



TMSCA MIDDLE SCHOOL MATHEMATICS

TEST #8 ©

JANUARY 22, 2022

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.

[illegible]

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1. $817 + 1,023,006 =$ _____ (nearest thousand)

- A. 1,023,000 B. 1,024,000 C. 1,022,000 D. 1,025,000 E. 1,023,800

2. $7,003.09 - 651.3 =$ _____

- A. 6,351.6 B. 6,351.06 C. 6,654.39 D. 6,351.79 E. 6,351.69

3. $8\frac{2}{3} \times \frac{9}{16} =$ _____

- A. $4\frac{7}{8}$ B. $9\frac{5}{8}$ C. $2\frac{7}{16}$ D. $4\frac{7}{16}$ E. $8\frac{11}{19}$

4. $12\frac{3}{4} \div 2\frac{1}{2} =$ _____

- A. $\frac{51}{10}$ B. $\frac{15}{2}$ C. $\frac{13}{2}$ D. $\frac{9}{4}$ E. $\frac{55}{4}$

5. If $A = 1$, $B = 2$, $C = 3$, ..., $Y = 25$, and $Z = 26$, what is the sum of all the vowels?

- A. 50 B. 75 C. 56 D. 47 E. 51

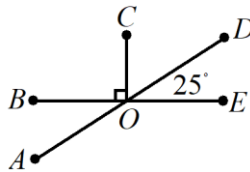
6. 3.5 pounds = _____ ounces

- A. 7 B. 28 C. 56 D. 42 E. 49

7. It is now 10:12 am. What time will it be in 16 hours 29 minutes?

- A. 2:41 pm B. 4:41 am C. 5:41 pm D. 2:41 am E. 4:41 pm

8. In the picture below, what is the measure of $\angle AOC$?



- A. 160° B. 125° C. 115° D. 165° E. 120°

9. 15 is what percent of 600?

- A. 1.5% B. 3% C. 3.5% D. 2% E. 2.5%

10. What is the range of the set of numbers 67, 119, 131, 17, 22, 97, 106, and 65?

- A. 114 B. 148 C. 19.5 D. 9 E. 101.5

11. Chocolate bars are on sale for “buy three get one free”. If each chocolate bar costs \$1.80, how much would 16 chocolate bars cost, assuming there is no tax?

- A. \$28.60 B. \$28.80 C. \$21.60 D. \$23.60 E. \$27.00

12. Simplify: $(20 - 7 - 6)^2 - (2^3 + 2 - 8)^3$

- A. 49 B. -541 C. 45 D. 41 E. -53

13. What is the sum of the faces of a pentagonal prism and a cube?

- A. 12 B. 13 C. 18 D. 15 E. 16

14. If November is a month that contains Friday the 13th, what day of the week lands on November 26th?

- A. Monday B. Tuesday C. Wednesday D. Thursday E. Friday

15. What is the area of a rhombus with diagonals of 14 cm and 17 cm?

- A. 78 cm^2 B. 238 cm^2 C. 578 cm^2 D. 156 cm^2 E. 119 cm^2

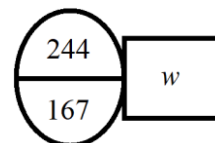
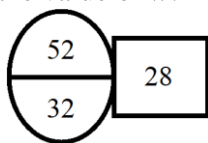
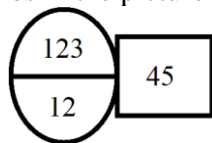
16. What is the 9th term of the sequence $-6, 1, 8, \dots$?

- A. 50 B. 43 C. 57 D. 56 E. 64

17. In *The TreeLands* subdivision, there are 119 houses, each numbered consecutively 1 to 119. The houses numbered 22 – 38 inclusive are to be demolished, in order for a park to be developed. How many houses will remain?

- A. 97 B. 102 C. 104 D. 81 E. 98

18. Use the examples in the picture below to find the value of w .



- A. 121 B. 139 C. 142 D. 151 E. 137

19. $23 \times 28 =$ _____ (Roman numeral)

- A. DCXLIV B. CDLXXIX C. DLXXV D. XLXI E. CDLXII

20. 60% of 140 = 20% of what value?

- A. 84 B. 380 C. 210 D. 420 E. 360

21. How many units are in the sum of the lengths of all the edges of a cube that has a volume of 64 in^3 ?

- A. 36 inches B. 48 inches C. 72 inches D. 24 inches E. 32 inches

22. What is the GCF of a^3b^2 and $7a^5b$?

- A. $7a^5b^2$ B. $7a^3b$ C. a^3b D. a^5b^2 E. a^8b^3

23. Which equation produces the table of values below?

x	-4	2	14	22
y	-9	-6	0	4

- A. $y = 2x - 1$ B. $y = 3x + 3$ C. $y = \frac{1}{4}x - 8$ D. $y = 0.5x + 7$ E. $y = \frac{1}{2}x - 7$

24. 101 quarters + 101 dimes + 101 nickels + 11 pennies = _____

- A. \$45.41 B. \$40.51 C. \$41.41 D. \$40.41 E. \$41.45

25. Solve: $18 - 3n > -15$

- A. $n < 11$ B. $n > 11$ C. $n < -11$ D. $n > -11$ E. $n = 11$

26. If $f(x) = -x^2 - 7$ and $g(x) = \frac{x}{2} + 6$, what is the value of $f(-3) + g(32)$?

- A. 6 B. -9 C. -3 D. 12 E. 3

27. $122_9 =$ _____ (base 4)

- A. 1001 B. 1211 C. 1121 D. 1221 E. 1021

28. What is the product of 4.5×10^4 and 2.8×10^6 in scientific notation?

- A. 7.3×10^{10} B. 7.3×10^{11} C. 1.26×10^{10} D. 2.845×10^6 E. 1.26×10^{11}

29. If the vertex angle of an isosceles triangle measures 54° , what is the measure of one of the base angles?
 A. 54° B. 126° C. 36° D. 31° E. 63°

30. What is the range of the function $3x - 2y = 8$, for a domain of $\{-2, 0, 10\}$?

- A. $\{\frac{4}{3}, \frac{8}{3}, \frac{28}{3}\}$ B. $\{-\frac{2}{3}, \frac{8}{3}, \frac{10}{3}\}$ C. $\{-7, \frac{8}{3}, -19\}$ D. $\{-7, -4, 11\}$ E. $\{-1, -4, -19\}$

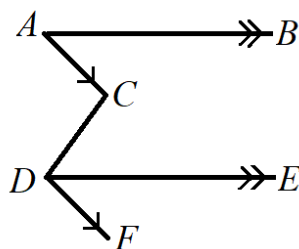
31. The number 18 can be written as the sum of 9 consecutive integers. What is the product of these 9 integers?

- A. 120 B. 504 C. 240 D. 45 E. 0

32. Which of the following is equivalent to $6x - 4y = -3$?

- A. $y = -\frac{3}{2}x + \frac{3}{4}$ B. $y = \frac{3}{2}x - \frac{3}{4}$ C. $y = \frac{3}{2}x + \frac{3}{4}$ D. $y = -\frac{2}{3}x + \frac{3}{4}$ E. $y = \frac{2}{3}x - \frac{3}{4}$

33. In the picture below, $m\angle BAC = 32^\circ$ and $m\angle CDE = 69^\circ$. What is the sum of $m\angle EDF + m\angle ACD$?



- A. 132° B. 101° C. 138° D. 103° E. 133°

34. Line a passes through the points $(2a - 1, 3a + 2)$ and $(5a - 1, 7a + 2)$. What is the slope of line a ?

- A. $\frac{2}{3}$ B. $-\frac{3}{2}$ C. $\frac{4}{3}$ D. $-\frac{3}{4}$ E. $\frac{1}{2}$

35. Kate wants to spend no more than \$285.00 on new school clothes. She spends \$125.00 on a pair of shoes and wants to buy some shirts that are on sale for \$20 each. What is the greatest number of shirts Kate can buy?

- A. 8 B. 7 C. 6 D. 10 E. 9

36. Let U be a universal set and A and B be subsets of U defined as shown. Find $A \cap B'$.

$$U = \{a, b, c, d, e, f, g\} \quad A = \{a, e\} \quad B = \{b, c, d, f, g\}$$

- A. $\{ \}$ B. $\{a, a, b, c, d, e, e, f, g\}$ C. $\{a, e\}$ D. $\{a, b, c, d, e, f, g\}$ E. $\{b, c, d, f, g\}$

37. What is the area of trapezoid $MNPQ$, with vertices $M(5, -3)$, $N(-4, -1)$, $P(-4, 2)$, and $Q(5, 5)$?

- A. 41.5 units² B. 57.5 units² C. 37.5 units² D. 71.5 units² E. 49.5 units²

38. How many total degrees are in a regular 13-sided polygon?

- A. $1,980^\circ$ B. $2,160^\circ$ C. $2,340^\circ$ D. $2,520^\circ$ E. $2,070^\circ$

39. $\frac{\frac{5}{6}}{\frac{1}{2} + \frac{2}{3} - \frac{3}{4}} =$ _____

- A. 4 B. 6 C. 3 D. 2 E. 5

40. What is the solution to the inequality $7 - 2b \leq -9$?

- A. $(-\infty, 16]$ B. $(-\infty, -8]$ C. $[-8, \infty)$ D. $[16, \infty)$ E. $[8, \infty)$

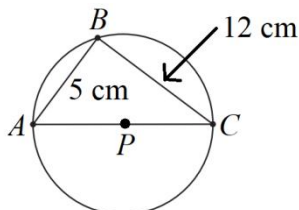
41. What is the measure of the diameter of a circle with an equation of $x^2 + (y - 5)^2 = 576$?

- A. 48 units B. 288 units C. 144 units D. 72 units E. 36 units

42. In a 30 – 60 – 90 right triangle, the difference between the length of the longest side and the length of the shortest side is 48 units. What is the length of the longest side?

- A. 24 units B. 48 units C. 96 units D. 192 units E. 144 units

43. In terms of π , what is the area of the circle?



- A. $56.25\pi \text{ cm}^2$ B. $169\pi \text{ cm}^2$ C. $84.5\pi \text{ cm}^2$ D. $48.25\pi \text{ cm}^2$ E. $42.25\pi \text{ cm}^2$

44. The initial population of fish in a local pond is 200. If the fish are decreasing every year by a rate of 20%, how many fish will be remaining after 2 years?

- A. 128 B. 64 C. 132 D. 120 E. 160

45. $(4i)^4 =$ _____

- A. $256i$ B. $-256i$ C. 256 D. -256 E. $16i$

46. How many unique roots does the equation $3x^2 + 48 = -24x$ have?

- A. 0 B. 1 C. 2 D. 3 E. 4

47. Solve for n : $\sqrt{n + 7} = n + 5$

- A. 9 B. -2 C. 4 D. -3 E. -1

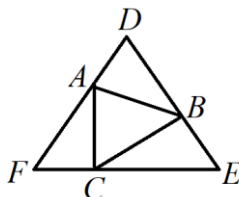
48. Lola has a total of 75 coins consisting of dimes and nickels. If the value of Lola's coins is \$5.40, how many more nickels than dimes does Lola have?

- A. 12 B. 7 C. 9 D. 13 E. 8

49. Which of the following is equivalent to $\frac{24}{\sqrt{6}}$?

- A. $6\sqrt{6}$ B. $4\sqrt{6}$ C. $\frac{2\sqrt{6}}{3}$ D. $\frac{4\sqrt{6}}{3}$ E. $\frac{\sqrt{6}}{4}$

50. Using the picture below, an equilateral triangle ABC is inscribed inside a larger equilateral triangle DEF , and A , B , and C lie at the trisection points of the side of $\triangle DEF$. If the perimeter of $\triangle DEF = 27$ units, what is the perimeter of $\triangle ABC$?



- A. 9 units B. 18 units C. $18\sqrt{3}$ units D. $12\sqrt{3}$ units E. $9\sqrt{3}$ units

2021 – 2022 TMSCA Middle School Mathematics Test #8 Answer Key

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

2021 – 2022 TMSCA Middle School Mathematics Test #8 Selected Answers

6. 1 pound = 16 ounces, so 3.5 pounds = $3.5(16) = 56$ ounces.

13. A pentagonal prism has 7 faces and a cube has 6 faces. Therefore, the sum of the faces of a pentagonal prism and a cube is $7 + 6 = 13$.

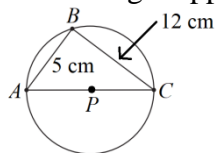
26. If $f(x) = -x^2 - 7$ and $g(x) = \frac{x}{2} + 6$, then $f(-3) + g(32) = -(-3)^2 - 7 + \frac{32}{2} + 6 = -9 - 7 + 16 + 6 = -16 + 16 + 6 = 6$.

28. The product of 4.5×10^4 and 2.8×10^6 is equal to $(4.5)(2.8)(10^4)(10^6) = 12.6(10^{4+6}) = 12.6(10^{10}) = (1.26 \times 10^1)(10^{10}) = 1.26 \times 10^{10+1} = 1.26 \times 10^{11}$ in scientific notation.

38. To find the total degree of a polygon, use the formula $(n - 2) \cdot 180$, where n is the number of sides of the polygon. Therefore, a 13-sided polygon will have $(13 - 2)(180) = 11(180) = 1,980^\circ$.

$$39. \frac{\frac{5}{6}}{\frac{1}{2} + \frac{2}{3} - \frac{3}{4}} = \frac{\frac{5}{6}}{\frac{6}{12} + \frac{8}{12} - \frac{9}{12}} = \frac{\frac{5}{6}}{\frac{5}{12}} = \frac{5}{6} \div \frac{5}{12} = \frac{5}{6} \cdot \frac{12}{5} = \frac{60}{30} = 2.$$

43. If one side of a triangle inscribed in a circle is a diameter of the circle, then the triangle is a right triangle and the angle opposite the diameter is the right angle. In the picture given, \overline{AC} is a diameter, and therefore the hypotenuse of $\triangle ABC$. Using the Pythagorean theorem, $AC = \sqrt{5^2 + 12^2} = \sqrt{25 + 169} = \sqrt{169} = 13$. The radius of the circle is then $\frac{1}{2}(13) = 6.5$. The area of the circle is then $\pi(6.5)^2 = 42.25\pi \text{ cm}^2$.

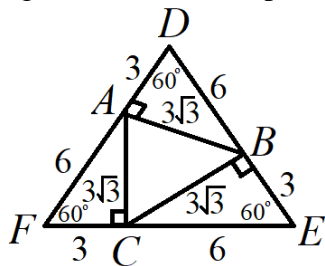


44. An exponential decay function is in the form $y = a \cdot b^x$, where a is the initial amount, $0 < b < 1$, $b = 1 - r$, and $r = \text{rate}$. From the information given, substitute to get $y = 200(1 - 0.2)^2 = 200(0.8)^2 = 200(0.64) = 128$. After 2 years, at a decay rate of 20%, 128 fish will remain.

45. Since $i = \sqrt{-1}$, then $i^2 = -1$. $(4i)^4 = 4^4 \cdot i^4 = 256 \cdot i^2 \cdot i^2 = 256(-1)(-1) = 256$.

49. To rationalize the denominator of $\frac{24}{\sqrt{6}}$, multiply by $\frac{\sqrt{6}}{\sqrt{6}}$. Therefore, $\frac{24}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{24\sqrt{6}}{6} = 4\sqrt{6}$.

50. If the points of the smaller triangle lie at the trisection points of the larger triangle, the three smaller triangles are 30-60-90 special right triangles, as shown in the diagram.



Therefore, the perimeter of $\triangle ABC = 3\sqrt{3} + 3\sqrt{3} + 3\sqrt{3} = 9\sqrt{3}$ units.