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

G E A R - U P T E S T ©

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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 Gear-Up Test

1. $15.4 + 6\frac{3}{5}$ = _____

A. 21.8 B. 21.7 C. 21.9 D. 22 E. 22.2

2. $23.1 - \frac{3}{4}$ = _____

A. 22.24 B. 22.25 C. 22.35 D. 23.025 E. 23.02

3. $\frac{3}{8} \times 2\frac{7}{4}$ = _____

A. $1\frac{13}{16}$ B. $1\frac{13}{32}$ C. $3\frac{5}{32}$ D. $3\frac{1}{8}$ E. $2\frac{5}{8}$

4. $\frac{6}{5} \div \frac{48}{20}$ = _____

A. $\frac{3}{4}$ B. $\frac{3}{8}$ C. $\frac{1}{4}$ D. $\frac{3}{2}$ E. $\frac{1}{2}$

5. What is 16% of 450?

A. 76 B. 72 C. 84 D. 68 E. 78

6. $7(3a - b) - 11a + 2(a - b)$ is equivalent to which of the following?

A. $10a - 7b$ B. $8a - 9b$ C. $12a - 9b$ D. $12a - 7b$ E. $10a - 9b$

7. CDXCIX = _____ (Arabic number)

A. 419 B. 499 C. 699 D. 449 E. 659

8. Evaluate $ab \div cd$ for $a = -6, b = 18, c = 2$ and $d = -24$.

A. ¾ B. 1,296 C. 648 D. –¾ E. -21

9. What is the sum of the first ten prime numbers?

A. 160 B. 129 C. 158 D. 131 E. 143

10. How many numbers are in the list 8, 9, 10, …, 29, 30, 31?

A. 24 B. 23 C. 25 D. 22 E. 21

11. Cocoa and Cinammon were running around the block. Cocoa finished in 6 minutes 23 seconds and Cinammon finished in 8 minutes 37 seconds. How many seconds longer did it take Cinammon to finish the race than Cocoa?

A. 218 B. 134 C. 148 D. 124 E. 234

12. How many four-digit palindromes can be created using the digits 1, 2, and 3, if the digits can repeat?

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

13. If *A* = 1, *B* = 2, *C* = 3, …, *X* = 24, *Y* = 25, and *Z* = 26, what is the sum of the letters of the word *VERTEX?*

A. 99 B. 96 C. 93 D. 97 E. 94

14. What number when divided by 6 gives a quotient of 46 with a remainder of 5?

A. 277 B. 271 C. 281 D. 283 E. 303

15. Burton has a standard deck of cards that he will draw twice from. What is the probability Burton pulls out a 6 on his first draw, and then without replacement draws an 8?

A. $\frac{4}{663}$ B. $\frac{1}{169}$ C. $\frac{1}{221}$ D. $\frac{1}{442}$ E. $\frac{3}{221}$

16. $\sqrt{529}$ = _____

A. 29 B. 23 C. 27 D. 33 E. 37

17. When all possible diagonals are drawn from one vertex of a regular hexagon, how may triangles will be created?

A. 3 B. 6 C. 16 D. 4 E. 12

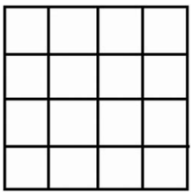
18. Including tax, Neil's favorite candy costs $1.12 per ounce. How much will it cost Neil to buy two and one-half pounds of his favorite candy?

A. $38.80 B. $36.20 C. $40.60 D. $44.80 E. $42.60

19. How many times larger is 40.5 than 4.05×10^{-3}?

A. 100 B. 1,000 C. 10,000 D. 100,000 E. 1,000,000

20. How many squares can be found in the 4×4 square grid below?



A. 17 B. 16 C. 30 D. 31 E. 29

21. Shayna has a collection of 4-inch and 6-inch straws, that she is connecting singularly one at a time. What is the greatest impossible length of straws Shayna can make?

A. 38 inches B. 36 inches C. 12 inches D. 18 inches E. 14 inches

22. Which equation below can be represented by the table?

x	-5	5	15	40
y	1	-3	-7	-17

A. $y = -\frac{2}{5}x - 1$ B. $y = \frac{2}{5}x - 1$ C. $y = \frac{2}{3}x + 2$ D. $y = x + 6$ E. $y = x - 8$

23. The odds of it raining today are 3:8. What is the probability of it not raining today?

A. 3:11 B. 5:11 C. 8:3 D. 8:11 E. 5:8

24. The ratio of $a:b:c:d$ is 9:6:4:4. If $d = 28$, what is the value of a?

A. 72 B. 90 C. 63 D. 108 E. 54

25. Cecilia has six socks, colored red, blue, green, pink, purple, and orange are in a drawer. How many combinations of two socks can be randomly selected from Cecilia's drawer?

A. 12 B. 15 C. 30 D. 24 E. 18

26. What is the value of *m*, if $\frac{1}{m}+\frac{1}{m}+\frac{1}{m}=24$?

A. $\frac{1}{6}$ B. 8 C. $\frac{3}{8}$ D. $\frac{5}{6}$ E. $\frac{1}{8}$

27. What is the measure of an exterior angle of a regular octagon?

A. 30° B. 135° C. 60° D. 15° E. 45°

28. 112_8 = _____ (base 4)

A. 1021 B. 1121 C. 1122 D. 1022 E. 1013

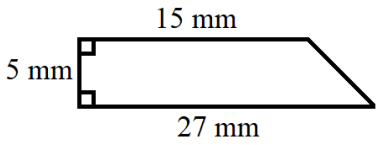
29. If $m\Delta n=\left(\frac{5+m}{2+n}\right)^2$, then what is the value of $67\Delta 2$?

A. 256 B. 484 C. 324 D. 196 E. 576

30. Nella is buying a dirt bike that is marked down $420. This is a 35% decrease from the original price. What is the original price of the dirt bike?

A. $1,250.00 B. $1,350.00 C. $1,200.00 D. $1,225.00 E. $1,300.00

31. What is the perimeter of the trapezoid below?



A. 94 mm B. 47 mm C. 60 mm D. 67.5 mm E. 105 mm

32. *DJ Memories* charges $250 to provide 3 hours of entertainment for any special occasion. He charges an additional $75 per hour beyond the initial 3 hours. If a wedding lasts 6 hours, how much will *DJ Memories* get paid?

A. $475 B. $450 C. $425 D. $500 E. $525

33. Two cyclists start from the same point. One travels north at 22 mi/h and the other travels south at 27 mi/h. If both cyclists maintain a constant rate, how far apart will the cyclists by after 4 hours?

A. 184 miles B. 196 miles C. 176 miles D. 188 miles E. 192 miles

34. Line *A* has a slope of $\frac{3}{7}$. If line *A* passes through the points (10, 18) and $(-4, y)$. What is the value of *y*?

A. 8 B. 14 C. 12 D. 2 E. 16

35. What is the simple interest depositing $3,200 at 4% for 9 years?

A. $1,152 B. $1,242 C. $1,382 D. $1,092 E. $1,262

36. Solve: $\frac{3-x}{5}>8$

A. $x > 43$ B. $x>-37$ C. $x=-37$ D. $x<-37$ E. $x < 43$

37. $(3i^8)(4i^{42})$ = _____

A. 12 B. $12i$ C. -12 D. $-12i$ E. $7i$

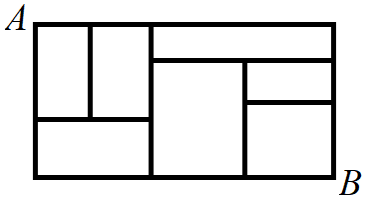
38. What is the number of degrees in the measure of one of the base angles of an isosceles triangle, if the measure of the vertex angle is twenty degrees less than three times the measure of one of the base angles?
A. 40° B. 45° C. 25° D. 30° E. 35°

39. A line that contains the points $(-10, -15)$ and $(5, -3)$ also contains the point $(x, -11)$. What is the value of *x*?
A. -1 B. -5 C. 7 D. 3 E. -9

40. $\sqrt{24}\left(\sqrt{48}\right) =$ _____
A. $16\sqrt{2}$ B. $24\sqrt{2}$ C. $12\sqrt{3}$ D. $12\sqrt{6}$ E. $32\sqrt{3}$

41. What is the diameter of a circle with an equation of $(x-11)^2 + (x-19)^2 = 441$?
A. 30 units B. 220.5 units C. 21 units D. 42 units E. 8 units

42. Moving only to the right or down, how may paths exist from *A* to *B*?



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

43. What is the growth rate of the exponential growth function $y = 3.8(2.4)^x$?
A. 380% B. 280% C. 240% D. 140% E. 40%

44. If $3\begin{bmatrix}-23 & 4\\ 17 & -1\end{bmatrix} - 2\begin{bmatrix}-24 & 7\\ 13 & -10\end{bmatrix} = \begin{bmatrix}w & x\\ y & z\end{bmatrix}$, then what is the value of $xy - w + z$?
A. -54 B. -71 C. -12 D. 19 E. 34

45. $-30^\circ C =$ _____$^\circ F$
A. -22 B. -8 C. -54 D. -16 E. -18

46. $\frac{a^{-3}b^{-2}}{a^7 b} \cdot \frac{ab^5}{a^2b^2} \cdot \frac{a^{-1}b^0}{ab} =$ _____
A. $\frac{b}{a^6}$ B. $\frac{b^3}{a^6}$ C. $\frac{1}{a^6 b}$ D. $\frac{1}{a^{13}b^6}$ E. $\frac{1}{a^{13}b}$

47. $41_5 \times 12_5 =$ _____ (base 5)
A. 1132 B. 1042 C. 1024 D. 1034 E. 1124

48. What are the coordinates of the vertex of the graph of the quadratic equation $2x^2 - 20x - 8 = y$?
A. (10, 12) B. $(5, -51)$ C. $(5, -58)$ D. $(-10, -51)$ E. $(-10, 392)$

49. What is the area of a triangle with vertices located at (3, 5), $(-5, 1)$, and $(-2, -3)$?
A. 18 units^2 B. 22 units^2 C. 18.5 units^2 D. 24 units^2 E. 20.5 units^2

50. What is the equation of the line that passes through the origin and the intersection point of the lines $4x - y = 18$ and $-x - 2y = -9$?
A. $y = \frac{2}{3}x$ B. $y = -\frac{1}{3}x$ C. $y = \frac{2}{5}x$ D. $y = \frac{3}{7}x$ E. $y = \frac{2}{9}x$

2020 – 2021 TMSCA Middle School Mathematics Gear-Up Test Answer Key

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

2020 – 2021 TMSCA Middle School Mathematics Gear-Up Test Selected Answers

7. In the Roman numeral, CDXCIX, we know that CD = 500 – 100 = 400, XC = 100 – 10 = 90, and IX = 10 – 1 = 9. Therefore, CDXCIX = 499.

10. We are asked to find mow many numbers there are in the list 8, 9, 10, …, 29, 30, and 31. We notice that each number in the list is one greater than the previous number. So, if we subtract 7 from every number in the list, we get the new list of 1, 2, 3, …, 22, 23, and 24. Thus, there are 24 numbers total in the original list.

15. The probability of drawing a 6 on the first draw is $\frac{4}{52} = \frac{1}{13}$. If we do not replace the first cad, the probability of drawing an 8 on the second draw is $\frac{4}{51}$. Therefore, the probability of drawing a 6 and then an 8, without replacement is $\frac{1}{13} \cdot \frac{4}{51} = \frac{4}{663}$.

17. Three diagonals can be drawn from one vertex of a regular hexagon. As seen in the picture,

4 triangles are created after drawing all the possible diagonals from one vertex of a regular hexagon.

18. Since 1 pound = 16 ounces, two and one-half pounds = 16(2.5) = 40 ounces. If the candies cost \$1.12 per ounce, the total will be 40(1.12) = \$44.80.

26. To solve $\frac{1}{m} + \frac{1}{m} + \frac{1}{m} = 24$, first eliminate the variables in the denominators by multiplying the entire equation by *m*, which gives us $m\left(\frac{1}{m} + \frac{1}{m} + \frac{1}{m} = 24\right) = 1 + 1 + 1 = 24m$. So, after simplifying, we solve the equation 3 = 24*m* by dividing both sides of the equation by 3 to get a solution of $m = \frac{3}{24} = \frac{1}{8}$.

29. If $m\Delta n = \left(\frac{5+m}{2+n}\right)^2$, then the value of $67\Delta 2 = \left(\frac{5+67}{2+2}\right)^2 = \left(\frac{72}{4}\right)^2 = 18^2 = 324$.

33. If one cyclist travels north at 22 mi/h, then after 4 hours, that cyclists travels a distance of 4(22) = 88 miles. If the second travels south at 27 mi/h, then after 4 hours, that cyclists travels a distance of 4(27) = 108 miles. So, after 4 hours of traveling in opposite directions, they will be 108 + 88 = 196 miles apart.

36. To solve the inequality $\frac{3-x}{5} > 8$, first multiply by 5 to both sides of the inequality symbol. This gives us $3 - x > 40$. Subtract 3 from both sides and we get $-x > 37$. Now, divide by -1 to both sides and knowing that when you multiply or divide by a negative number, you flip the inequality symbol. Therefore, the solution is $x < -37$.

40. $\sqrt{24}\left(\sqrt{48}\right) = 2\sqrt{6}\left(4\sqrt{3}\right) = 8\sqrt{18} = 8 \cdot 3\sqrt{2} = 24\sqrt{2}$.

43. An exponential function is in the form $y = a \cdot b^x$. In an exponential growth function, $b = 1 + r$, where *r* is the rate. So, an exponential growth function is in the form $y = a \cdot (1 + r)^x$. We are given the exponential growth function $y = 3.8(2.4)^x$, so to find the rate, create the equation 2.4 = 1 + *r*. Subtracting 1 from each side of the equation gives us 1.4 = *r*. This is the decimal representation of the rate, so 1.4 = 140%.