PLUGGING IN AND PITA DRILL 2

Easy

3. Which of the following expressions is equivalent to $a^2 - 8a + 16$?

A. $(a-4)(a-4)$
B. $(a-4)(a+4)$
C. $(a-2)(a-8)$
D. $(a-2)(a+8)$
E. $(2a-4)(2a-4)$

6. A 62-centimeter-long string is cut into 4 pieces such that the first piece is twice as long as the second piece, the second piece is three times as long as the third piece, and the third piece is three times as long as the fourth piece. How many centimeters in length is the longest of the 4 pieces?

F. 2
G. 8
H. 18
J. 26
K. 36

7. The expression $-w\left[x-\left(y+z\right)\right]$ is equivalent to:

A. $-wx-wy-wz$
B. $-wx+wy-wz$
C. $-wx+wy+wz$
D. $-wx-y+z$
E. $wx-y+z$

9. Jenna is swimming laps in a pool on 5 consecutive days. If the numbers below represent the number of laps she swims each day, what 3 numbers should be placed in the blanks below so that the difference between the laps Jenna swims on consecutive days remains the same?

5, ____, ____, ____, 53

A. 12, 24, 36
B. 16, 32, 48
C. 17, 29, 41
D. 20, 30, 40
E. 21, 29, 37

11. Which of the following is equivalent to $(x^4)^{22}$?

A. x^{88}
B. x^{26}
C. $4x^{22}$
D. $26x$
E. $88x$

12. An artist is purchasing the raw materials necessary for a sculpture. Moulding clay comes in 25-pound bags, and plaster of Paris comes in 14-pound bags. If the artist purchases a total of 50 bags of moulding clay and plaster of Paris weighing a total of 1,030 pounds, how many bags of plaster of Paris does the artist purchase?

F. 11
G. 20
H. 25
J. 30
K. 39

15. Points X, Y, and Z lie on a line (not shown), with Y between X and Z. If $XY = a$, $YZ = a - 2$, and $XZ = 18$, what is the value of a ?

A. 8
B. 9
C. 10
D. 18
E. 20

18. Teddy, Harry, and Obie are buying baseball cards. Teddy always buys cards in packs of 15, Harry always buys cards in packs of 10, and Obie always buys cards in packs of 25. What is the smallest number of cards all three could buy such that they all have the same number of cards?

F. 25
G. 150
H. 250
J. 750
K. 3,750

19. Which of the following variable expressions would represent the area of a parallelogram if its base is represented by $a+3$ and its height is represented by $a-5$?

A. $2a-2$
B. a^2-15
C. $a^2-8a-15$
D. $a^2-2a-15$
E. $a^2-2a+15$

20. The expression $(2x+5y)-(3x-2y)$ is equivalent to:

F. $-x-3y$
G. $-x+7y$
H. $x-3y$
J. $x+7y$
K. $5x-3y$

Medium

21. For all positive integers a, b, and c, which of the following expressions is equivalent to $\frac{a-b}{b}$?

A. $\frac{a+b+c}{b+c}$
B. $\frac{a\cdot c-b\cdot c}{b\cdot c}$
C. $\frac{a-b\cdot c}{b\cdot c}$
D. $\frac{a\cdot c+b\cdot c}{b\cdot c}$
E. $\frac{-a-b\cdot c}{-b\cdot c}$

22. Sheldon has 30 comic books. Some of the comic books were originally 10¢, and the others were originally 45¢. The original value of all 30 comic books is $9.65. How many 45¢ comic books does Sheldon have?

F. 11
G. 13
H. 15
J. 19
K. 21

23. Let a be a real number. Which of the following is a value of a such that $a^2+9a=0$?

A. 18
B. 6
C. 3
D. –3
E. –9

26. Given $7a-b=2a+3b$, which of the following is an expression for b ?

F. $-\left(\frac{2a+3b}{7a}\right)$
G. $-\frac{5a}{4}$
H. $\frac{5a}{4}$
J. $\frac{5a}{2}$
K. $\frac{2a+3b}{7a}$

27. The height of a parallelogram is 7 inches shorter than the base from which the height is measured. If the area of the parallelogram is 60 square inches, what is the height, in inches?

A. 5
B. 9
C. 12
D. 24
E. 53

29. If $f(x) = x^2 + 8x + 12$, what is(are) the real value(s) of a for which $f(a) = a$?

A. –6 and –2 only
B. –4 and –3 only
C. 3 only
D. 6 only
E. 3 and 4 only

32. In a set of 5 numbers, value A is removed and replaced with a different number, value B. If the mean of the new set is 2 more than the mean of the original set, what is the positive difference between A and B ?

F. $\frac{2}{5}$

G. 3

H. 7

J. 10

K. 25

33. For all real values y, $\frac{\left[4(y-3)\right]^2}{8} = ?$

A. $\frac{1}{2}y^2 - 3y + \frac{9}{2}$

B. $y^2 - 9$

C. $2y^2 - 18$

D. $2y^2 - 12y - 18$

E. $2y^2 - 12y + 18$

35. Brian and Miguel decide to have a race. Miguel decides to give Brian a 20-meter lead at the beginning of the race. Brian runs at a speed of $2\frac{1}{2}$ meters per second. Miguel runs at a speed of 5 meters per second. If they start running at the same time, how many seconds will it take Miguel to catch Brian?

A. $2\frac{1}{2}$

B. 4

C. 8

D. $12\frac{1}{2}$

E. 20

36. A marathon director is looking to define the rectangular starting area for an upcoming race. She has determined that she needs 64 square meters of space for the starting area, which will be delineated by rope barriers. What is the minimum length, in meters, of rope needed to enclose the starting area?

F. 8

G. 16

H. 32

J. 40

K. 64

Hard

44. If $h(x) = \frac{1}{x^2}$ and $j(x) = x + 3$, what is $j(h(x))$?

F. $\frac{x+3}{x^2}$

G. $\frac{x^2+3}{x^2}$

H. $\frac{1}{x^2}+3$

J. $\frac{1}{x^2+3}$

K. $\frac{1}{(x+3)^2}$

45. Function f is defined as $f(x) = \frac{3}{x}$. If $\frac{1}{7} < f(a) < \frac{1}{6}$, where a is an integer. Which of the following lists all possible values of a ?

A. 19 only

B. 20 only

C. 19 and 20

D. 18, 19, 20, and 21

E. There are no possible values of a.

47. If b is an integer, then the difference of $3b$ and $7b$ is *always* divisible by which of the following?

A. 3
B. 4
C. 7
D. 10
E. 21

48. For all real values of x, which of the following statements is true?

I. $\sin^2(4x) + \cos^2(4x) = 1$
II. $4\sin(4x) + 4\cos(4x) = 8$
III. $\sin(4x) + \cos(4x) = 4$

F. I only
G. II only
H. I and II only
J. I and III only
K. II and III only

49. Luree is measuring a quilt that is in the shape of a parallelogram. She discovers that the area of the quilt is A feet squared, and the base is b feet. The height of the parallelogram is y feet longer than its base. Which of the following equations would give Luree the length y in terms of A and b ?

A. $y = A - 2b$

B. $y = \frac{A}{2} - b$

C. $y = \frac{A}{b}$

D. $y = \frac{A}{b} - b$

E. $y = \frac{A}{b} - 2b$

50. Party Hats X and Y are both right circular cones. The radius of the base of Hat X is 6 times the radius of the base of Hat Y, and the height of Hat X is 3 times the height of Hat Y. The volume of Hat X is how many times the volume of Hat Y ?

(Note: $V_{\text{cone}} = \frac{1}{3}\pi r^2 h$)

F. 9
G. 18
H. 36
J. 54
K. 108

51. What real value of x satisfies the equation $27^{x+2} = \frac{3^2}{9^{x-3}}$?

A. -1

B. $\frac{2}{5}$

C. $\frac{3}{2}$

D. 2

E. 3

52. Real numbers $x = a$ and $x = b$ satisfy $h(x) = 2$.

If $h(x) = 2^{x^2+2x-2}$, what are the values of a and b ?

F. $\{-3, 0\}$
G. $\{-3, 1\}$
H. $\{-3, 3\}$
J. $\{-1, 1\}$
K. $\{0, 1\}$

53. Let x and y be real numbers. If $(x-y)^2 = -2xy$, it *must* be true that:

A. both x and y are zero.
B. both x and y are negative.
C. both x and y are fractions.
D. either x or y is zero.
E. x is positive and y is negative.

56. Let $\aleph x$ be equal to the average (arithmetic mean) of the first x positive integers. For example, $\aleph 6 = \frac{6+5+4+3+2+1}{6} = 3.5$. For all positive integers, x, which of the following statements, if any, are true?

I. $\aleph x + \aleph(x-1) = \aleph(2x)$
II. $\aleph x = \frac{x+1}{2}$
III. $(\aleph x)^2 = \aleph x^2$

F. I only
G. I and II only
H. II only
J. III only
K. None