T M S C A M I D D L E S C H O O L

M A T H E M A T I C S

T E S T # 1 2 ©

M A R C H 6, 2 0 2 1

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.

2020 – 2021 TMSCA Middle School Mathematics Test #12

1. 114 – 569 = _____
A. 455 B. -483 C. -445 D. -455 E. 445

2. $-187 + 628$ = _____
A. -815 B. 815 C. 441 D. 471 E. -441

3. $(-76) \times (-48)$ = _____
A. 3,648 B. $-3{,}648$ C. 3,768 D. $-3{,}768$ E. 3,528

4. $\frac{4{,}508}{14}$ = _____
A. 322 B. 314 C. 364 D. 342 E. 312

5. Evaluate $-4|-3a| - 5|b - 12| + ab$ for $a = -6$ and $b = 4$.
A. -84 B. -224 C. -88 D. -176 E. -136

6. MDIX – CDXXVII – DCVII = _____ (Arabic number)
A. 465 B. 485 C. 415 D. 445 E. 475

7. $\sqrt{6800}$ lies between which two integers?
A. 80 and 81 B. 81 and 82 C. 82 and 83 D. 83 and 84 E. 84 and 85

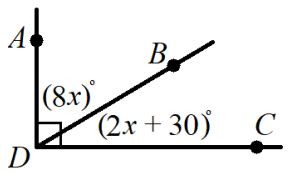
8. How many multiples of 3 are there between 14 and 125?
A. 37 B. 33 C. 38 D. 39 E. 41

9. What value is 115% of 120?
A. 126 B. 144 C. 142 D. 172 E. 138

10. If $A = 1$, $B = 2$, $C = 3$, …, $X = 24$, $Y = 25$, and $Z = 26$, what is the sum of the letters of the word *PARABOLA*?
A. 72 B. 70 C. 68 D. 66 E. 64

11. Cooking one egg at a time, it takes Sofia 8 minutes to cook herself two eggs. At this same rate, how long would it take Sofia to cook three eggs for each of her family of five?
A. 45 minutes B. 30 minutes C. 1 hour D. 1 hour 20 minutes E. 1 hour 15 minutes

12. What is the measure of the supplement of the measure of $\angle BDC$?

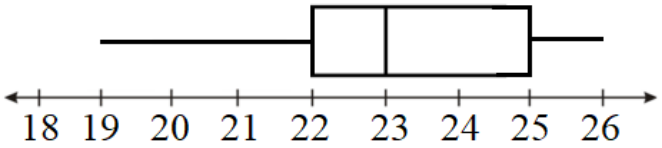


A. 138° B. 148° C. 142° D. 132° E. 122°

13. Simplify: $-\frac{1}{2}(12x + 2y) - \frac{2}{5}(20x - 15y)$
A. $-14x + 5y$ B. $14x + 5y$ C. $-14x - 5y$ D. $14x - 5y$ E. $14x + 10y$

14. The sum of two numbers is 10 and their product is 24. What is twice the sum of their reciprocals?
A. $\frac{11}{12}$ B. $\frac{5}{6}$ C. $1\frac{1}{4}$ D. $1\frac{1}{6}$ E. $2\frac{2}{9}$

15. What is the value of the sum of the lower quartile and interquartile range of the box and whisker plot?



A. 25 B. 45 C. 28 D. 60 E. 47

16. What is the product of the range values of the function $\{(-2,3),(8,-4),(7,7),(5,-1)\}$?
A. 23 B. -560 C. 84 D. 224 E. 588

17. Two positive integers have a sum of 32 and are in a ratio of 7:9. What is the value of seven more than the smallest of these two integers?
A. 14 B. 28 C. 19 D. 21 E. 25

18. It is exactly 7:30 am on a 12-hour clock. What time will it be in exactly 50 hours 45 minutes?
A. 9:15 am B. 10:15 am C. 9:15 pm D. 10:15 pm E. 9:45 am

19. On his birthday, Juan and three of his friends celebrated at *Pizza Meatza Restaurant*. The total bill came out to \$84.39. Juan's friends did not let him pay for any of the bill. If each friend added \$4.00 towards tipping the waiter, how much did each friend pay if they split the bill equally?
A. \$21.13 B. \$25.13 C. \$28.13 D. \$30.13 E. \$32.13

20. What is the units digit of the product of the first seven positive integers?
A. 1 B. 0 C. 2 D. 4 E. 3

21. If one gross is equal to 144, how many dozen are in six gross?
A. 24 B. 864 C. 288 D. 72 E. 432

22. How many more total diagonals can be drawn in a regular heptagon than a regular pentagon?
A. 2 B. 14 C. 9 D. 5 E. 6

23. $50^{\circ}F =$ _____ $^{\circ}C$.
A. 42 B. 9 C. 22 D. 12 E. 10

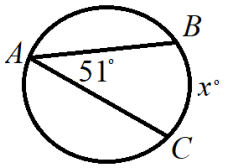
24. 110010111_2 = _____ (base 4)
A. 12113 B. 12123 C. 13112 D. 13113 E. 12313

25. In a rowing race, the distance between the teams in first and second place is 6.9 meters. The distance between the teams in second and third place is one-third that distance. How much farther ahead is the team in first place than the team in third place?
A. 9.2 meters B. 13.8 meters C. 2.3 meters D. 4.6 meters E. 11.5 meters

26. Point *A* has coordinates $(8, -3)$. What are the coordinates of point *A* if it is rotated counter-clockwise about the origin by 270°?

A. $(-8, 3)$ B. (8, 3) C. $(-3, -8)$ D. $(-3, 8)$ E. (3, 8)

27. In the circle, $m\angle BAC = 51^\circ$. What is the measure of minor arc *BC*?



A. 129 B. 25.5 C. 64.5 D. 102 E. 112

28. Idaho has approximately 1.5×10^7 people living in it. The United States has an approximate population of 3×10^8 people. How many times greater is the population of the United States than the population of Idaho? Answer in scientific notation.

A. 6×10^2 B. 6×10^1 C. 2×10^1 D. 4×10^2 E. 1.5×10^1

29. Juan is buying some jeans for \$39.00, a shirt for \$24.50, and some shoes for \$80.50. If the tax rate is 6%, what will Juan's total price be?

A. \$148.84 B. \$149.34 C. \$152.64 D. \$154.24 E. \$138.54

30. Find the value of $(-5 \heartsuit 8) + (6 \heartsuit (-1))$, if $m \heartsuit n = \frac{-3m+n}{2}$.

A. 4 B. 1 C. 6 D. 2 E. -3

31. What is the slope of the line passing through the points (3.2, 4.8) and (2.4, 2.6)?

A. 2½ B. 2¼ C. 2¾ D. 2⅖ E. 2⅜

32. A book has 76 pages, but the page numbers were incorrectly printed. Every fourth page number has been omitted, so that the pages are numbered 1, 2, 3, 5, 6, 7, 9, … and so on. What is the number on the last printed page?

A. 99 B. 103 C. 102 D. 101 E. 105

33. $\overline{AB}$ has vertices $A(-8, 2)$ and $B(4, -6)$. Find *AB*.

A. $13\sqrt{2}$ units B. $6\sqrt{2}$ units C. $8\sqrt{13}$ units D. $4\sqrt{13}$ units E. 10 units

34. What is the sum of all palindromes between 406 and 425?

A. 838 B. 1,240 C. 1,242 D. 966 E. 848

35. The geometric mean of *a* and *b* is $20\sqrt{3}$. If *a* = 25, what is the value of *b*?

A. 24 B. 48 C. 32 D. 16 E. 34

36. Find the area of a triangle with vertices located at $(-4, 2), (-1, -1),$ and (6, 4).

A. 18 units^2 B. 22 units^2 C. 19 units^2 D. 20 units^2 E. 21 units^2

37. The ratio of the measures of two supplementary angles is 2:7. What is the measure of the larger angle?

A. 170° B. 160° C. 70° D. 120° E. 140°

38. The linear equation $y = \frac{3}{5}x + \frac{1}{6}$ would be which of the following in standard form?

A. $30x - 18y = 5$ B. $18x - 30y = 5$ C. $18x - 30y = -5$ D. $3x - 5y = -1$ E. $3x - 5y = -6$

39. What is the rate of decay in the exponential function $y = 0.65(0.38)^x$?

A. 35% B. 65% C. 38% D. 62% E. 1.03%

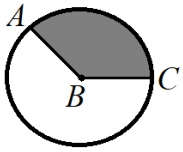
40. $\sqrt{778 + \sqrt[3]{216}}$ = _____

A. 124 B. 28 C. 16 D. 36 E. 38

41. If $D = -2\begin{bmatrix} 3 & 1 \\ -1 & 0 \end{bmatrix}$ and $C = -3\begin{bmatrix} -2 & -4 \\ 3 & -1 \end{bmatrix}$, then *CD* is equal to which of the following?

A. $\begin{bmatrix} -36 & -24 \\ -18 & 0 \end{bmatrix}$ B. $\begin{bmatrix} -12 & -12 \\ 60 & 18 \end{bmatrix}$ C. $\begin{bmatrix} 36 & -24 \\ -18 & 0 \end{bmatrix}$ D. $\begin{bmatrix} -6 & 18 \\ 120 & 9 \end{bmatrix}$ E. $\begin{bmatrix} -24 & -48 \\ 30 & 36 \end{bmatrix}$

42. In $\odot B$ below, *BC* = 12 cm. If $\pi = 3$ and $m\angle ABC = 140^\circ$, what is the area of the unshaded region?



A. 264 units^2 B. 168 units^2 C. 336 units^2 D. 296 units^2 E. 352 units^2

43. Samantha surveyed 43 people of which was their favorite pizza topping, sausage or pepperoni. 12 people said they liked both sausage and pepperoni, 26 people said they like sausage and 21 people said they like pepperoni. How many people did not like either of the toppings?

A. 0 B. 2 C. 6 D. 8 E. 4

44. Manny can row his boat 40 miles in 4 hours with the current. Against the current, he can only row 90% of the distance in 6 hours. Assuming the rate is constant, what is the rate of Manny's boat?

A. 8 mi/hr B. 6 mi/hr C. 2 mi/hr D. 10 mi/hr E. 12 mi/hr

45. $67_8 \times 12_8$ = _____ (base 8)

A. 1052 B. 1066 C. 1048 D. 1106 E. 1046

46. 25% of the circle with the equation $(x - 5)^2 + (y + 13)^2 = 225$ is colored red. If $\pi = 3$, what is the area of the red colored region?

A. 184.5 units^2 B. 124.75 units^2 C. 168.75 units^2 D. 112.5 units^2 E. 92.25 units^2

47. What is the sum of all the integers that satisfy the inequality $6x - 10 < 8x + 2 \leq 16 - 6x$?

A. -20 B. -14 C. -8 D. -12 E. -10

48. Which of the following is equivalent to $\log_7 11 - \log_7 5$?

A. $\log_7\left(\frac{11}{5}\right)$ B. $\log_7 6$ C. $\log_7 16$ D. $\log_7 11^5$ E. $\log_7\left(\frac{5}{11}\right)$

49. What is the value of *xy*, if $x^2 + y^2 = 150$ and *x* + *y* = 14?

A. 23 B. 27 C. 17 D. 16 E. 32

50. Simplify: $\left(\frac{9}{5}a^3b^5c\right)\left(\frac{2}{3}a^{-2}bc^{-4}\right)\left(\frac{1}{2}a^0b^{-2}c^3\right)$

A. $\frac{2}{5}a^2bc^2$ B. $\frac{2}{5}ab^5$ C. $\frac{3}{5}ab^4$ D. $\frac{3}{5}a^2bc^2$ E. $\frac{2}{5}ab^5$

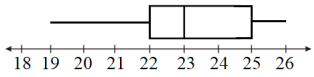
2020 – 2021 TMSCA Middle School Mathematics Test #12 Answer Key

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

2020 – 2021 TMSCA Middle School Mathematics Test #12 Selected Answers

13. $-\frac{1}{2}(12x+2y)-\frac{2}{5}(20x-15y)=-\frac{1}{2}(12x)+\left(-\frac{1}{2}(2y)\right)-\frac{2}{5}(20x)-\left(-\frac{2}{5}(15y\right)=$
$-6x-y-8x+6y=-14x+5y.$

15. In the box and whisker plot,



the lower quartile is 22 and the interquartile range is 25 – 22 = 3. Therefore, the sum of the lower quartile and interquartile range is 22 + 3 = 25.

16. The range values of a function consisting of ordered pairs are all the values of the *y* coordinates. The range values of the function $\{(-2,3),(8,-4),(7,7),(5,-1)\}$ are $\{3,-4,7,-1\}$. Therefore, the product of the range values of the function is equal to $(3)(-4)(7)(-1)=84.$

17. Set up the equation $7x + 9x = 32$, which gives us $16x = 32$. Dividing by 2 on both sides gives us $x = 2$. The smallest integer is then 7(2) = 14. Seven more than 14 is equal to 14 + 7 = 21.

21. If one gross = 144, then 1 gross = 12 dozen. Therefore, 6 gross is equal to 6(12) = 72 dozen.

23. The formula to change Fahrenheit to Celsius is $C=\frac{5}{9}(F-32)$. Therefore, $50^{\circ}F$ is equal to $\frac{5}{9}(50-32)=$
$\frac{5}{9}(18)=10^{\circ}C.$

33. The distance formula between two points is $d=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$. We are given the points $A(-8,2)$ and $B(4,-6)$. Therefore, $AB=\sqrt{(-8-4)^2+\big(2-(-6)\big)^2}=\sqrt{(-12)^2+8^2}=\sqrt{144+64}=$
$\sqrt{208}=\sqrt{16\cdot 13}=4\sqrt{13}.$

34. The palindromes between 406 and 425 are 414 and 424. Therefore, their sum is 414 + 424 = 838.

40. We know $6^3 = 216$, so $\sqrt{778+\sqrt[3]{216}}$ can be rewritten as $\sqrt{778+6}=\sqrt{784}$, and $\sqrt{784}=28.$

47. $6x-10<8x+2\le 16-6x$ is a compound inequality that can be broken into the two inequalities $6x-10<8x+2$ and $8x+2\le 16-6x$. To solve $6x-10<8x+2$, subtract 6*x* from both sides to get $-10<2x+2$. Subtract 2 from both sides and get $-12<2x$. Divide both sides by 2 and get $-6<x$. To solve $8x+2\le 16-6x$, add 6*x* to both sides and get $14x+2\le 16$. Subtract 2 from both sides and get $14x\le 14$. Divide both sides by 14 and get $x\le 1$. We can now write the compound inequality $-6<x\le 1$. The sum of the integers that satisfy this is $-5+(-4)+(-3)+(-2)+(-1)+0+1=-14.$

49. If $x + y = 14$, then squaring both sides $(x+y)^2=14^2$, gives us $x^2+2xy+y^2=196$. Because we know $x^2+y^2=150$, then $2xy=196-150=46$. Dividing both sides by 2, and $xy = 23$.

50. Using the exponent rule $a^m\cdot a^n=a^{m+n}$, $\left(\frac{9}{5}a^3b^5c\right)\left(\frac{2}{3}a^{-2}bc^{-4}\right)\left(\frac{1}{2}a^0b^{-2}c^3\right)=$
$\left(\frac{9}{5}\cdot\frac{2}{3}\cdot\frac{1}{2}\right)\left(a^{3+(-2)+0}\right)\left(b^{5+1+(-2)}\right)\left(c^{1+(-4)+3}\right)=\frac{3}{5}a^1b^4c^0=\frac{3}{5}ab^4.$