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GENERAL DIRECTIONS

1. About this test:
   A. You will be given 40 minutes to take this test.
   B. There are 50 problems on this test.
2. All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary for accurate grading.
3. If using a scantron answer form be sure to correctly denote the number of problems not attempted.
4. You may write anywhere on the test itself. You must write only answers on the answer sheet.
5. You may use additional scratch paper provided by the contest director.
6. All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
7. Calculators **MAY NOT** be used on this test.
8. All problems answered correctly are worth **FIVE** points. **TWO** points will be deducted for all problems answered incorrectly. No points will be added or subtracted for problems not answered.
9. In case of ties, percent accuracy will be used as a tie breaker.

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1. $14 - \frac{5}{8} = $ _____
A. 13.225 B. 13.125 C. 13.325 D. 13.375 E. 13.275

2. $98.6 + 5\frac{3}{5} = $ _____
A. 103.4 B. 103.2 C. 104.2 D. 104.4 E. 104.8

3. What is the value of $\frac{5}{4}$ of 64?
A. 42 B. 46 C. 48 D. 72 E. 80

4. $128 \div 8 \div 4 \div 2 = $ _____
A. 1 B. 2 C. 4 D. 6 E. ½

5. Using only nickels, how many coins are needed to create the amount of $42.65?
A. 763 B. 845 C. 851 D. 853 E. 871

6. 42 minutes is what percentage of an hour?
A. 70% B. 60% C. 80% D. 65% E. 75%

7. At *Tasty Subs*, for lunch, you have a choice among five meats, six condiments, four breads, three bags of chips and three drinks. If you must choose one meat, one condiment, one bread, one bag of chips and one drink, how many different options do you have to choose from for your lunch?
A. 360 B. 1,080 C. 720 D. 21 E. 1,296

8. What is the sum of the LCM of the numbers 20 and 30 and the GCF of the numbers 64 and 96?
A. 88 B. 90 C. 92 D. 94 E. 96

9. $32,118 \div 9$ has a remainder of what value?
A. 6 B. 5 C. 4 D. 3 E. 2

10. 1 square yard = _____ square feet
A. 12 B. 9 C. 144 D. 36 E. 72

11. Find the value of *n*, if $\frac{3}{70} = \frac{1}{56} + \frac{1}{n} + \frac{1}{90}$.
A. 84 B. 80 C. 76 D. 74 E. 72

12. What number is one-third more than the multiplicative inverse of $2\frac{1}{4}$?
A. $2\frac{2}{7}$ B. $2\frac{1}{7}$ C. $\frac{5}{12}$ D. $\frac{7}{9}$ E. $\frac{31}{12}$

13. If $m\angle B = 39°$, then the sum of the complement and supplement of $\angle B = $ ____°.
A. 192 B. 141 C. 151 D. 152 E. 202

14. Find the next number in the sequence. 10, 11, 12, 33, 56, 101, …
A. 169 B. 181 C. 201 D. 190 E. 196

15. A regular hexagon has *n* total diagonals. What is the value of $10n + 10$?
A. 190 B. 180 C. 80 D. 90 E. 100

16. Simplify: $-3^2|9-15|-(-8)+(-17)$
A. -72   B. 76   C. -63   D. -54   E. 45

17. Use the examples below to find the value of *m*.
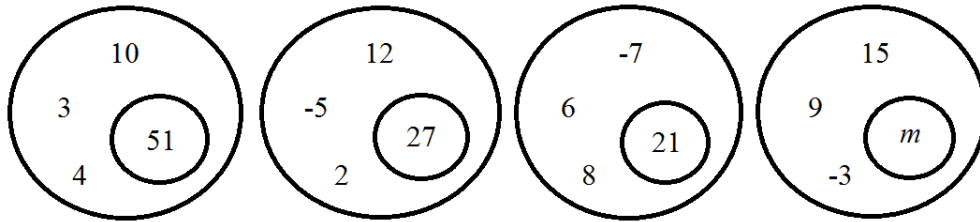
A. 45   B. 72   C. 54   D. 63   E. 81

18. Solve: $-\frac{2}{3}w < 48$
A. $w > 32$ B. $w > -72$ C. $w < -32$ D. $w < -72$ E. $w = 32$

19. A regular polyhedron has eight vertices and twelve edges. How many faces does the polyhedron have?
A. 6   B. 8   C. 10   D. 12   E. 9

20. Square *A* has an area of 81 cm^2, square *B* has an area of 256 cm^2 and square *C* has an area of 169 cm^2. If the three squares are placed side by side, as in the picture below, what is the perimeter of the octagon created?
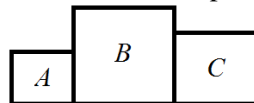
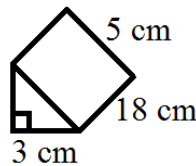A. 152 cm   B. 98 cm   C. 111 cm   D. 115 cm   E. 108 cm

21. The angles in a triangle are in a ratio of 2:3:5. The angle measure of the largest angle is equal to ____° .
A. 45   B. 54   C. 27   D. 36   E. 90

22. What is the product of the mean and median of the set of numbers?   10, 12, 4, 4, 18, 30
A. 24   B. 44   C. 143   D. 121   E. 156

23. Calculate the volume of the triangular prism below.

A. 135 cm^3 B. 108 cm^3 C. 270 cm^3 D. 81 cm^3 E. 228 cm^3

24. A six foot tall man casts a shadow that is ten feet long. If a tree is next to the man at the exact same time and casts a shadow that is forty-eight feet long, how tall is the tree?
A. 26.4 feet   B. 32.8 feet   C. 28.2 feet   D. 30.8 feet   E. 28.8 feet

25. Simplify: $5\sqrt{32a^3b^6}$
A. $9ab\sqrt{2ab}$ B. $20a^2b^4\sqrt{ab^2}$ C. $20a^2b^3\sqrt{2ab^3}$ D. $9ab^3\sqrt{2a}$ E. $20ab^3\sqrt{2a}$

26. If the hypotenuse of a 30-60-90 triangle measure 124 inches, how long is the shortest leg of the triangle?
A. $62\sqrt{3}$ inches   B. $62\sqrt{2}$ inches   C. 62 inches   D. 32 inches   E. $32\sqrt{3}$ inches

27. What is the units digit of 4^{20}?
A. 0   B. 2   C. 4   D. 6   E. 8

28. Which of the following is the equation of the line that passes through the point (4, 5) and has a slope of ½ ?
A. $x - 2y = -6$ B. $x + 2y = -6$ C. $2x - y = 6$ D. $2x - y = -6$ E. $½ x + y = 12$

29. If $f(x) = 2x^2$ and $g(x) = 3x^2 + 5$, what is the value of $f(g(-2))$?
A. 578   B. 289   C. 98   D. 197   E. 101

30. A line segment is drawn from the point (-1, 5) to the point (2, 1). What is the length of the line segment?
A. 3 units   B. 5 units   C. 6 units   D. 8 units   E. 12 units

31. If $\frac{1}{x} + \frac{5}{6} = \frac{2}{3}$, then find the value of $x^2 - 6$.
A. 30   B. -42   C. -6   D. -18   E. 24

32. A(n) _____ is a two-step isometry that is a composition of a translation and a reflection that is parallel to the translation vector.
A. reflected reflection   B. flip   C. composition   D. glide reflection   E. translated dilation

33. What is the perimeter of ΔABD shown below?

B
15 cm
12 cm
A
E   13 cm   D
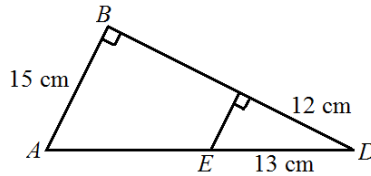
A. 90 cm   B. 115 cm   C. 60 cm   D. 120 cm   E. 40 cm

34. Let B equal the value of the decay factor for the exponential decay function $y = 79(0.42)^x$. Find the value of seventy-five less than $100B$.
A. -33   B. -17   C. 4   D. -32   E. 67

35. What is the probability of throwing a dart at the board below and landing in the shaded region?

5 in
8 in
7 in
20 in
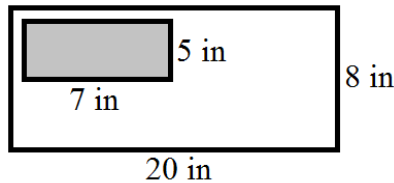
A. $\frac{7}{32}$ B. $\frac{3}{7}$ C. $\frac{5}{8}$ D. $\frac{3}{20}$ E. $\frac{9}{20}$

36. What is the number of pecans in a bag of 120 mixed nuts, if 45% of the mixed nuts are not pecans?
A. 66   B. 54   C. 72   D. 56   E. 64

37. What is the x-intercept of the linear equation $y = \frac{3}{8} x + 15$?
A. $\frac{45}{8}$ B. $-\frac{45}{8}$ C. 40   D. -40 E. 15

38. What is the sum of the roots of the quadratic equation $y = ¼ x^2 + 16x - 8$?
A. 4   B. -4   C. -64   D. 32   E. -½

39. Calculate the area of a quadrilateral with its vertices located at (-1, -3), (4, -2), (3, 4) and (-7, 3).
A. 55.5 units^2 B. 52.5 units^2 C. 44 units^2 D. 48.5 units^2 E. 50.5 units^2

40. If $3^x = 4$, what is the value of 3^{3x}?
A. 12   B. 64   C. 531,441   D. 36   E. 72

41. Convert 144° into a radian measure.
A. $\frac{7\pi}{9}$ B. $\frac{5\pi}{6}$ C. $\frac{4\pi}{5}$ D. $\frac{6\pi}{7}$ E. $\frac{10\pi}{11}$

42. A painting is increasing at a rate of 60% per year. If the painting is worth $40 now, how much will it be worth after two years?
A. $64.40   B. $84.60   C. $96.40   D. $102.40   E. $104.80

43. What is the sum of the exponents when $\frac{(a^4b^{-2})^3(ab^5)^2}{a^5b^3}$ is written in simplest form?
A. 9   B. 10   C. 12   D. 13   E. 14

44. You are given a circle with the equation $(x-3)^2 + (y-2)^2 = 13^2$. If the point (-2, -10) lies on the circle, what is the slope of the line tangent to the circle at that point?
A. $-\frac{12}{5}$ B. $-\frac{5}{12}$ C. $\frac{7}{12}$ D. $\frac{3}{4}$ D. $-\frac{7}{5}$

45. Peanuts cost $1.20 per pound and almonds cost $3.40 per pound. If you wanted to make an eleven pound mixture of peanuts and almonds that costs $2.60 per pound, how many pounds of almonds would you need?
A. 6 pounds   B. 9 pounds   C. 2 pounds   D. 7 pounds   E. 5 pounds

46. If $-6\begin{bmatrix} a & d \\ b & c \end{bmatrix} = \begin{bmatrix} 18 & -36 \\ -24 & -48 \end{bmatrix}$, then find the value of $\frac{ac}{b} + \frac{ac}{d}$.

A. -12   B. -6   C. 8   D. -18   E. -10

47. In the picture below, if $m\angle A = 40^\circ$ and the measure of minor arc $BE = 50^\circ$, then the measure of minor arc $CD = $ _____$^\circ$.
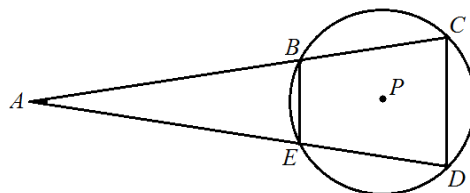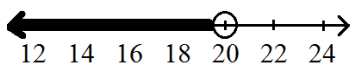

A. 90   B. 180   C. 150   D. 130   E. 100

48. If $y + \frac{1}{y} = 5$, what is the value of $y^2 + \frac{1}{y^2}$?
A. 20   B. 25   C. 23   D. 27   E. 30

49. Find the value of the y-intercept of the quadratic equation $y = -7(x-2)^2 - 8$.
A. -28   B. 4   C. 12   D. -108   E. -36
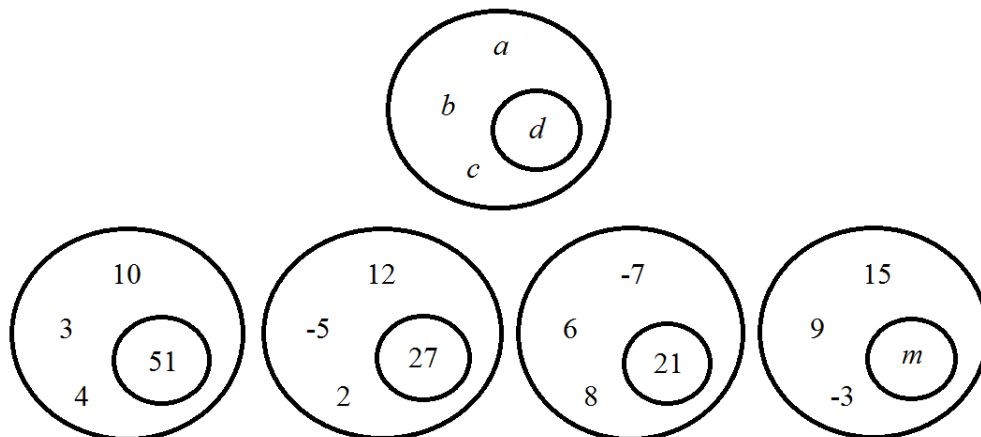
50. Use interval notation to express the inequality below.

12   14   16   18   20   22   24

A. $(\infty, 20)$ B. $[\infty, 20]$ C. $(20, \infty)$ D. $(-\infty, 20)$ E. $[-\infty, 20)$

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1. D	18. B	35. A
2. C	19. A	36. A
3. E	20. E	37. D
4. B	21. E	38. C
5. D	22. C	39. D
6. A	23. B	40. B
7. B	24. E	41. C
8. C	25. E	42. D
9. A	26. C	43. B
10. B	27. D	44. B
11. E	28. A	45. D
12. D	29. A	46. E
13. A	30. B	47. D
14. D	31. A	48. C
15. E	32. D	49. E
16. C	33. A	50. D
17. D	34. A	

17. Look at the picture and use variables to help.

From our examples, we see that $d = 3(a + b + c)$. Therefore, $3(15 + 9 + (-3)) = 63 = m$.

25. $5\sqrt{32a^3b^6} = 5\sqrt{16 \cdot 2 \cdot a^2 \cdot a \cdot b^3 \cdot b^3} = 20ab^3\sqrt{2a}$.

43. $\dfrac{\left(a^4b^{-2}\right)^3\left(ab^5\right)^2}{a^5b^3} = \dfrac{a^{12}b^{-6}a^2b^{10}}{a^5b^3} = \dfrac{a^{14}b^4}{a^5b^3} = a^9b^1$. The sum of the exponents is $9 + 1 = 10$.

48. If $y + \dfrac{1}{y} = 5$, then $\left(y + \dfrac{1}{y}\right)^2 = y^2 + \dfrac{y}{y} + \dfrac{y}{y} + \dfrac{1}{y^2} = y^2 + \dfrac{1}{y^2} + 2$. Since we know that $y + \dfrac{1}{y} = 5$,

then $\left(y + \dfrac{1}{y}\right)^2 = 25$. So, $y^2 + \dfrac{1}{y^2} + 2 = 25$ and $y^2 + \dfrac{1}{y^2} = 23$.

49. The standard form of a quadratic equation is $y = Ax^2 + Bx + C$, where C is the y-intercept of the graph. We are given the quadratic equation $y = -7(x - 2)^2 - 8$ and are asked to find the y-intercept. To do so we must multiply out the given equation to change it into standard form. $y = -7(x - 2)^2 - 8 \rightarrow y = -7(x^2 - 4x + 4) - 8 \rightarrow y = -7x^2 + 28x - 28 - 8 \rightarrow y = -7x^2 + 28x - 36$. In standard form, our value of C is -36, so therefore our y-intercept of the graph is -36.