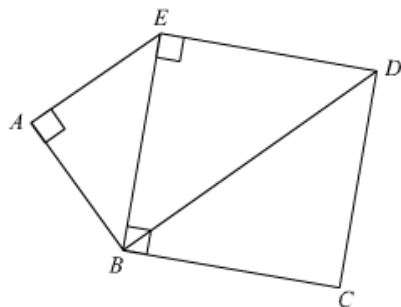
- ○ F $\left\{\frac{8}{3}\right\}$
- ○ G $\{-2\}$
- ○ H $\{2\}$
- ○ J $\{1\}$
- ○ K ∅

13.

If m∠EAB = m∠BED = m∠EBC = 90°, and $AB = AE = 2$, and $DE = 3$, what is the length of $\overline{BD}$?

- ○ A   4
- ○ B   3.5
- ○ C   5
- ○ D $\sqrt{17}$
- ○ E $\sqrt{13}$

14. Which of the following represents the distance between −8 and 5 on the number line?

- ○ F $|5 - (-8)|$
- ○ G $-|-8 - 5|$
- ○ H $|5 + (-8)|$
- ○ J $|-8 + 5|$
- ○ K $-|-8 + 5|$

15. Which of the following is not equal to the others?

○ A   1.125

● B $\dfrac{9}{8}$

○ C $1\dfrac{1}{8}$

○ D   1125%

○ E $\dfrac{3}{4}+\dfrac{3}{8}$

16. What is the complete factorization of $6x^2 + 6x - 36$?

○ F $3(x - 2)(2x + 6)$

○ G $6(x - 2)(x + 3)$

○ H $(2x - 4)(3x + 9)$

○ J $6(x + 2)(x - 3)$

● K $2(3x^2 + 3x - 18)$

17. How many different slates of officers—president, vice-president, secretary, and treasurer—can be selected from an organization of 20 members?

○ A   4845

● B   5

○ C   About $1.0137(10^{17})$

○ D   116,280

○ E   80

18. What is another name for a quadrilateral with congruent angles and congruent sides?

    ○ F   A rhombus

    ○ G   A rectangle

    ○ H   A square

    ○ J   A pentagon

    ● K   A parallelogram

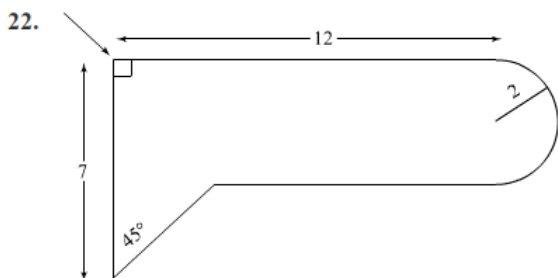19. What is the completely simplified form of $2x - 3[x - 2(3x - 2)]$?

    ○ A $17x + 12$

    ○ B $17x - 12$

    ○ C $-19x - 12$

    ○ D $-17x + 4$

    ○ E $-19x + 4$

20. What is the value of -4^{-2}?

    ○ F   16

    ○ G -16

    ○ H $\dfrac{1}{16}$

    ○ J $\dfrac{-1}{16}$

    ○ K   8

21. What is the product of the complex numbers $-1 + 3i$ and $2 + 4i$?

     A $-14 + 2i$

     B $10 + 2i$

     C $-14 - 2i$

     D $-14 - 10i$

     E $-10 - 10i$

22.

In the diagram, the long sides of the figure are parallel, the right end is capped with a semicircle, and the left end has a triangular extension as shown. What is the area of this figure?

     F $98 + \dfrac{9}{2} + 2\pi$

     G $84 + 2\pi$

     H $57 + 4\pi$

     J $57 + 2\pi$

     K $\dfrac{1}{2}(105 + 4\pi)$

23. What is the simplest form of $\dfrac{12\sqrt{20}}{\sqrt{6}}$?
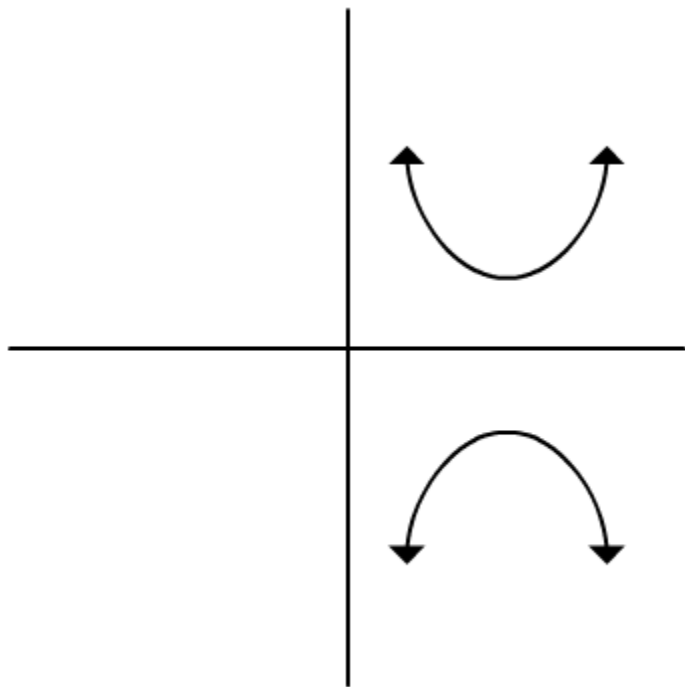
- ○ A $\quad 4\sqrt{30}$

- ○ B $\quad 2\sqrt{120}$

- ○ C $\quad \dfrac{12\sqrt{10}}{\sqrt{3}}$

- ○ D $\quad \dfrac{12\sqrt{30}}{3}$

- ○ E None of these

24.

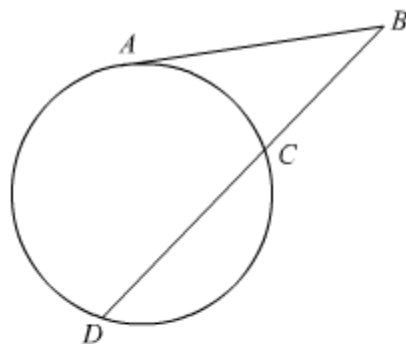What symmetry is shown in the accompanying graph?

- ○ F Symmetry to the x-axis.

- ○ G Symmetry to the y-axis.

- ○ H Symmetry to the origin.

- ○ J Symmetry to the line $y = x$.

- ○ K No symmetry is shown in this graph.

25.

In the diagram, $BC = 4$ and $CD = 5$. What is the length of the tangent $\overline{AB}$?

- ○ A $\quad \sqrt{20}$
- ○ B $\quad 3$
- ○ C $\quad \sqrt{41}$
- ○ D $\quad 6$
- ○ E $\quad 5$

26. A number is randomly selected from $\{1,2,3,\cdots,20\}$. What is the probability that it is prime?

- ○ F $\quad \dfrac{9}{20}$
- ○ G $\quad \dfrac{2}{5}$
- ○ H $\quad \dfrac{7}{20}$
- ○ J $\quad \dfrac{3}{10}$
- ○ K $\quad \dfrac{1}{4}$

27. If $a > 0$ and $b > 0$, express in simplest radical form: $\left(6\sqrt{48a}\right)\left(4\sqrt{30ab^3}\right)$.

A $24\sqrt{1440a^2b^3}$

B $288ab\sqrt{10b}$

C $288a\sqrt{10b^3}$

D $144a\sqrt{40b^3}$

E $12a\sqrt{40b^3}$

28. If $a \neq b$, what is equal to $\dfrac{a-b}{b-a}$?
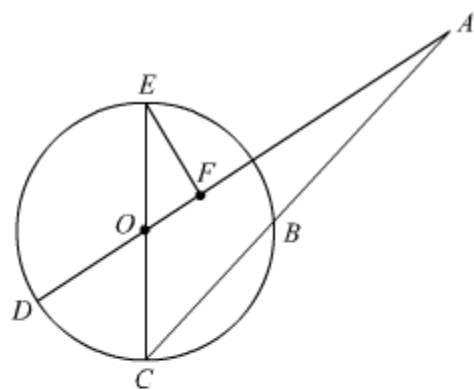
F   1

G $\dfrac{a+b}{b+a}$

H $\dfrac{a-b}{a-b}$

J   0

K   −1

29. If $\log_2 3 = a$, $\log_2 5 = b$ and $\log_2 7 = c$, then what is $\log_2 35\sqrt{6}$?

- ○ A $\quad b + c + \dfrac{1}{2}(1 + a)$

- ○ B $\quad bc + \dfrac{1}{2}a$

- ○ C $\quad \dfrac{1}{2}a(bc)$

- ○ D $\quad a + b + c + \dfrac{1}{2}$

- ○ E $\quad$ There is not enough information.

30.

In the diagram, which of the following is an inscribed angle?

- ○ F $\quad \angle DAC$

- ○ G $\quad \angle DOC$

- ○ H $\quad \angle ECB$

- ○ J $\quad \angle DOE$

- ○ K $\quad \angle EFO$

32. If the terminal side of θ contains the point $(-2, 3)$, what is the value of $\cos\theta$?

- F $\quad \dfrac{3}{\sqrt{13}}$

- G $\quad \dfrac{-2}{3}$

- H $\quad \dfrac{-3}{2}$

- J $\quad \dfrac{-2}{\sqrt{13}}$

- K $\quad \dfrac{-\sqrt{13}}{2}$

33.
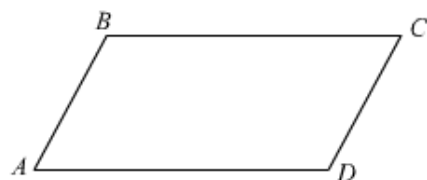
In parallelogram $ABCD$, m$\angle A = 60°$, $AB = 6$, and $BC = 10$. What is the area of $ABCD$?

- A $\quad$ 60

- B $\quad$ 32

- C $\quad 15\sqrt{3}$

- D $\quad 30\sqrt{3}$

- E $\quad 60\sqrt{3}$

34. What is the solution set for the following system of equations: $\begin{pmatrix} 3x - y = 1 \\ 4x + 2y = -12 \end{pmatrix}$?

- ○ F $\{(1,2)\}$

- ○ G $\{(1,-8)\}$

- ○ H $\left\{\left(\dfrac{5}{3}, 4\right)\right\}$

- ○ J $\{(-1,-4)\}$

- ○ K $\{(-5,4)\}$

35. A store advertises tires on sale: "Buy three, get the fourth free." This is equivalent to which of the following?

- ○ A $\dfrac{1}{3}$ off on three tires; fourth tire free

- ○ B $\dfrac{1}{3}$ off on four tires

- ○ C 25% off on four tires

- ○ D 25% off on three tires; fourth tire free

- ○ E None of these

36. In a dog show, $\dfrac{1}{4}$ of the dogs are hounds. One-third of the hounds are Basset Hounds. If there are five Basset Hounds, how many dogs are in the dog show?
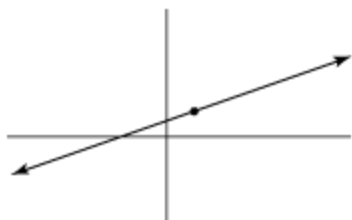
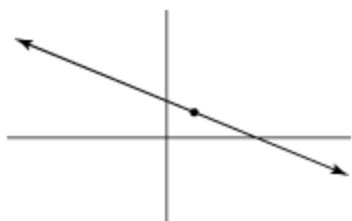- ○ F 24

- ○ G 12

- ○ H 20

- ○ J 72

- ○ K 60

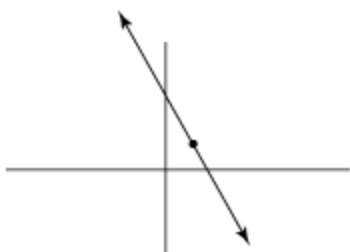**37.** Which of the following could be the graph of $2x + 5y = 7$?
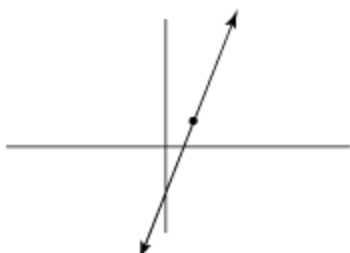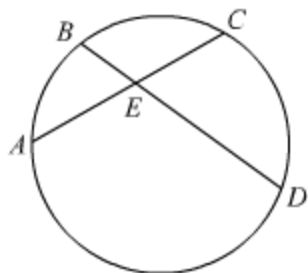
○ A

○ B

○ C

○ D

○ E

38.

In the diagram, $BE = 2$, $CE = 3$, and $DE = 6$. Find AE.

○ F 4

○ G 5

○ H $3\sqrt{2}$

○ J $2\sqrt{3}$

○ K 3

39. What is the probability of getting three consecutive heads when a fair coin is flipped three times?

○ A $\dfrac{1}{2}$

○ B $\dfrac{1}{4}$

○ C $\dfrac{3}{8}$

○ D $\dfrac{1}{8}$

○ E $\dfrac{1}{6}$

39. What is the probability of getting three consecutive heads when a fair coin is flipped three times?

○ A $\dfrac{1}{2}$

○ B $\dfrac{1}{4}$

○ C $\dfrac{3}{8}$

○ D $\dfrac{1}{8}$

○ E $\dfrac{1}{6}$

41. The first two terms of an arithmetic sequence are 3 and 1, in that order. What are the next two terms in the sequence?

○ A 1 and 3

○ B −1 and −3

○ C 0 and −1

○ D $\dfrac{1}{3}$ and $\dfrac{1}{9}$

○ E 5 and 7

42. What is the measure of one exterior angle of a regular pentagon?

○ F 108°

○ G 45°

○ H 60°

○ J 72°

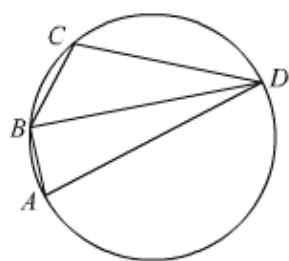○ K 80°

43. What is the distance between the points $(-1,4)$ and $(3,-1)$?

○ A   3

○ B   6

○ C $\sqrt{13}$
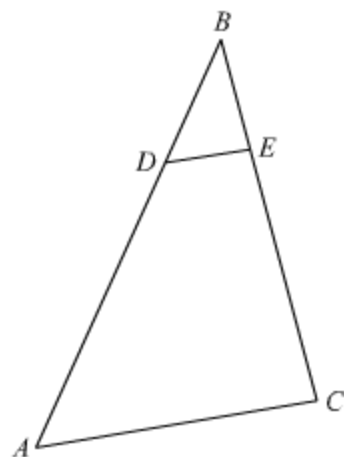
○ D $\sqrt{19}$

○ E $\sqrt{41}$

44.

In the diagram, $\overline{AD}$ is a diameter, and $m\angle BCD = 110°$. What is $m\angle BAD$ in degrees?

○ F   70

○ G   55

○ H   30

○ J   110

○ K   150

45. The length of a rectangle is three feet longer than twice its width. What is the length of the rectangle if its perimete is 54 feet?

◉ A   8 feet

○ B   13 feet

○ C   19 feet

○ D   10 feet

○ E   23 feet

46.

In the diagram, $\overline{DE} \parallel \overline{AC}$, $AB = 8$, $BE = 2$, and $EC = 5$. What is DB?

○ F $5\dfrac{5}{7}$

○ G   3

○ H $\dfrac{7}{16}$

○ J $1\dfrac{2}{3}$

○ K $2\dfrac{2}{7}$

47. If θ is in quadrant III and $\tan\theta = \dfrac{5}{12}$, then what is the value of $\sin\theta$?

◉ A $\dfrac{12}{13}$

○ B $\dfrac{5}{13}$

○ C $\dfrac{-5}{13}$

○ D $\dfrac{-12}{13}$

○ E $\dfrac{12}{5}$

48. If the sum of the interior angles of the polygon is 1080°, how many sides does the polygon have?

○ F   5

○ G   6

○ H   7

○ J   8

○ K   9

49. Jackie got scores of 78, 85, 74, and 75 on the first four math tests. What score must she get on the fifth test in order to have an average of at least 80?

○ A   78

○ B   More than 88

○ C   Less than 88

○ D   88

○ E   88 or more

50. What is the solution set for this system of equations? $\begin{pmatrix} 2x - 3y = 6 \\ y = \dfrac{2}{3}x - 2 \end{pmatrix}$

○ F $\{(0,-2)\}$

○ G $\{(3,0)\}$

○ H $\{(0,0)\}$

○ J   All points on the line $\{(x,y)|2x - 3y = 6\}$.

○ K   No solution, $\{\ \}$

51. Which of the following is identically equal to cos2A?

○ A $\cos^2 A - \sin^2 A$

○ B $\pm\sqrt{1-\sin^2 2A}$

● C $2\cos^2 A - 1$

○ D $1 - 2\sin^2 A$

○ E   All of the above are identically equal to cos2A.

52. Carliss has $3.75 in dimes and quarters only. If the number of quarters is three more than twice the number of dimes, how many of each kind of coin does she have?

○ F   5 dimes, 13 quarters

○ G   13 dimes, 5 quarters

○ H   0 dimes, 15 quarters

○ J   30 dimes, 3 quarters

○ K   6 dimes, 15 quarters

53. If a and b are both positive and $a < b$, which of the following is equal to $|a - b| - |b + a|$?

○ A $2a$

○ B $-2a$

○ C $2b$

○ D $-2b$

○ E $2a - 2b$

54. $(x-2)^3 = ?$

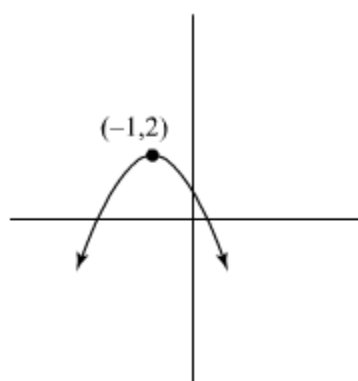   ○ F $x^3 - 8$

   ○ G $x^3 - 3x^2 + 3x - 8$

   ○ H $x^3 - 6x^2 - 12x - 8$

   ○ J $x^3 + 4x - 8$

   ○ K $x^3 - 6x^2 + 12x - 8$

55.

$(-1,2)$

Which equation corresponds to this graph?

   ○ A $y = (x+1)^2 + 2$

   ○ B $y = -(x-1)^2 + 2$

   ○ C $y = -(x+1)^2 - 2$

   ○ D $y = (x-1)^2 + 2$

   ○ E $y = -(x+1)^2 + 2$

56. What is the solution set for the equation: $\sqrt{2x+1} = x-1$?

○ F   {0,4}
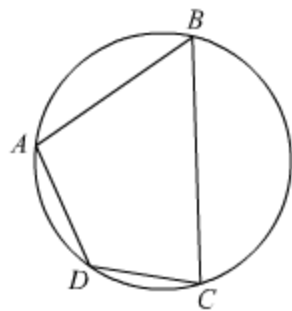
○ G   {0}

○ H   {4}

○ J   {0,2}

○ K   {2}

57. What is the solution set for the equation $2x^2 + x = 3$?

○ A $\{-1\}$

○ B $\left\{\dfrac{-3}{2}, 1\right\}$

○ C $\left\{3, \dfrac{1}{2}\right\}$

○ D $\left\{\dfrac{3}{2}\right\}$

◉ E $\left\{\dfrac{3}{2}, -1\right\}$

58. Which of the following is true for all x in the appropriate domain?

○ F $\cos^2 x - \sin^2 x = 1$

○ G $\cot^2 x - 1 = \csc^2 x$

○ H $\sin^2 x = 2\sin x \cos x$

○ J $\cos 2x + \sin 2x = 1$

○ K $1 + \tan^2 x = \sec^2 x$

59.

In *ABCD*, m∠*ABC* = 65°. What is ∠*ADC* in degrees?

○ A   65

○ B   130

○ C   95

○ D   100

○ E   115