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 3 ©

M A R C H 1 3, 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 #13

1. $65{,}810 + 76{,}827$ = _____ (nearest thousand)
A. 144,000 B. 143,000 C. 142,000 D. 140,000 E. 141,000

2. $-91.8 - 76.44$ = _____ (nearest tenth)
A. -172.2 B. -166.4 C. -176.2 D. -166.2 E. -168.2

3. 995×995 = _____
A. 990,125 B. 991,025 C. 990,225 D. 990,025 E. 991,225

4. $100{,}768 \div (-16)$ = _____
A. 6,498 B. $-6{,}498$ C. $-6{,}298$ D. 6,478 E. $-6{,}248$

5. Evaluate $\frac{5}{4}a + \frac{3}{2}b - \frac{2}{5}c$ for $a = -6, b = -7$ and $c = 15$.
A. -3 B. -24 C. 12 D. -9 E. -18

6. Express the ratio $\frac{7}{20}$ to 7 as a common ratio.
A. $\frac{1}{10}$ B. $\frac{1}{20}$ C. $\frac{1}{5}$ D. $\frac{1}{7}$ E. $\frac{1}{4}$

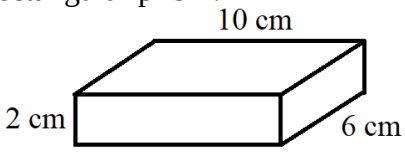
7. What is the smallest positive integer that can be added to 7,364,116 to make a multiple of 3?
A. 2 B. 4 C. 1 D. 5 E. 7

8. 408 minutes = _____ hours
A. 5⅞ B. 6¾ C. 6⅘ D. 6⅔ E. 6⅓

9. CCXXXVII + CDLXIX + DCCV = _____ (Arabic number)
A. 1,267 B. 1,317 C. 1,521 D. 1,371 E. 1,411

10. What is ½% of 260?
A. 2.6 B. 0.52 C. 0.052 D. 1.3 E. 5.2

11. What is the total surface area of the rectangular prism?



A. 64 cm^2 B. 124 cm^2 C. 184 cm^2 D. 120 cm^2 E. 224 cm^2

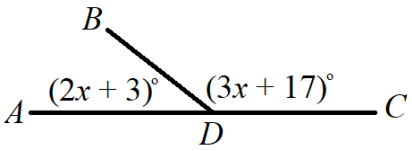
12. What is the positive difference of 7^2 and 19^2?
A. 312 B. 354 C. 347 D. 332 E. 318

13. The value of 15 quarters and 17 nickels is the same as _____ dimes and 250 pennies.
A. 24 B. 17 C. 16 D. 19 E. 21

14. How many positive integers are less than 12π?
A. 38 B. 36 C. 37 D. 15 E. 18

15. What is the unit rate of spending \$525.36 for 8 items?
A. \$64.47 B. \$65.27 C. \$64.87 D. \$66.17 E. \$65.67

16. What is the complement to $\angle BDA$?



A. 47° B. 62° C. 23° D. 7° E. 39°

17. What is the positive difference of the GCF of the numbers 56 and 140 and the LCM of the numbers 320 and 64?
A. 292 B. 256 C. 196 D. 348 E. 248

18. In how many ways can a student randomly guess a complete set of answers to a four-question multiple choice quiz if there are four answer choices per question?
A. 64 B. 16 C. 128 D. 512 E. 256

19. The table below models which of the following functions?

x	-16	-7	2	23
$f(x)$	-14	-6.5	1	18.5

A. $y = \frac{5}{6}x + \frac{1}{4}$ B. $y = \frac{2}{3}x - \frac{1}{3}$ C. $y = \frac{3}{4}x + \frac{4}{5}$ D. $y = \frac{5}{6}x - \frac{2}{3}$ E. $y = \frac{4}{3}x - \frac{2}{5}$

20. A six-sided die is rolled five times. What is the probability the that the die will show an odd number exactly three times?
A. $\frac{9}{32}$ B. $\frac{5}{16}$ C. $\frac{5}{8}$ D. $\frac{3}{8}$ E. $\frac{15}{32}$

21. 179 is the _____ term of the arithmetic sequence 999, 917, 835, 753, ….
A. 12^{th} B. 11^{th} C. 13^{th} D. 15^{th} E. 14^{th}

22. If $a \clubsuit b = -a^3 + \frac{b^2}{2}$, then what is the value of $(-3 \clubsuit 8)$?
A. 63 B. 59 C. 67 D. 61 E. 65

23. If two prime numbers have a product of 323, what is the sum of these two prime numbers?
A. 36 B. 30 C. 32 D. 42 E. 28

24. 12^3 = _____
A. 1,254 B. 1,258 C. 1,648 D. 1,748 E. 1,728

25. ΔXYZ has vertices $X(18, 6)$, $Y(4, -9)$, and $Z(-3, 8)$. If ΔXYZ is dilated by a scale factor of ⅘, what are the coordinates of point Y?
A. $(3.2, -7.2)$ B. $(4.8, -9.8)$ C. $(4.8, -8.2)$ D. $(7.2, -16.2)$ E. $(4, -11.25)$

26. 217_9 = _____ (base 3)
A. 21121 B. 21123 C. 21113 D. 20121 E. 20211

27. $\frac{1+3+5+\cdots+31+33+35}{37+39+41+\cdots+67+69+71}$ = _____

A. 5/6 B. 2/3 C. 5/6 D. 2/5 E. 1/3

28. Forty percent of 60% of 300 is equal to what percent of 45% of 200?
A. 120 B. 60 C. 75 D. 80 E. 40

29. $\overrightarrow{MN}$ bisects $\angle LMP$, $m\angle LMN = (7x - 30)^\circ$, and $m\angle PMN = (3x + 18)^\circ$. Find $m\angle LMP$.
A. 96° B. 108° C. 84° D. 92° E. 106°

30. On a number line, the distance from point *A* to point *B* is 67 units. Point *A* has the coordinate of 6. What is the sum of all possible values of point *B*?
A. 16 B. 12 C. 28 D. 26 E. 24

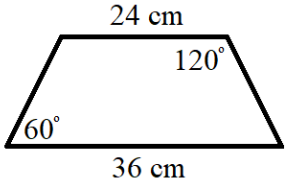
31. Anhita is planting a rectangular vegetable garden measuring 4×10^3 feet by 6×10^5 feet. Anhita is also planting a flower bed measuring 2×10^4 feet by 8×10^4 feet. How much larger is Anhita's vegetable garden than her flower bed? Answer in scientific notation.
A. 8×10^8 ft^2 larger B. 1.4×10^{10} ft^2 larger C. 6×10^8 ft^2 larger D. 4×10^{10} ft^2 larger E. 2×10^8 ft^2 larger

32. A pool float is marked down $8.64. If this is an 18% decrease, what is the sale price of the pool float?
A. $39.36 B. $39.76 C. $40.16 D. $40.26 E. $40.46

33. Line *A* passes through the points (22, 24) and (28, 18). Line *B* passes through the points (15, 17) and (*x*, 7). If lines *A* and *B* are parallel, what is the value of *x*?
A. -17 B. -19 C. 33 D. 21 E. 25

34. 10^3 = 1,000. Not including 1,000, how many other 4-digit numbers are also perfect cubes?
A. 14 B. 13 C. 12 D. 11 E. 10

35. What is the perimeter of the isosceles trapezoid?



A. $60 + 12\sqrt{3}$ cm B. $60 + 24\sqrt{3}$ cm C. 120 cm D. 72 cm E. 84 cm

36. Solve for *a*: $\frac{3}{2}(2a - b) = 9(a - b)$
A $a = \frac{3}{4}b$ B. $a = \frac{5}{4}b$ C. $a = \frac{5}{2}b$ D. $a = \frac{7}{4}b$ E. $a = \frac{2}{3}b$

37. $0.04\overline{6}$ = _____ (fraction)
A. $\frac{23}{500}$ B. $\frac{23}{50}$ C. $\frac{7}{150}$ D. $\frac{23}{495}$ E. $\frac{23}{450}$

38. Four consecutive integers sum to 498. What is the median of these four integers?
A. 132.5 B. 126.5 C. 124.5 D. 130.5 E. 128.5

39. If $x - \frac{1}{x} = 8$, then what is the value of $x^2 + \frac{1}{x^2}$?

A. 68 B. 62 C. 64 D. 65 E. 66

40. What is the product of the roots of the quadratic equation $22x - 16 = 16 - 4x^2$?

A. 0 B. -8 C. -4 D. $-\frac{11}{2}$ E. $\frac{2}{11}$

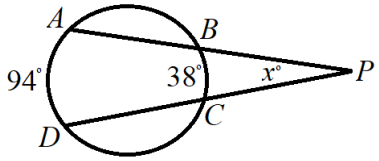
41. $310_9 \div 3_9$ = _____ (base 10)

A. 101 B. 103 C. 76 D. 84 E. 74

42. The roots of the equation $3x^2 - 45x = -150$ are the lengths of the legs of a right triangle. What is the hypotenuse of the right triangle?

A. $5\sqrt{5}$ B. $5\sqrt{3}$ C. $10\sqrt{2}$ D. $10\sqrt{5}$ E. $10\sqrt{3}$

43. What is the value of *x* in the circle, if minor arc $AD = 94^\circ$ and minor arc $BC = 38^\circ$?



A. 56 B. 17 C. 47 D. 48 E. 28

44. Simplify by rationalizing the denominator: $\frac{6+\sqrt{2}}{3-\sqrt{2}}$

A. $18 - 6\sqrt{2}$ B. $6 - 2\sqrt{2}$ C. $\frac{3\sqrt{2}+20}{7}$ D. $\frac{18\sqrt{2}+20}{7}$ E. $\frac{9\sqrt{2}+20}{7}$

45. Which of the following is equivalent to $\log_8 42$?

A. $\log_8 50 - \log_8 8$ B. $\log_8 6(\log_8 7)$ C. $\log_8 14 + \log_8 3$ D. $\log_8 40 + \log_8 2$ E. $\log_8 21^2$

46. What is the equation of the perpendicular bisector of $\overline{AB}$ with endpoints $A(3, 6)$ and $B(7, -2)$?

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

47. Which of the following is the solution to the inequality $|2x - 7| < 15$?

A. $x < -4$ or $x > 11$ B. $x < 2$ or $x > 22$ C. $-4 < x < 22$ D. $-4 < x < 11$ E. $2 < x < 22$

48. $\frac{8x^3+28x^2+12x}{6x} \cdot \frac{3x}{4x^2+2x}$ = _____

A. $\frac{x+3}{2}$ B. $\frac{2}{x+1}$ C. $x + 3$ D. $x + 1$ E. $\frac{x+3}{x+1}$

49. The hypotenuse of a 30-60-90 right triangle is $36\sqrt{3}$ inches. What is the area of the triangle?

A. $324\sqrt{3}$ in^2 B. $486\sqrt{3}$ in^2 C. $288\sqrt{3}$ in^2 D. $512\sqrt{3}$ in^2 E. $556\sqrt{3}$ in^2

50. At a local zoo, there are zebras and flamingos. If there are a total of 116 feet and 38 heads, how many more zebras are there than flamingos?

A. 12 B. 6 C. 7 D. 11 E. 2

2020 – 2021 TMSCA Middle School Mathematics Test #13 Answer Key

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

2020 – 2021 TMSCA Middle School Mathematics Test #13 Selected Answers

10. ½% of 260 = 0.005(260) = 1.3

14. $12\pi \approx 37.69$ .... This means there are 37 positive integers less than 12π.

18. There are $4 \cdot 4 \cdot 4 \cdot 4 = 256$ different ways of answering the multiple-choice quiz.

25. ΔXYZ has vertices $X(18, 6)$, $Y(4, -9)$, and $Z(-3, 8)$. If ΔXYZ is dilated by a scale factor of ⅘, then the coordinates of point Y are $\left(\frac{4}{5}(4), \frac{4}{5}(-9)\right) = \left(\frac{16}{5}, \frac{-36}{5}\right) = (3.2, -7.2)$.

29. If $\overrightarrow{MN}$ bisects $\angle LMP$, then $m\angle LMN = m\angle PMN$. Therefore, $7x - 30 = 3x + 18$. Subtracting $3x$ from both sides gives us $4x - 30 = 18$. Adding 30 to both sides gives us $4x = 48$, which means $x = 12$. Substituting 12 for x in $m\angle LMN = (7x - 30)^\circ$, gives us $7(12) - 30 = 84 - 30 = 54$. Therefore, $m\angle LMP = 2(54) = 108^\circ$.

30. On a number line, the distance from point A to point B is 67 units. Point A has the coordinate of 6. The possible values of B are then $6 + 67 = 73$ and $6 - 67 = -61$. The sum of these values is $73 + (-61) = 12$.

34. We know that $10^3 = 1{,}000$. We can narrow our search by finding 20^3, which equals 8,000. We can continue and see that, $21^3 = 9{,}261$ and $22^3 = 10{,}648$. So, we see that we will have 11^3, 12^3, 13^3, 14^3, 15^3, 16^3, 17^3, 18^3, 19^3, 20^3, and 21^3 all equal to a 4-digit number. So, there are 11 numbers other than 1,000 that are 4-digit perfect cubes.

38. Four consecutive integers can be represented by $x, x + 1, x + 2, x + 3$. We use this to make the equation $x + x + 1 + x + 2 + x + 3 = 4x + 6 = 498$. Subtract 6 and then divide by 4 to the equation and we get $x = 123$. So, the four consecutive integers are 123, 124, 125, and 126. The median of the integers is then $\frac{124+125}{2} = 124.5$.

39. Given $x - \frac{1}{x} = 8$, we must square both sides. $\left(x - \frac{1}{x}\right)^2 = 8^2$, which becomes $x^2 - \frac{x}{x} - \frac{x}{x} + \frac{1}{x^2} = x^2 - 2 + \frac{1}{x^2} = 64$. Adding 2 to both sides gives us $x^2 + \frac{1}{x^2} = 66$.

40. The standard form of a quadratic equation is $0 = Ax^2 + Bx + C$. To find the product of the roots, use $\frac{C}{A}$. We are given the equation $22x - 16 = 16 - 4x^2$, which will be $4x^2 + 22x - 32 = 0$ in standard form. Therefore, the product of the roots is then $\frac{-32}{4} = -8$.

47. To solve $|2x - 7| < 15$, we must create two inequalities, $2x - 7 < 15$ and $2x - 7 > -15$. To solve each, add 7 to both sides and then divide by 2. This will give us $x < 11$ and $x > -4$. The two inequality statements can be combined to form the compound inequality $-4 < x < 11$.

48. $\frac{8x^3+28x^2+12x}{6x} \cdot \frac{3x}{4x^2+2x} = \frac{4x(2x+1)(x+3)}{6x} \cdot \frac{3x}{2x(2x+1)} = \frac{\cancel{12x^2}(\cancel{2x+1})(x+3)}{\cancel{12x^2}(\cancel{2x+1})} = x + 3.$