TMSCA MIDDLE SCHOOL MATHEMATICS

TEST#5 ©

NOVEMBER 14, 2020

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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2020 – 2021 TMSCA Middle School Mathematics Test #5

1. 607 + 1,827 + 9.66 = _____ (nearest ten)
A. 2,443.7 B. 2,450 C. 2,400 D. 2,440 E. 2,444

2. 1,000,312 – 87,367 = _____
A. 912,956 B. 912,945 C. 912,875 D. 912,915 E. 912,955

3. 9.7×9.2 = _____
A. 89.14 B. 89.76 C. 89.62 D. 89.64 E. 89.24

4. $784.8 \div 1.2$ = _____
A. 654 B. 676 C. 672 D. 674 E. 668

5. Evaluate $|-3m| - 2n^2$ for $m = -7$ and $n = -11$.
A. -221 B. 263 C. -263 D. -233 E. 241

6. How many triangles can be found in the picture below?

A. 3 B. 4 C. 5 D. 6 E. 7

7. 82 is 80% of what number?
A. 102.5 B. 112.5 C. 108.5 D. 106.5 E. 110.5

8. What is the additive inverse of $-\frac{14}{5}$?
A. $2\frac{4}{5}$ B. $-\frac{5}{14}$ C. $\frac{5}{14}$ D. -2.8 E. $-\frac{14}{5}$

9. 120 cm + 1,800 mm + 1 km = _____ meters
A. 1,000.3 B. 1,003 C. 100.3 D. 10,030 E. 103,000

10. 1,306 = _____ (Roman numeral)
A. MXXXIV B. DCCCIV C. DCCCVI D. MCCCVI E. LCCCVI

11. Which of the following is equivalent to $\frac{1}{2}(6a + 20b) + \frac{1}{2}(10a - 16b)$?
A. $5a + 18b$ B. $5a + 2b$ C. $13a - 6b$ D. $8a + 2b$ E. $8a - 6b$

12. What is the sum of the GCF and LCM of the numbers 18 and 16?
A. 288 B. 146 C. 154 D. 168 E. 216

13. $\sqrt{760}$ lies between which two integers?
A. 26 and 27 B. 27 and 28 C. 25 and 26 D. 28 and 29 E. 31 and 32

14. $\{1, 2, 3, 4, 5\} \cap \{2, 4, 6, 8\}$ = _____
A. $\{1, 3, 5\}$ B. $\{2, 4\}$ C. $\{1, 2, 3, 4, 5, 6, 8\}$ D. $\{1, 2, 3, 4, 5, 6\}$ E. $\{1, 2, 2, 3, 4, 4, 5, 6, 8\}$

15. What are the odds of drawing a red 3 from a standard deck of cards?
A. 1:26 B. 1:24 C. 1:25 D. 1:13 E. 1:12

16. What is the sum of the first 7 odd numbers?
A. 28 B. 56 C. 53 D. 49 E. 47

17. Simplify: $18 - 3|6 - 13| - 2^3$
A. -11 B. 97 C. 31 D. 5 E. 47

18. The angle measures of a triangle are 42°, 29°, and x°. What is the value of *x*?
A. 71 B. 119 C. 79 D. 109 E. 99

19. 14 quarters – 17 dimes + 19 nickels – 25 pennies = _____
A. \$2.40 B. \$2.25 C. \$2.75 D. \$2.50 E. \$2.60

20. What is the value of *n*, if $\frac{n+2}{5} = \frac{7}{4}$?
A. 6.5 B. 6.75 C. 6.25 D. 7.25 E. 5.75

21. In a group of 42 students, 23 like chocolate, 17 like vanilla, and 6 like both chocolate and vanilla. How many students in the group like neither of the two flavors?
A. 0 B. 2 C. 6 D. 4 E. 8

22. What is the degree of the polynomial $12a^3b^2 - 5a^2b + 4a - 9$?
A. 5 B. 2 C. 9 D. 10 E. 7

23. 1101_2 = _____ (base 4)
A. 27 B. 33 C. 32 D. 29 E. 31

24. If 35% of a number *m* is 21, what is $\frac{2}{5}$ of *m*?
A. 18 B. 28 C. 16 D. 24 E. 30

25. What is the 10^{th} triangular number?
A. 45 B. 65 C. 66 D. 55 E. 36

26. The ratio of *a:b:c:d* is 6:5:3:2. If *c* = 24, what is the value of *a*?
A. 48 B. 32 C. 72 D. 42 E. 56

27. ΔABC has vertices $A(-4, 5)$, $B(6, 0)$ and $C(8, 12)$. If ΔABC is dilated by a scale factor of 2.5 about the origin, what are the new coordinates of point *C*?
A. (3.2, 4.8) B. (10.5, 14.5) C. (20, 30) D. (5.5, 9.5) E. (12, 18)

28. Zainab has five Unites States coins. One of the coins is a half-dollar, while none of the other coins have a value greater than 25¢. What is the positive difference in the greatest and least amounts of money Zainab could have?
A. \$1.21 B. \$0.92 C. \$0.87 D. \$1.04 E. \$0.96

29. The population of a city is 9.6×10^5, which is twelve times larger than its neighboring smaller city. What is the population of the smaller city? Answer in scientific notation.
A. 8×10^5 B. 8×10^4 C. 8×10^3 D. 1.152×10^5 E. 1.152×10^4

30. *Batteries* + sold 18 robots in one day. When the robots went on sale, they started selling 27 robots per day. What is the percent increase in the number of robots sold?
A. 80% B. 90% C. 40% D. 20% E. 50%

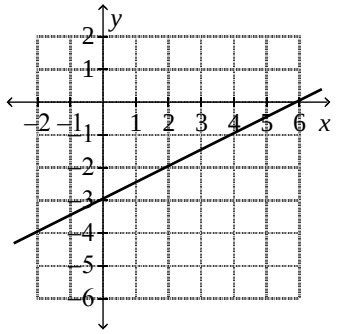
31. What is the slope of the line passing through the points $(-5, 7)$ and $(-1, -19)$?
A. $-6½$ B. $4⅓$ C. $-4⅔$ D. 2 E. -2

32. The base angles of an isosceles triangle each measure 30°. The base of the triangle measures $14\sqrt{3}$ cm. What is the perimeter of the triangle?
A. $35\sqrt{3}$ cm B. $42\sqrt{3}$ cm C. $28 + 14\sqrt{3}$ cm D. $7 + 14\sqrt{3}$ E. $28 + 7\sqrt{3}$

33. 1,280 acres = _____ square miles
A. 1 B. 1.5 C. 2 D. 2.5 E. 4

34. If $m \triangle n = 5m - 3n^3$, then what is the value of $\big(1 \triangle (-1)\big) \triangle ((-1) \triangle 1)$?
A. 1,284 B. 1,576 C. 1,424 D. 1,628 E. 1,842

35. What is the equation of the line graphed below?



A. $y = 2x - 3$ B. $y = -2x - 3$ C. $y = -½x - 3$ D. $y = ½x - 3$ E. $y = 2x + 3$

36. 6! = _____
A. 120 B. 36 C. 3,024 D. 72 E. 720

37. Nico has a box that measures 12 cm by 14 cm by 7 cm. If Nico only fills his box half full with sand, what is the volume of sand he will need?
A. 700 cm^3 B. 588 cm^3 C. 1,176 cm^3 D. 1,400 cm^3 E. 364 cm^3

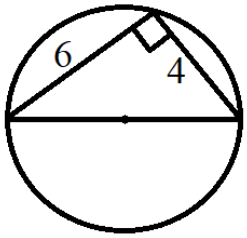
38. How may combinations can be made of 9 items taken 4 at a time?
A. 126 B. 6,561 C. 36 D. 3,024 E. 720

39. David deposited $800 into a simple interest account at 4% for 3 years. If he does not withdraw any money from his account, how much money will be in his account after 3 years?
A. $124.00 B. $96.00 C. $924.00 D. $896.00 E. $704.00

40. i^{237} is equivalent to which of the following?

A. $-i$ B. i C. 0 D. 1 E. -1

41. What is the radius of the circle below?



A. $4\sqrt{13}$ B. $2\sqrt{2}$ C. $2\sqrt{13}$ D. $\sqrt{13}$ E. $\sqrt{2}$

42. Point *B* is the midpoint of $\overline{AC}$. If the coordinates of point *B* are $(13, -6)$ and the coordinates of point *A* are (7, 8), what are the coordinates of point *C*?

A. $(10, -7)$ B. (10, 1) C. $(20, -2)$ D. $(19, -2)$ E. $(19, -20)$

43. If $4^{x+2} = 144$, then 4^x is equal to what value?

A. 9 B. 6 C. ⅔ D. 12 E. 36

44. Maricel is buying a shirt that costs \$15.50 and a hat that costs \$8.25. If there is an 8% tax, what is Maricel's change is she pays with a twenty-dollar bill and a ten-dollar bill?

A. \$0.65 B. \$4.15 C. \$4.05 D. \$4.35 E. \$3.65

45. What is the growth factor of the exponential growth equation $y = 12(3.7)^x$?

A. 12 B. 2.7 C. 3.7 D. 44.4 E. 15.7

46. $\left(\frac{8a^3b^4}{4ab^{-2}}\right)^2 \cdot \left(\frac{6a^2b^2}{12a^4b^3}\right)$ = _____

A. $4a^4b^{12}$ B. $2a^2b$ C. $4a^2b^{12}$ D. $2a^2b^{11}$ E. $2a^4b^{11}$

47. 50 people attended a luncheon, which raised \$91.00. If student tickets cost \$1.50 and adult tickets cost \$2.00, how many more adults attended the luncheon than students?

A. 14 B. 16 C. 18 D. 32 E. 22

48. What are the roots of the quadratic equation $2x^2 + 10x - 48 = 0$?

A. {3, 8} B. $\{-2, 6\}$ C. $\{-8, 3\}$ D. $\{-4, -10\}$ E. $\{-6, 12\}$

49. Evaluate: $-4\begin{bmatrix}-5 & -11\\ 13 & -6\end{bmatrix} + 3\begin{bmatrix}-7 & 12\\ 4 & 8\end{bmatrix}$ = _____

A. $\begin{bmatrix}-41 & 80\\ -40 & 48\end{bmatrix}$ B. $\begin{bmatrix}-1 & 80\\ -40 & 48\end{bmatrix}$ C. $\begin{bmatrix}-5 & 21\\ 3 & 14\end{bmatrix}$ D. $\begin{bmatrix}41 & 8\\ -64 & 0\end{bmatrix}$ E. $\begin{bmatrix}-1 & 8\\ -64 & 0\end{bmatrix}$

50. $23_6 \times 35_6$ = _____ (base 6)

A. 1324 B. 1243 C. 1523 D. 1543 E. 1333

2020 – 2021 TMSCA Middle School Mathematics Test #5 Answer Key

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

2020 – 2021 TMSCA Middle School Mathematics Test #5 Selected Answers

8. The additive inverse of a number *n*, is the number when added to *n* equals 0. The additive inverse of $-\frac{14}{5}$ is the equal to $\frac{14}{5} = 2\frac{4}{5}$.

11. Using the distributive property, $\frac{1}{2}(6a + 20b) + \frac{1}{2}(10a - 16b) = \frac{1}{2}(6a) + \frac{1}{2}(20b) + \frac{1}{2}(10a) - \frac{1}{2}(16b) = 3a + 10b + 5a - 8b = 8a + 2b$.

15. The odds of something occurring is the ratio that compares the number of ways the event can occur with the number of ways the event cannot occur. There are 52 cards in a standard deck of cards and two of them are red 3's. So, the odds of drawing a red 3 from a standard deck of cards is 2:50, which is equal to 1:25.

22. The degree of a polynomials is the term with the highest degree. The degree of a term is the sum of the exponents of the variables. The degree of the term $12a^3b^2$ = 3 + 2 = 5, the degree of $-5a^2b$ is 2 + 1 = 3, the degree of $4a$ is 1 and the degree of -9 is 0. Therefore, the degree of the polynomial $12a^3b^2 - 5a^2b + 4a - 9$ is equal to 5.

25. The formula to find the n^{th} triangular number is $\frac{n(n+1)}{2}$. So, the 10^{th} triangular number is equal to $\frac{10(10+1)}{2} = \frac{10(11)}{2} = \frac{110}{2} = 55$. The 10^{th} triangular number is 55.

26. The ratio of *a:b:c:d* is 6:5:3:2. If *c* = 24, then 3*x* = 24. Dividing both sides of the equation by 3 and *x* = 8. Therefore, the value of *a* is equal to 6*x* and since *x* = 8, *a* = 6(8) = 48.

33. If 640 acres = 1 square mile, 1,280 acres = $1{,}280 \div 640$ = 2 square miles

36. 6! = $6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$.

39. David deposited \$800 into a simple interest account at 4% for 3 years. The simple interest formula, is *I* = *prt*, *p* = principal, *r* = rate and *t* = time, in years. Substituting into our formula, the simple interest of David's account is *I* = (800)(0.04)(3) = \$96. Therefore, the total in David's account is \$800 + \$96 = \$896.

41. The hypotenuse of any right triangle inscribed inside a circle is always equal to the diameter of the circle. Our right triangle has legs of 6 and 4. Using the Pythagorean Theorem, we find our hypotenuse to be $\sqrt{52} = \sqrt{4 \cdot 13} = 2\sqrt{13}$. Since this is the measure of the diameter, the radius of the circle is half, which is $\sqrt{13}$.

45. An exponential growth function is in the form $y = a \cdot b^x$, where *a* is the initial amount and *b* is the growth factor. Therefore, the growth factor of the exponential growth equation $y = 12(3.7)^x$ is equal to 3.7.

49. $-4\begin{bmatrix}-5 & -11\\ 13 & -6\end{bmatrix} + 3\begin{bmatrix}-7 & 12\\ 4 & 8\end{bmatrix} = \begin{bmatrix}-4(-5) & -4(-11)\\ -4(13) & -4(-6)\end{bmatrix} + \begin{bmatrix}3(-7) & 3(12)\\ 3(4) & 3(8)\end{bmatrix} =$
$\begin{bmatrix}20 & 44\\ -52 & 24\end{bmatrix} + \begin{bmatrix}-21 & 36\\ 12 & 24\end{bmatrix} = \begin{bmatrix}20 + (-21) & 44 + 36\\ -52 + 12 & 24 + 24\end{bmatrix} = \begin{bmatrix}-1 & 80\\ -40 & 48\end{bmatrix}$