TMSCA MIDDLE SCHOOL MATHEMATICS TEST #10 ©

FEBRUARY 2, 2019

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 on Scantrons and Chatsworth cards.
3. If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
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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2018 – 2019 TMSCA Middle School Mathematics Test #10

1. $-98.56 - 1.932 + 6.88$ = _____ (nearest tenth)
A. -93.6 B. -92.5 C. -92.6 D. -103.5 E. -107.4

2. $42\frac{3}{5} - 16\frac{7}{10}$ = _____
A. $25\frac{4}{5}$ B. $25\frac{9}{10}$ C. $26\frac{2}{5}$ D. $26\frac{4}{5}$ E. $25\frac{4}{15}$

3. 4.5×19.3 = _____ (nearest integer)
A. 86.9 B. 86.8 C. 86 D. 87 E. 90

4. $56\frac{2}{3} \div \frac{8}{9}$ = _____
A. 63.25 B. 63.5 C. 63.75 D. 64.25 E. 64.5

5. Evaluate $\frac{3a-4b}{c^2}$, for $a = -2$, $b = 6$ and $c = 3$.
A. $-3\frac{2}{3}$ B. $3\frac{2}{3}$ C. -5 D. -2 E. $-3\frac{1}{3}$

6. Clint bought a fishing pole for $49.56 and two packs of fishing worms that were $6.59 each. Assuming there was no tax, how much change did Clint receive after paying with a $100 bill?
A. $50.44 B. $43.85 C. $44.85 D. $37.26 E. $30.67

7. What is the greatest integer less than $\frac{67}{3}$?
A. 22 B. 23 C. 64 D. 70 E. 24

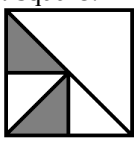
8. What is the product of the reciprocals of $\frac{5}{8}$ and $\frac{4}{5}$?
A. 2 B. $\frac{1}{2}$ C. $2\frac{1}{2}$ D. $2\frac{17}{20}$ E. $2\frac{3}{40}$

9. Simplify: $\frac{3}{8}(2^4 \cdot 3^{2-1}) + (-3^1) - (-10^1)$
A. 18 B. 25 C. 15 D. 8 E. 28

10. Linda weighs 1,376 ounces. How many pounds does Linda weigh?
A. 172 B. 114.7 C. 86 D. 92 E. 74

11. What is the sum of the reciprocals of the numbers 18 and 24?
A. $\frac{3}{4}$ B. $\frac{4}{7}$ C. $\frac{7}{72}$ D. $\frac{1}{18}$ E. $\frac{5}{24}$

12. What is the area of the shaded regions in $12\ in \times 12\ in$ square?



A. 36 in^2 B. 24 in^2 C. 48 in^2 D. 28 in^2 E. 32 in^2

13. What is the value of $\frac{1}{2}x + 7$, if $\frac{x}{3} - 5 = 7$?
A. 36 B. 31 C. 25 D. 79 E. 63

14. MDII + MMIX = _____ (Arabic number)
A. 3,321 B. 3,511 C. 2,611 D. 3,711 E. 3,011

15. What is the sum of all the positive integral divisors greater than 20 of the number 140?
A. 336 B. 196 C. 266 D. 273 E. 293

16. $A = \{1, 2, 3, 4, 5, 6\}, B = \{2, 4, 6, 8, 10, 12\}$ and $C = \{3, 6, 9, 12\}$. $\{A \cap B\} \cup C$ has how many elements?
A. 7 B. 8 C. 6 D. 2 E. 3

17. A built-in locker lock has three characters. The first two characters are letters and the last character is a digit 0 – 9. How many combinations are possible for the built-in locker lock, if no letter may repeat?
A. 6,720 B. 6,760 C. 5,850 D. 6,500 E. 6,450

18. All the 6th graders at St. Augustine Middle School took a survey as to how they rated the cafeteria food. The results showed that 56 students rated the cafeteria food as "exceptional". This number represented 35% of the total number of students who took the survey. How many students took the survey?
A. 180 B. 156 C. 140 D. 160 E. 148

19. Nurmeen is finding the sum of the prime numbers between 80 and 90. What is Nurmeen's sum?
A. 168 B. 186 C. 152 D. 162 E. 172

20. An alien lizard has four heads. Every time a head is chopped off, four new heads grow. If five heads are chopped off one by one, how many heads will the alien lizard have at the end?
A. 23 B. 18 C. 19 D. 21 E. 20

21. If $f(x) = 5x - 9$ and $g(x) = 9x - 5$, what is the value of $f(9) - g(5)$?
A. 0 B. 1 C. -4 D. 76 E. 4

22. What is $0.\overline{427}$ expressed as a fraction?
A. $\frac{427}{990}$ B. $\frac{7}{15}$ C. $\frac{11}{31}$ D. $\frac{47}{111}$ E. $\frac{427}{999}$

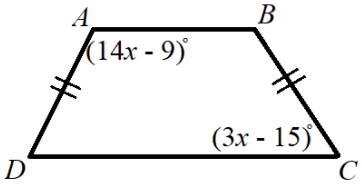
23. Mike is listing all the multiples of 6. If Mike finds the sum of the first seven multiples of 6, what will his sum be?
A. 216 B. 168 C. 210 D. 174 E. 180

24. 6.25 kg = _____ mg
A. 6,250,000 B. 62,500,000 C. 625,000 D. 625 E. 6,250

25. At her local grocery store, Amy's favorite candy costs $2.50 per ounce. If the tax rate is 7%, how much will it cost Amy to buy one pound of her favorite candy?
A. $2.68 B. $26.75 C. $42.80 D. $40.00 E. $43.20

26. $104^\circ F =$ _____ $^\circ C$
A. $26^\circ C$ B. $30^\circ C$ C. $35^\circ C$ D. $38^\circ C$ E. $40^\circ C$

27. *ABCD* is an isosceles trapezoid. Find $m\angle B$.



A. 21° B. 121° C. 163° D. 159° E. 137°

28. $\overline{MN}$ has endpoints $M(-4, -2)$ and $N(6, 4)$. $\overline{MN}$ is extended, through point *N* to point *P*. If $NP = \frac{1}{2}MN$, what are the coordinates of point *P*?
A. (1, 1) B. (11, 7) C. (5, 3) D. (16, 10) E. (16, 8)

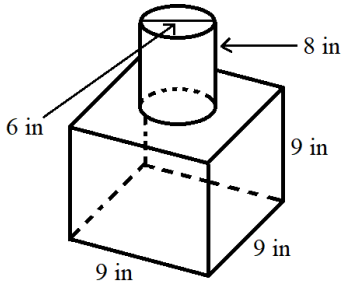
29. How many combinations can be made of 5 objects taken 4 at a time?
A. 20 B. 9 C. 1 D. 5 E. 120

30. What is the probability of rolling a pair of dice and the sum of the faces showing is not a prime number?
A. $\frac{7}{12}$ B. $\frac{5}{12}$ C. $\frac{5}{9}$ D. $\frac{4}{9}$ E. $\frac{3}{4}$

31. The first three terms of an arithmetic sequence are $4x + 6$, $6x - 14$, and $7x - 22$, in that order. What is the value of x?
A. 14 B. -8 C. 28 D. 16 E. 12

32. What is the equation of the parabola that passes through the points $(-1, 10)$, $(1, -2)$ and $(6, 3)$?
A. $y = 2x^2 + 4x + 12$ B. $y = x^2 - 6x + 3$ C. $y = 3x^2 - x + 6$ D. $y = x^2 - 4x + 2$ E. $y = x^2 + x + 10$

33. What is the volume of the figure, if $\pi = 3$?

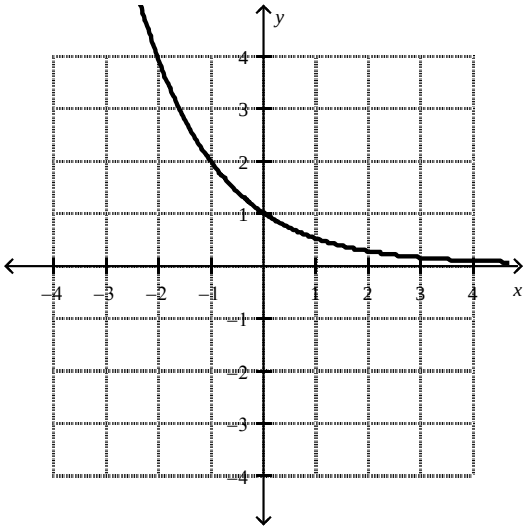


A. 5,859 in^3 B. 873 in^3 C. 657 in^3 D. 630 in^3 E. 945 in^3

34. What is the GCF of the two monomials $44a^2b$ and $32a^3$?
A. $4a^3b$ B. $4ab$ C. $8a^2b$ D. $4a^2b$ E. $4a^2$

35. What is the name of a convex regular polygon that has 35 total diagonals.
A. undecagon B. octagon C. nonagon D. decagon E. septagon

36. What type of function is graphed below?



A. exponential growth B. linear C. quadratic D. exponential decay E. cubic

37. What is the value of C such that $4x^2 - 12x + C$ is a perfect square trinomial?
A. -8 B. 9 C. 36 D. 16 E. 8

38. What is the positive geometric mean of the numbers 7 and $9\frac{1}{7}$?
A. $8\frac{1}{14}$ B. $8\frac{1}{7}$ C. 8 D. $8\frac{2}{7}$ E. $8\frac{3}{14}$

39. What is the sum of the three greatest prime numbers less than 200?
A. 589 B. 583 C. 594 D. 585 E. 591

40. Alfred invests $440 into an account that pays 5.8% compounded annually. Which function below can be used to find out how much Alfred will have in his account after 8 years if he makes no further deposits?
A. $y = 440(1.58)^8$ B. $y = 440(1.058)^8$ C. $y = 1.058(440)^8$ D. $y = 440\left(1 + \frac{0.058}{4}\right)^{8\cdot 4}$ E. $y = 440(5.8)^8$

41. What is the area of a triangle with vertices located at $(-7, -1)$, (3, 6) and $(-1, -3)$?
A. 27 units^2 B. 62 units^2 C. 54 units^2 D. 31 units^2 E. 45 units^2

42. How many integers belong to the arithmetic sequence 5, 11, 17, 23, …, 635?
A. 106 B. 108 C. 112 D. 114 E. 122

43. The solutions to the equation $2x + \frac{1}{2x} = 6 + \frac{1}{6}$ are a and b. What is the value of $12ab$?
A. 144 B. 24 C. 18 D. 12 E. 3

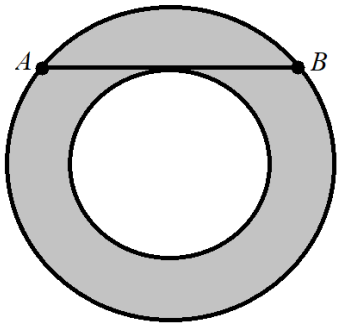
44. What are the coordinates of the center of the circle with equation $x^2 - 12x + 27 + 2y^2 = y^2 + 8y$?
A. $(-2, -6)$ B. $(-6, 2)$ C. (6, 4) D. (3, 9) E. (9, 6)

45. An adult ticket for a school fundraiser costs $2.50 and a student ticket costs $1.50. If 364 people attended the school fundraiser totaling $692.00, how many more students attended the fundraiser than adults?
A. 68 B. 72 C. 112 D. 76 E. 84

46. How many two-digit prime numbers have the property that if the digits are reversed, the number created is still a prime number?
A. 6 B. 4 C. 9 D. 12 E. 11

47. The equation $-7|4x + 10| = -98$ has solutions a and b. What is the value of $|b - a|$?
A. 7 B. 9 C. 8 D. 6 E. 10

48. What is the area of the annulus, if AB = 24 cm?



A. 576π cm^2 B. 48π cm^2 C. 96π cm^2 D. 144π cm^2 E. 192π cm^2

49. Train stations A and B are 321 miles apart. A train leaves station A at 3:00 pm traveling at a constant rate of 54 mph and a train leaves station B at 4:00 pm traveling at a constant rate of 63 mph. How far apart are the two trains twenty minutes before they pass each other?
A. 18 miles B. 21 miles C. 39 miles D. 45 miles E. 42 miles

50. $\frac{3\log_4 6}{5}$ = _____.
A. $\frac{3\log_4 6}{\log_4 5}$ B. $3\left(\frac{\log_4 6}{\log_4 5}\right)$ C. $\log_4\left(\sqrt[3]{6^5}\right)$ D. $\log_4\left(5\sqrt{6^3}\right)$ E. $\log_4\left(\sqrt[5]{6^3}\right)$

2018 – 2019 TMSCA Middle School Mathematics Test #10 Answer Key

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

2018-2019 TMSCA Middle School Mathematics Test #10 Selected Answers

7. Since $\frac{67}{3} = 22.\overline{3}$, the greatest integer less than $\frac{67}{3}$ is 22.

15. The divisors of 140 are 1, 2, 4, 5, 7, 10, 14, 20, 28, 35, 70 and 140. The sum of all the positive integral divisors greater than 20 of the number 140 is then 28 + 35 + 70 + 140 = 273.

22. If $A = 0.\overline{427}$, then $1{,}000A = 427.\overline{427}$. Now we have the equation $1{,}000A - A = 427.\overline{427} - 0.\overline{427}$, which gives us $999A = 427$. Divide both sides by 999 and we get $A = \frac{427}{999}$. Therefore, $0.\overline{427} = \frac{427}{999}$.

25. 1 pound = 16 ounces, so Amy's favorite candy costs 2.50(16) = \$40 per pound. If the tax rate is 7%, Amy will have to spend 40(1.07) = \$42.80 for one pound of candy.

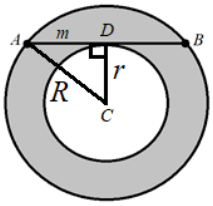
31. Let *A*, *B* and *C* be the first three terms of the arithmetic sequence, which means $A = 4x + 6$, $B = 6x - 14$ and $C = 7x - 22$. The difference between any two terms of an arithmetic sequence is constant. So, $B - A = C - B$. So, this means $6x - 14 - (4x + 6) = 7x - 22 - (6x - 14)$. Simplify and we get $2x - 20 = x - 8$. Subtract *x* from both sides and the add 20 to both sides and we get $x = 12$.

37. If $C = 9$, then $4x^2 - 12x + 9$ can be factored to $(2x - 3)^2$, which means $4x^2 - 12x + 9$ is a perfect square trinomial. Therefore, *C* must be 9.

42. We are given the arithmetic sequence 5, 11, 17, 23, …, 635. Since 635 is our final term, we need to figure out how many terms are in the sequence. We use the formula $a_n = a_1 + (n - 1)(d)$ to find the n^{th} term of an arithmetic sequence. Use the formula with 635 as our a_n term. We get the equation $635 = 5 + (n - 1)(6)$. Distribute and combine like terms to get $635 = 6n - 1$. Add 1 to both sides to get 636 = 6*n*. Divide both sides by 6 and $n = 106$. Therefore, there are 106 integers belonging to the sequence.

46. There are 9 such two-digit prime numbers that have the property if the digits are reversed, the number created is still a prime number. The nine such prime numbers are 11, 13, 17, 31, 37, 71, 73, 79 and 97.

48. Draw the following,



Let $CD = r$, $AC = R$ and $AD = m$. We now see that the area of the large circle is $R^2\pi$ and the area of the small circle is $r^2\pi$. The area of the annulus is then $R^2\pi - r^2\pi$, which can be reduced to $R^2 - r^2$. We have a right triangle and we see that $R^2 - r^2 = m^2$. Since $AB = 24$ cm, then $AD = 12$ cm. The area of the annulus is then $12^2(\pi) = 144\pi$ cm^2.

49. 20 minutes = ⅓ hour. So, train *A* travels $\frac{54}{3} = 18$ miles and train *B* travels $\frac{63}{3} = 21$ miles in twenty minutes before they pass each other. Therefore, the trains are 18 + 21 = 39 miles apart twenty minutes before they pass each other.

50. $\frac{3\log_4 6}{5}$ can be rewritten as $\frac{3}{5}\log_4 6$. Since $x \cdot \log_a b = \log_a(b^x)$, $\frac{3}{5}\log_4 6$ can be rewritten as $\log_4\left(6^{\frac{3}{5}}\right)$ and since $6^{\frac{3}{5}}$ can be rewritten as $\sqrt[5]{6^3}$, then $\log_4\left(6^{\frac{3}{5}}\right) = \log_4\left(\sqrt[5]{6^3}\right)$.