# TMSCA MIDDLE SCHOOL MATHEMATICS

# TEST#11 ©

# FEBRUARY 13, 2021

## 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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1. $3\frac{1}{5} + 8\frac{4}{5} + 2\frac{3}{10} =$ _____

A. $14\frac{7}{10}$　　　B. $14\frac{4}{5}$　　　C. $14\frac{1}{10}$　　　D. $14\frac{3}{10}$　　　E. $13\frac{7}{10}$

2. $688 - 456 - 178 =$ _____
A. 54　　　B. 62　　　C. 56　　　D. 52　　　E. 64

3. $24\frac{1}{2} \times 7 =$ _____
A. 168.5　　　B. 171.5　　　C. 167.5　　　D. 173.5　　　E. 170.5

4. $123\frac{1}{4} \div 4 =$ _____ (nearest tenth)
A. 28.6　　　B. 28.4　　　C. 30.8　　　D. 30.2　　　E. 32.2

5. What is the value of $-x$ if $x$ is $-23^1$ ?
A. $-23$　　　B. $\frac{1}{23}$　　　C. $-\frac{1}{23}$　　　D. 23　　　E. $-22$

6. 340 minutes = _____ hours
A. $4\frac{3}{5}$　　　B. $5\frac{2}{3}$　　　C. $5\frac{5}{6}$　　　D. $5\frac{3}{5}$　　　E. $5\frac{3}{4}$

7. What value is 34% of 4,800?
A. 1,648　　　B. 1,624　　　C. 1,632　　　D. 1,628　　　E. 1,636

8. The units digit and the hundreds digit of the number 4,573 are interchanged to create a new number. What is the positive difference between the original number and the new number?
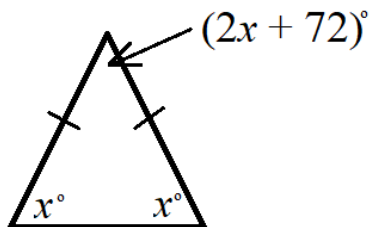A. 198　　　B. 200　　　C. 197　　　D. 199　　　E. 202

9. In the picture below, what is the value of $x$?



A. 27　　　B. 54　　　C. 32　　　D. 64　　　E. 9

10. 6 quarts = _____ ounces
A. 48　　　B. 768　　　C. 192　　　D. 24　　　E. 96

11. What is the value of $15 \blacksquare 18$, if $a \blacksquare b = \frac{-b}{2a} + \frac{b}{a}$?
A. 0.6　　　B. 0.4　　　C. 0.8　　　D. 0.2　　　E. 0.25

12. $23 \times 65 =$ _____ (Roman numeral)
A. MCDXCV　　　B. MCDXCIX　　　C. MDCXCV　　　D. MCDLCV　　　E. MDXCIX

13. An average person blinks 20 times per minute. How many times does an average person blink in one hour? Answer in scientific notation.
A. $4.8 \times 10^2$　　　B. $1.2 \times 10^3$　　　C. $1.728 \times 10^4$　　　D. $9.6 \times 10^3$　　　E. $7.2 \times 10^2$

14. What is the sum of the digits of the sum of 6,328 + 1,222 + 457 + 28?
A. 19                    B. 16                    C. 17                    D. 20                    E. 18

15. Hana runs $\frac{1}{6}$ of a mile in 60 seconds.  At this rate, how many seconds will it take Hana to run 2.5 miles?
A. 540 seconds           B. 600 seconds           C. 1,200 seconds         D. 1,260 seconds         E. 900 seconds

16. In gym class, 21 out of 35 girls wore a hair tie.  What percent of the girls did not wear a hair tie?
A. 40%                   B. 30%                   C. 60%                   D. 25%                   E. 35%

17. Simplify:   $\frac{1}{3}(6x - 9) + \frac{2}{5}(20 - 15x) - \frac{1}{8}(16x - 32)$
A. $-3x + 12$            B. $-3x + 6$             C. $-3x - 9$             D. $-6x - 12$            E. $-6x + 9$

18. 5 Students run a race.  In how many ways can they finish the race?
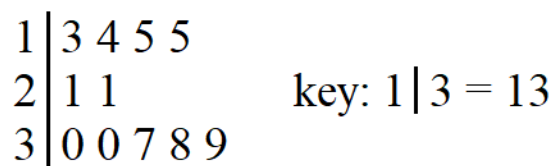A. 5                     B. 10                    C. 60                    D. 120                   E. 25

19. What is the value of $n$, if $n$ is the least positive integer with exactly 16 factors?
A. 144                   B. 224                   C. 120                   D. 160                   E. 148

20. What is the sum of all the perfect squares between 20 and 90?
A. 271                   B. 230                   C. 255                   D. 371                   E. 319

21. What is the product of the three modes in the stem-and-leaf plot?

$$\begin{array}{c|l} 1 & 3\ 4\ 5\ 5 \\ 2 & 1\ 1 \\ 3 & 0\ 0\ 7\ 8\ 9 \end{array} \qquad \text{key: } 1|3 = 13$$

A. 9,261                 B. 27,000                C. 3,375                 D. 9,450                 E. 8,190

22. Solve:        $-\frac{w}{3} - 1 > -7$
A. $w > 18$              B. $w > 24$              C. $w > -3$              D. $w < 24$              E. $w < 18$

23. What is the $18^{th}$ term of the sequence 104, 116, 128, …?
A. 308                   B. 312                   C. 316                   D. 314                   E. 310

24. If 75% of a number $w$ is 105, what is $\frac{4}{7}$ of $w$?
A. 68                    B. 72                    C. 80                    D. 76                    E. 64

25. $314_{10} =$ _____ (base 11)
A. 266                   B. 256                   C. 254                   D. 262                   E. 258

26. $\dfrac{1+3+5+7+9+11+13+15+17+19}{21+23+25+27+29+31+33+35+37+39} =$ _____

A. ¾                     B. ⅔                     C. ⅜                     D. ⅕                     E. ⅓

27. If 32 gallons fill a container 40% full, how may gallons are needed to fill the container completely?
A. 76                    B. 120                   C. 100                   D. 80                    E. 84

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



A. 12        B. 10        C. 9        D. 11        E. 8

29. A six-sided die is rolled five times. What is the probability that the die will show an odd number exactly two times?

A. $\frac{7}{16}$        B. $\frac{17}{32}$        C. $\frac{15}{32}$        D. $\frac{15}{64}$        E. $\frac{5}{16}$

30. Amelia is buying a new scooter that costs \$420. If the tax rate is 8%, what is the total price of the scooter?

A. \$453.60        B. \$756.00        C. \$427.40        D. \$436.80        E. \$445.20

31. Line *A* has a slope of $-\frac{2}{5}$. If line *A* passes through the points $(-5, 8)$ and $(3, y)$, what is the value of *y*?

A. 5.8        B. 5.6        C. 4.8        D. 6.2        E. 5.4

32. A circle has an area of $64\pi$ units$^2$ and is inscribed within a square. What is the perimeter of the square?

A. 64 units        B. 32 units        C. 16 units        D. 8 units        E. 24 units

33. What is the sum of the 5$^{th}$ and 6$^{th}$ triangular numbers?

A. 49        B. 36        C. 64        D. 57        E. 37

34. How many integers satisfy the inequality $-16 \le 2x - 6 < 12$?

A. 16        B. 34        C. 35        D. 12        E. 14

35. Quadrilateral *ABCD* has vertices $A(4, 1)$, $B(7, 5)$, $C(13, 6)$, and $D(10, 2)$. Which of the following is true?

A. $BD \parallel AC$        B. $AB \perp BC$        C. $CB \parallel DA$        D. $CD \perp CB$        E. $DA \parallel CD$

36. The areas of three distinct faces of a rectangular prism are 20, 45 and 36 units$^2$. What is the volume of this rectangular prism?

A. 101 units$^3$        B. 224 units$^3$        C. 234 units$^3$        D. 180 units$^3$        E. 240 units$^3$

37. Solve for *n*: $\frac{3n-1}{7} = 2m - 7n$

A. $n = \frac{14m+1}{52}$        B. $n = \frac{14m+7}{52}$        C. $n = \frac{14m+7}{10}$        D. $n = \frac{7(2m+7)}{52}$        E. $n = \frac{7(2m+7)}{10}$

38. $\overrightarrow{BD}$ lies in the interior of $\angle ABC$. $m\angle ABC = 42°$, $m\angle ABD = (x^2)°$, and $m\angle DBC = (4x + 10)°$. What is the measure of $\angle ABD$?

A. $4°$        B. $16°$        C. $14°$        D. $64°$        E. $26°$

39. When factored completely, the polynomial $5n^4 - 5$ has how many real factors?

A. unfactorable        B. 3        C. 4        D. 5        E. 2

40. *Max Movies* charges \$12.00 for adult tickets and \$9.00 for child tickets. At a show where 240 tickets were sold, *Max Movies* collected \$2,610. How many fewer child tickets were sold than adult tickets?

A. 45        B. 55        C. 75        D. 60        E. 40

41. Simplify by rationalizing the denominator: $\frac{18}{\sqrt{6}}$

A. $3\sqrt{6}$      B. $\frac{1}{\sqrt{3}}$      C. $\sqrt{3}$      D. $3\sqrt{3}$      E. $6\sqrt{6}$

42. What is the measure of angle $\angle APB$, if minor arc $AC = 77°$ and minor arc $BD = 143°$?
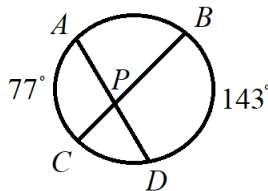
A. $105°$      B. $110°$      C. $75°$      D. $65°$      E. $70°$

43. $220_6 \div 3_6 = $_____ (base 10)

A. 28      B. 44      C. 32      D. 26      E. 34

44. What is the sum of the roots of the quadratic equation $12 = 10x + 6 - 5x^2$?

A. 17      B. $-\frac{1}{2}$      C. 1.2      D. 2      E. $-1.2$

45. Simplify: $\sqrt{\left(\left(2^3\right)^{\frac{5}{3}}\right)^2}$

A. 1,024      B. 32      C. 64      D. 96      E. 16

46. If $A = \begin{bmatrix} -6 & -5 \\ 8 & -11 \end{bmatrix}$, then $A^2$ is equal to which of the following?

A. $\begin{bmatrix} -4 & 85 \\ -136 & 81 \end{bmatrix}$    B. $\begin{bmatrix} -12 & -10 \\ 16 & -22 \end{bmatrix}$    C. $\begin{bmatrix} 36 & 25 \\ 64 & 121 \end{bmatrix}$    D. $\begin{bmatrix} -36 & -25 \\ 64 & -121 \end{bmatrix}$    E. $\begin{bmatrix} 144 & 50 \\ 128 & 484 \end{bmatrix}$

47. A 45-45-90 right triangle has a leg with a side length of $\sqrt{128}$ inches. What is the length of the hypotenuse of the right triangle?

A. $14\sqrt{2}$ inches      B. $8\sqrt{2}$ inches      C. 16 inches      D. 64 inches      E. 32 inches

48. Denise buys an antique for $154.00. If Denise sells the antique for 30% more than she paid, how much will she sell the antique for?

A. $200.20      B. $261.80      C. $224.40      D. $224.20      E. $208.60

49. A square has a side length of 9 cm, which is also the radius of the circle. If $\pi = 3$, what is the area of the shaded region?

9 cm
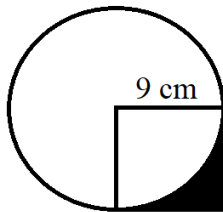
A. $27$ cm$^2$      B. $20.25$ cm$^2$      C. $60.75$ cm$^2$      D. $18.75$ cm$^2$      E. $16.5$ cm$^2$

50. Which of the following is equivalent to $\log_8(12) + \log_8(8)$?

A. $\log_8(4)$      B. $\log_8(8)$      C. $\log_8(20)$      D. $\log_8(96)$      E. $\log_{16}(20)$

# 2020 – 2021 TMSCA Middle School Mathematics Test #11 Answer Key

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

5. If $x$ is $-23^1$, then $x = -23$. Therefore, $-x = -(-23) = 23$.

10. 1 quart $= 32$ ounces. Therefore, 6 quarts $= 6(32) = 192$ ounces.

20. There are 5 perfect squares between 20 and 90. They are 25, 36, 49, 64, and 81. Their sum is $25 + 36 + 49 + 64 + 81 = 255$.

21. The three modes of the stem-and-leaf plot,

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1|3 4 5 5
2|1 1        key: 1|3 = 13
3|0 0 7 8 9
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are 15, 21, and 30. Their product is $15(21)(30) = 9{,}450$.

26. The sum of the first $n$ consecutive odd integers divided by the sum of the next $n$ consecutive odd integers is always equal to $\frac{1}{3}$. Therefore, since we are asked to find the sum of the first 10 consecutive odd integers divided by the sum of the next 10 consecutive odd integers, the sum will be $\frac{1}{3}$.

39. When factored completely, $5n^4 - 5 = 5(n^4 - 1) = 5(n^2 + 1)(n^2 - 1) = 5(n^2 + 1)(n + 1)(n - 1)$, which has 4 factors.

44. The standard form of a quadratic equation is $y = Ax^2 + Bx + C$. To find the sum of the roots, use $\frac{-B}{A}$. We are given the equation $12 = 10x + 6 - 5x^2$ which, when changed to standard form, is $5x^2 - 10x + 6 = 0$. Therefore, the sum of the roots is equal to $\frac{-(-10)}{5} = \frac{10}{5} = 2$.

45. Since $\sqrt{x}$ can be rewritten as $x^{\frac{1}{2}}$, then $\sqrt{\left((2^3)^{\frac{5}{3}}\right)^2}$ can be rewritten as $\left(\left((2^3)^{\frac{5}{3}}\right)^2\right)^{\frac{1}{2}}$. By the exponent rule,

$(a^m)^n = a^{m \cdot n}$, $\left(\left((2^3)^{\frac{5}{3}}\right)^2\right)^{\frac{1}{2}} = 2^{3 \cdot \frac{5}{3} \cdot 2 \cdot \frac{1}{2}} = 2^5 = 32$.

46. If $A = \begin{bmatrix} -6 & -5 \\ 8 & -11 \end{bmatrix}$, then

$A^2 = \begin{bmatrix} -6 & -5 \\ 8 & -11 \end{bmatrix} \cdot \begin{bmatrix} -6 & -5 \\ 8 & -11 \end{bmatrix} = \begin{bmatrix} -6(-6) + (-5)(8) & -6(-5) + (-5)(-11) \\ 8(-6) + (-11)(8) & 8(-5) + (-11)(-11) \end{bmatrix} = \begin{bmatrix} -4 & 85 \\ -136 & 81 \end{bmatrix}$.

49. To find the area of the shaded region, you must first find the area of the square and then subtract the area of the quarter circle. The area of the square is equal to $9^2 = 81$ cm$^2$. The area of the quarter circle is equal to $\frac{1}{4}(3)(9^2) = 60.75$ cm$^2$. Therefore, the area of the shaded region is equal to $81 - 60.75 = 20.25$ cm$^2$.

50. By the Logarithm Product Rule, $\log_b(x \cdot y) = \log_b(x) + \log_b(y)$. Therefore, $\log_8 12 + \log_8 8 = \log_8(12 \cdot 8) = \log_8(96)$.