2016 – 2017 TMSCA BANA Invitational MS Math Test

1. Which of the following produce a value of 450?

I. $2 \cdot 3^2 \cdot 5^2$ II. $30 \cdot 15$ III. 311 + 149 IV. -226 + 676 V. $450^0 + 450$

A. I and II B. II and IV C. V only D. III, IV and V E. I, II and IV

2. Sochie went to a garage sale and bought a shirt for \$2, a magazine for 50¢, a painting for \$4.50, a watch for \$3.50 and a pair of earrings for \$0.10. If Sochie paid with a \$20 bill, how much change did she receive?

A. \$8.50 B. \$9.60 C. \$9.40 D. \$8.80 E. \$9.20

3. Levi has a dozen crates with a dozen boxes in each crate. If each box holds ten bottles of detergent and each bottle has enough detergent to do eight loads of laundry, how many total loads of laundry does Levi have enough detergent to do?

A. 1,960 B. 11,520 C. 12,260 D. 18,320 E. 16,180

4. $\left(5\frac{3}{8} - 2\frac{1}{4}\right) \div 2\frac{1}{2} =$ _____ (decimal)

A. 1.25 B. 1.5 C. 1.75 D. 2.25 E. 2.125

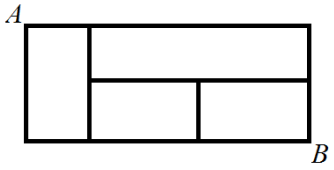
5. What is the sum of the next three terms of the sequence? -40, -27, -14, -1…

A. 75 B. 113 C. 62 D. 37 E. 88

6. If $4x - 79 = -47$, then find the value of $\frac{5}{2}x + 23$.

A. 51 B. 31 C. 43 D. 37 E. 49

7. Moving only to the right or down, how many paths are there from *A* to *B*?



A. 4 B. 5 C. 6 D. 3 E. 9

8. On a number line, *X* and *Y* are located at 16 and 40, respectively. *Z* is the midpoint of $\overline{XY}$ and *W* is the midpoint of $\overline{XZ}$. What is the measure of $\overline{XW}$?

A. 12 units B. 28 units C. 22 units D. 6 units E. 8 units

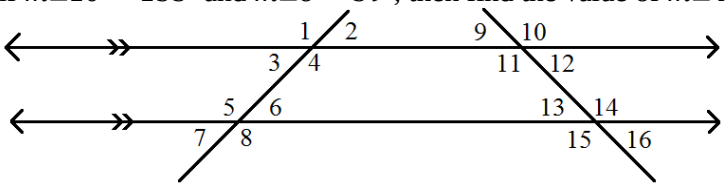
9. The expression $\sqrt{400} - \sqrt{9} + \sqrt{256} - \sqrt{196}$ is not equivalent to which of the following?

A. $2(2+3) + 3^2$ B. $2^2 \cdot 5 - 11^0$ C. $3^3 - 2^3$ D. $4^2 + 2^2 - 1^3$ E. $5^2 - 3^2 + 3^0$

10. What is the sum of the two largest three-digit prime numbers less than 120?

A. 204 B. 210 C. 216 D. 222 E. 240

11. Using the picture below, if $m\angle 10 = 155^\circ$ and $m\angle 6 = 39^\circ$, then find the value of $m\angle 4 + m\angle 13$?



A. 166° B. 141° C. 116° D. 192° E. 245°

12. If $x \downarrow y = x^3 + y^2 + xy$, then find the value of $((-2) \downarrow 2) + (3 \downarrow (-3))$.

A. -8 B. -27 C. 35 D. 17 E. 19

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13. How many whole numbers lie between -½ and 3π?
A. 10 B. 9 C. 8 D. 11 E. infinitely many

14. At *Beautify Your Wrist*, bracelets are all priced equally. Assuming there is no tax, if Stacy bought seven bracelets for $87.50, how much would she pay for eleven bracelets?
A. $137.00 B. $137.50 C. $136.50 D. $138.00 E. $138.50

15. What is the sum of the largest palindrome less than 2,000 and the smallest palindrome greater than 2,000?
A. 3,992 B. 3,993 C. 3,999 D. 2,992 E. 4,114

16. When 1,029 is divided by *x*, the quotient is 73 with a remainder of 7. What is the remainder when 93 is divided by *x*?
A. 7 B. 8 C. 9 D. 6 E. 4

17. What is the positive difference of the upper quartile and mean of the set of data? {34, 44, 36, 40, 36, 86}
A. 4 B. 2 C. 10 D. 6 E. 8

18. 19,000,000,000 + 3,800,000,000 = _____ (scientific notation)
A. 2.28×10^{10} B. 2.28×10^{9} C. 5.7×10^{10} D. 5.7×10^{9} E. 22.8×10^{8}

19. $MMMCCXL \div XL \cdot II$ = _____ (Arabic number)
A. 162 B. 154 C. 148 D. 184 E. 136

20. Erin can do five puzzles in eighteen minutes. How many puzzles could Erin do in six hours?
A. 250 B. 200 C. 150 D. 100 E. 50

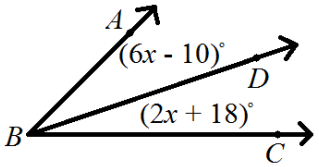
21. The number 260 has how many positive integral divisors?
A. 8 B. 12 C. 10 D. 14 E. 26

22. If $y = 4$, solve for x, given $\frac{1}{x} - \frac{1}{y} = 6$.
A. $\frac{6}{25}$ B. $\frac{1}{10}$ C. 10 D. $\frac{3}{2}$ E. $\frac{4}{25}$

23. Your neighbor's dog just had seven puppies that all look completely different. You plan to adopt two of the puppies when they are old enough. In how many ways can you choose two of the seven puppies?
A. 2,520 B. 42 C. 21 D. 18 E. 14

24. A toolbox contains seven screwdrivers and eight drill bits. If two tools are selected at random, without replacement, what is the probability that the two selected tools will be the same?
A. $\frac{5}{16}$ B. $\frac{7}{15}$ C. $\frac{3}{5}$ D. $\frac{9}{16}$ E. $\frac{1}{5}$

25. Using the picture below, $\overrightarrow{BD}$ bisects $\angle ABC$. Find the measure of the complement of $\angle ABC$.



A. 32° B. 64° C. 44° D. 26° E. 58°

26. If $\frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{4} \cdot \ldots \cdot \frac{m}{n} = \frac{1}{17}$, then what is the value of $5m - 2n$?
A. 46 B. 33 C. 53 D. 48 E. 62

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27. Simplify the following. $5\frac{2}{5} - 2\frac{1}{3} - \frac{3}{4}$

A. $2\frac{7}{20}$ B. $2\frac{23}{60}$ C. $2\frac{19}{60}$ D. $3\frac{17}{60}$ E. $2\frac{5}{12}$

28. What is the combined area of six identical trapezoids that have bases of length 10 cm and 12 cm and have a height of 15 cm?

A. 825 cm^2 B. 990 cm^2 C. 900 cm^2 D. 165 cm^2 E. 1,155 cm^2

29. 15 + 30 + 45 + … + 90 = _____

A. 275 B. 295 C. 305 D. 315 E. 325

30. A right triangle has legs of 24 inches and 10 inches. A square has a side length equal to the hypotenuse of the triangle. What is the perimeter of the square?

A. 676 inches B. 52 inches C. 160 inches D. 338 inches E. 104 inches

31. 439 is which term of the sequence -23, -9, 5, 19, 33, …?

A. 31st B. 32nd C. 33rd D. 34th E. 35th

32. $78_9 - 36_8 =$ _____$_7$

A. 56 B. 41 C. 42 D. 52 E. 48

33. The sum of three consecutive even integers is 174. What is the value of twice the largest integer?

A. 124 B. 118 C. 126 D. 120 E. 122

34. Sara deposits $400 into a simple interest account at a rate of 5% for 3 years. Bill deposits $300 into a simple interest account at a rate of 8%. After how many years will Bill have the same interest amount acquired as Sara?

A. 3 B. 2.5 C. 2 D. 4 E. 3.5

35. Claude has six cards, each with one number on it. The numbers are 1, 1, 2, 2, 3 and 4. Claude is going to make a row containing all six cards. How many different ways can he order the row?

A. 180 B. 720 C. 120 D. 256 E. 360

36. Which of the following represents the solution to the inequality? $\frac{2}{3}(x+3) > \frac{5}{6}(x-4)$

A. $x \leq 32$ B. $x \leq -32$ C. $x > 32$ D. $x < -32$ E. $x < 32$

37. $81^{\frac{3}{2}} + 64^{\frac{2}{3}} =$ _____

A. 729 B. 1,241 C. 745 D. $16 + 9\sqrt[3]{9}$ E. $729 + 2\sqrt[3]{2}$

38. A cube measuring 9 $cm \times 9\ cm \times 9\ cm$ is made using 1 centimeter cube blocks. What is the greatest number of centimeter cubes visible from any point?

A. 729 B. 243 C. 217 D. 81 E. 324

39. Point *A* has coordinates (-6, -7) and point *B* has coordinates (-3, *m*). The slope of the line that passes through *A* and *B* is 6. If point *B* is translated to the right 5 units to make point *C*, what are the coordinates of point *C*?

A. (-6, -2) B. (2, 16) C. (-2, 16) D. (2, 6) E. (2, 11)

40. If $x > 0$, find $\sqrt{x}$, if $-4(5+3x) - 5(4+x) = -3 - 9(2x-3)$.

A. $6\sqrt{2}$ B. $8\sqrt{2}$ C. $2\sqrt{6}$ D. 6 E. 8

41. A triangle has sides lengths of 8, 20 and *x*. What is the sum of all the possible integral lengths of *x*?

A. 300 B. 228 C. 340 D. 328 E. 288

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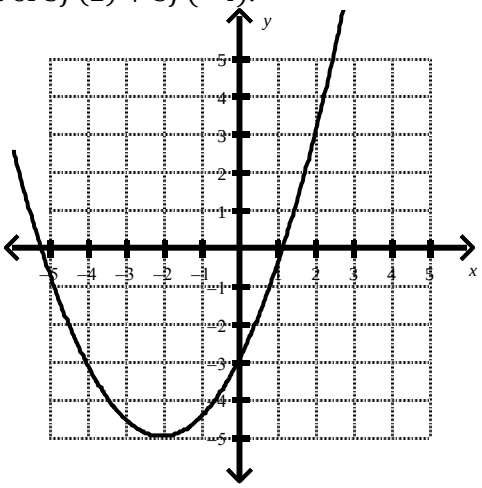
42. Chords $\overline{AB}$ and $\overline{CD}$ intersect in a circle at *P*. If *AP* = 7 units, *AB* = 16 units and *CP* = 3 units, what is the length of *DC*?
A. 18 units B. $37\frac{1}{3}$ units C. 30 units D. 21 units E. 24 units

43. To the nearest tenth, what is the slope of any line parallel to the line with the equation $30x = 4y - 17$?
A. 1.8 B. 7.5 C. 4.3 D. 0.2 E. 0.6

44. $\overline{AB}$ has endpoints *A*(-3, -2) and *B*(3, 0). Points *C* has coordinates (4, -7). What is the distance from *C* to the midpoint of $\overline{AB}$?
A. $4\sqrt{13}$ units B. $2\sqrt{13}$ units C. $6\sqrt{13}$ units D. $\sqrt{37}$ units E. $\sqrt{65}$ units

45. Use the graph below to find the value of $5f(2) + 3f(-4)$.



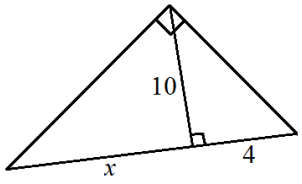
A. 15 B. -9 C. 24 C. -2 E. 6

46. Brett has a collection of 42 baseball cards. The total collection is worth $83, some valued at $1.50 and some valued at $2.30. How many more baseball cards valued at $2.30 does Brett have than cards valued at $1.50?
A. 8 B. 10 C. 12 D. 11 E. 7

47. What are the endpoints of the median of the trapezoid with its vertices located at (6, 2), (30, 24), (18, 24) and (42, 2)?
A. (24, 26) and (72, 26) B. (12, 13) and (14, 13) C. (12, 13) and (12, 26) D. (12, 13) and (36, 13) E. (24, 13) and (36, 13)

48. The initial population of geese at a neighborhood lake is 200. If the geese population is decreasing at a rate of 30% each year, how many geese will be at the neighborhood lake after two years?
A. 18 B. 76 C. 98 D. 140 E. 120

49. Using the picture below, find the value of *x*.



A. 21 B. 24 C. 18 D. 25 E. 27

50. Two brothers, Mike and Lucas, each leave their house riding their motorcycles at the same time and in the same direction. Mike travels at a constant speed of 55 mph and Lucas travels at a constant speed of 63 mph. In how many hours will the two brother be 24 miles apart?
A. 3 hrs. B. 2 hrs. C. 6 hrs. D. 4 hrs. E. 5 hrs.

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2016 – 2017 TMSCA BANA Mathematics Invitational Test Answer Key

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

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2016-2017 TMSCA Middle School Mathematics Invitational Test Selected Answers

13. Since $3\pi \approx 9.4$, we are looking for the number of whole numbers between -½ and 9.4. Those numbers would be 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9, which equals to 10 numbers.

30. Use the Pythagorean Theorem, $a^2 + b^2 = c^2$, to find the hypotenuse of the right triangle. We are given legs of 10 and 24, so $10^2 + 24^2 = c^2 \rightarrow 100 + 576 = 676 = c^2$. Square root both sides and we get $c = 26$. If the square has a side length equal to the hypotenuse, then its side length is 26 and the perimeter of the square is 4(26) = 104 inches.

33. Set up an equation. Let x be the smallest of the consecutive even integers. The next two consecutive even integers would then be $x + 2$ and $x + 4$. Our equation is $x + x + 2 + x + 4 = 174$. Simplify the equation to $3x + 6 = 174$. Subtract 6 from both sides and then divide by 3 to get $x = 56$. The three consecutive even integers are 56, 58 and 60. Twice the largest is 2(60) = 120.

34. Simple interest is $I = prt$, where I is the interest acquired, p is the principle amount, r is the rate and t is the time, in years. We need to create an equation that will find how long it will take the two accounts to have the same simple interest, so $(400)(0.05)(3) = (300)(0.08)t$. Simplify to get $60 = 24t$. Divide both sides by 28 and it will take Bill $60 \div 24 = 2.5$ years to have as much interest as Sara.

37. $81^{\frac{3}{2}} + 64^{\frac{2}{3}} = \left(\sqrt[2]{81}\right)^3 + \left(\sqrt[3]{64}\right)^2 = 9^3 + 4^2 = 729 + 16 = 745.$

43. Change the equation $30x = 4y - 17$ into slope intercept form. Add 17 to both sides, then divide by 4. $30x = 4y - 17 \rightarrow 4y = 30x + 17 \rightarrow y = \frac{30}{4}x + \frac{17}{4}$. Since it asks for the slope to the nearest tenth, $30 \div 4$ is equal to 7.5. Parallel lines have the same slope, so any line with a slope of 7.5 is parallel.

45. Using the graph, $f(2) = 3$ and $f(-4) = -3$. Therefore, $5(3) + 3(-3) = 6$.

47. The median of a trapezoid is a line segment linking the midpoints of the two non-parallel sides. Find the midpoints of the two non-parallel sides. Using the coordinates (6, 2) and (1, 24), $\frac{6+18}{2} = 12$ and $\frac{2+24}{2} = 13$. Using the coordinates (30, 24) and (42, 2), $\frac{30+42}{2} = 36$ and $\frac{24+2}{2} = 13$. Therefore, the median has endpoints (12, 13) and (36, 13).

48. This is an example of an exponential decay function. An exponential decay function is in the form $y = a \cdot (1 - r)^n$, where a is the initial amount, r is the rate of decay and n is the number of years. Using the information given, $y = 200 \cdot (1 - 0.3)^2 = 200(0.7)^2 = 200 \cdot 0.49 = 98$ geese.

49. Given a right triangle, if an altitude is drawn from the right angle perpendicular to the base, similar triangles are created. The triangles are similar, so set up a proportion. $\frac{4}{10} = \frac{10}{x} \rightarrow 4x = 100$ and $x = 25$.

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