



**TMSCA MIDDLE SCHOOL
MATHEMATICS
TEST #13 ©
FEBRUARY 29, 2020**

GENERAL DIRECTIONS

- About this test:
 - You will be given 40 minutes to take this test.
 - There are 50 problems on this test.
- 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.
- If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
- You may write anywhere on the test itself. You must write only answers on the answer sheet.
- You may use additional scratch paper provided by the contest director.
- All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
- Calculators **MAY NOT** be used on this test.
- 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.
- In case of ties, percent accuracy will be used as a tie breaker.

1. $14\frac{1}{8} + 17.25 + 19\frac{10}{16} =$ _____

- A. $48\frac{1}{4}$ B. $49\frac{3}{8}$ C. $50\frac{3}{4}$ D. 51 E. 52

2. $100\frac{5}{7} - 22\frac{1}{2} =$ _____ (nearest tenth)

- A. 78.1 B. 78.2 C. 77.9 D. 79.2 E. 78.4

3. $\frac{24}{120} \div \frac{16}{14} =$ _____

- A. $\frac{23}{80}$ B. $\frac{7}{40}$ C. $\frac{11}{28}$ D. $\frac{3}{16}$ E. $\frac{17}{32}$

4. $15 \div 1.6 =$ _____ (nearest tenth)

- A. 9.4 B. 9.3 C. 9.2 D. 9.1 E. 9.6

5. $1 + 2 + \dots + 7 + 8 + 8 + 7 + \dots + 2 + 1 =$ _____

- A. 72 B. 64 C. 80 D. 76 E. 78

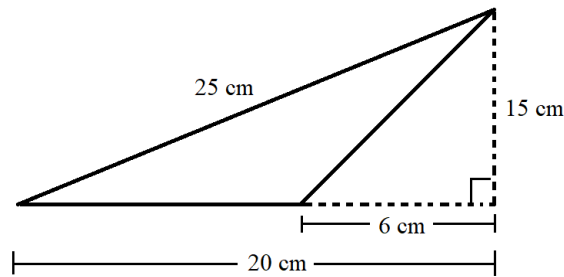
6. What is the measure of the supplement to the complement of an angle measuring 77° ?

- A. 167° B. 177° C. 13° D. 77° E. 73°

7. How many proper subsets does the set $\{11, 13, 15, 17, 19, 21\}$ have?

- A. 64 B. 128 C. 63 D. 1 E. 127

8. What is the area of the triangle below?



- A. 150 cm^2 B. 75 cm^2 C. 187.5 cm^2 D. 105 cm^2 E. 112 cm^2

9. If the number 200 is decreased by 70% and then that result is increased by 80%, what is the final value?

- A. 108 B. 124 C. 112 D. 136 E. 116

10. Noah bought a new fishing pole for \$26.94, some fishing tackle for \$32.17 and a new life jacket for \$37.69. If Noah paid with a \$100 bill, how much change did he receive?

- A. \$2.80 B. \$2.60 C. \$3.80 D. \$3.60 E. \$3.20

11. Mary is 4.5 feet tall and casts an 8 feet shadow. How tall is a tree next to Mary that casts a 72 feet shadow?

- A. 34.5 feet B. 44.5 feet C. 40.5 feet D. 38.5 feet E. 46.5 feet

12. Which of the following does not equal 400?

- A. $2^4 \cdot 5^2$ B. $2 \cdot 25 \cdot 8$ C. $2^3 \cdot 5 \cdot 2^1 \cdot 5^1$ D. $16 \cdot 25$ E. $2 \cdot 5 \cdot 2 \cdot 5^2$

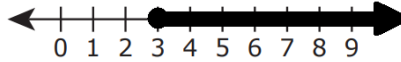
13. Aidan scored a 72, 90, and 76 on his exams. What must Aidan score on his next exam to have an average of 83?

- A. 91 B. 93 C. 95 D. 94 E. 92

14. Simplify: $\frac{3}{4}(24 - 36) - \frac{5}{2}(18 - 30) + \frac{1}{2}(-8 - 2)$
 A. 24 B. 16 C. 18 D. -4 E. -14

15. If Jackson can blink twice in one second, how many times can Jackson blink in three minutes?
 A. 360 B. 120 C. 240 D. 320 E. 280

16. Which inequality represents the graph below?



A. $n > 3$ B. $n < 3$ C. $n = 3$ D. $n \leq 3$ E. $n \geq 3$

17. What is the area of a rhombus with diagonals measuring 14 units and 30 units?
 A. 224 units² B. 420 units² C. 105 units² D. 176 units² E. 210 units²

18. What is the sum of the mean, median and mode of the set of numbers 64, 72, 84, 72 and 3?
 A. 228 B. 209 C. 203 D. 217 E. 212

19. In Coach William’s class of 40, 16 students do not wear contacts. What percentage of the students do wear contacts?
 A. 40% B. 55% C. 80% D. 45% E. 60%

20. What is the unit’s digit of 12⁴?
 A. 2 B. 4 C. 6 D. 8 E. 0

21. 14.5 tons = _____ pounds (scientific notation)
 A. 2.9×10^4 B. 7.25×10^4 C. 2.9×10^5 D. 7.25×10^5 E. 2.9×10^6

22. If $3k + 1 = 22$, what is the value of $\frac{4k}{5}$?
 A. 2.6 B. 2.8 C. 5.6 D. 5.2 E. 6.4

23. $MMXXVIII \div LXXVIII =$ _____ (Arabic number)
 A. 8 B. 32 C. 54 D. 14 E. 26

24. 94 is what term in the sequence $-6, -1, 4, 9, \dots$?
 A. 20th B. 21st C. 22nd D. 23rd E. 25th

25. The angles of a triangle are in the ratio 1:2:6. What is the measure of the largest angle?
 A. 60° B. 90° C. 100° D. 120° E. 150°

26. Which figure below has 11 faces, 18 vertices and 27 edges?
 A. octagonal prism B. nonagonal prism C. hexagonal pyramid D. decagonal pyramid E. decagonal prism

27. Ankik was jogging at a rate of 6.6 feet/second. How fast was Ankik jogging in miles/hour?
 A. 5.2 mi/hr B. 4.5 mi/hr C. 4.7 mi/hr D. 5.1 mi/hr E. 4.9 mi/hr

28. Every letter of the word *ALGEBRA* is placed inside a bag. What is the probability someone reaches inside the bag and draws out a vowel on the first draw and then, without replacement, draws another vowel on the second draw, and then without replacement again, draws a consonant on the third draw?

A. $\frac{12}{35}$ B. $\frac{7}{15}$ C. $\frac{4}{35}$ D. $\frac{2}{18}$ E. $\frac{1}{5}$

29. Line A has a slope of -5 and passes through the points $(x, 7)$ and $(-16, -8)$. What is the value of x ?
 A. 19 B. -9 C. 17 D. -13 E. -19

30. $32_8 \times 22_8 = \underline{\hspace{2cm}}_8$
 A. 634 B. 724 C. 762 D. 746 E. 672

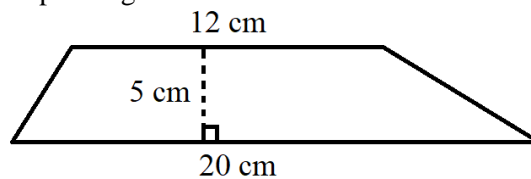
31. A painting is currently worth \$4,000 and is increasing in value at a rate of 20% each year. How much will the painting be worth after two years?
 A. \$5,760.00 B. \$5,720.00 C. \$5,784.00 D. \$5,728.00 E. \$5,720.00

32. Let A equal the value of squaring 11,111,111. Of the digits 0 – 9, inclusive, what digit is used only once in A?
 A. 1 B. 9 C. 7 D. 8 E. 6

33. Which of the following is the linear equation $y = -\frac{7}{8}x - 12$ changed to standard form?
 A. $7x + 8y = 96$ B. $7x - 8y = -96$ C. $7x + 8y = -96$ D. $7x - 8y = 96$ E. $7x - 8y = 20$

34. What is the number of different ways possible to arrange the letters of the word BANANA?
 A. 120 B. 60 C. 30 D. 720 E. 180

35. Rachel has a toy statue with a hexagonal base. One-half of the base is shown below. Rachel is painting the base red. What is the total area that Rachel will be painting red?



A. 80 cm^2 B. 74 cm^2 C. 148 cm^2 D. 154 cm^2 E. 160 cm^2

36. What is the 51st term of the sequence $-34, -27, -20, -13, \dots$?
 A. 316 B. 384 C. 323 D. 330 E. 309

37. If a fair coin is flipped four times, what are the odds of getting at least two heads?
 A. 3:5 B. 5:3 C. 5:16 D. 11:5 E. 11:16

38. What is the sum of the roots of the quadratic equation $20 - 3x^2 = -9x$?
 A. $-\frac{9}{20}$ B. 3 C. $\frac{1}{3}$ D. $-\frac{1}{3}$ E. $-\frac{20}{3}$

39. If $f(x) = 7 - x$, $g(x) = x - x^2$ and $h(x) = \frac{1}{x-2}$, what is the value of $g(f(h(3)))$?
 A. -8 B. -14 C. -6 D. -1 E. $-\frac{3}{8}$

40. $\frac{ac}{b} \cdot \left(\left(\frac{ac^{-2}ab^{-1}}{a^{-1}bc^2} \right)^2 \right)^2 = \underline{\hspace{2cm}}$
 A. $\frac{a^{12}}{b^8c^{16}}$ B. $\frac{a^7}{b^5c^8}$ C. $\frac{a^8}{b^6c^9}$ D. $\frac{a^{13}}{b^9c^{15}}$ E. $\frac{a^{13}}{b^5c^{15}}$

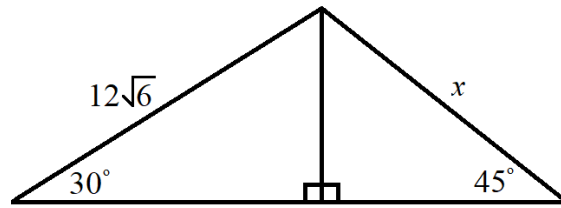
41. Which exponential growth function below has a growth rate of 450%?
 A. $y = 6 \cdot 5.5^x$ B. $y = 4.5 \cdot 5^x$ C. $y = 10 \cdot 3.5^x$ D. $y = 12 \cdot 45^x$ E. $y = 0.5 \cdot 450^x$

42. If $(x^2 + 3x - 1)(x^2 + 2x + 2) = Ax^4 + Bx^3 + Cx^2 + Dx + E$, what is the value of $ABC + CDE$?
 A. 27 B. -21 C. 91 D. -50 E. -7

43. In right $\triangle ABC$, $m\angle B = 90^\circ$, $AB = 7$, $AC = 25$, and $BC = 24$. What is the value of the trig ratio, $\sin\angle C$?
 A. $\frac{24}{25}$ B. $\frac{25}{24}$ C. $\frac{25}{7}$ D. $\frac{24}{7}$ E. $\frac{7}{25}$

44. $\left(4 - \frac{1}{1-\frac{1}{4}}\right) - \left(2 + \frac{1}{1+\frac{1}{2}}\right) =$ _____
 A. -1 B. 1 C. 2 D. 0 E. 2.5

45. What is the value of x in the picture below?



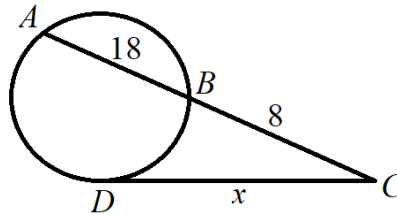
A. $12\sqrt{14}$ B. $14\sqrt{3}$ C. $12\sqrt{3}$ D. $12\sqrt{2}$ E. $14\sqrt{2}$

46. Four consecutive even integers have a sum of 764. What is the mean of the smallest and largest of the integers?
 A. 191 B. 192 C. 193 D. 190.5 E. 192.5

47. Which system below does not have the same solution as the system $\begin{cases} x + y = 10 \\ x - y = -16 \end{cases}$?
 A. $\begin{cases} 2x + y = 7 \\ x - y = -16 \end{cases}$ B. $\begin{cases} -3x + y = 22 \\ -x - y = -10 \end{cases}$ C. $\begin{cases} 2x + 2y = 20 \\ x - 8y = -107 \end{cases}$ D. $\begin{cases} x - 4y = 55 \\ -2x + y = 19 \end{cases}$ E. $\begin{cases} 5x + y = -2 \\ x - 3y = -42 \end{cases}$

48. $\frac{6}{2+\sqrt{3}}$ is equivalent to which of the following?
 A. $\frac{3}{1-\sqrt{3}}$ B. $-12 - 6\sqrt{3}$ C. $12 - 6\sqrt{3}$ D. $2 - \sqrt{3}$ E. $-2 - \sqrt{3}$

49. Given the circle, \overline{AC} is a secant intersecting tangent \overline{DC} . If $AB = 18$ and $BC = 8$, what is the measure of DC ?



A. 24 units B. 12 units C. $4\sqrt{13}$ units D. $10\sqrt{2}$ units E. $6\sqrt{3}$ units

50. A toy rocket is launched from a platform above the ground. The rocket will fall to the ground after exploding at its maximum height reached. The rocket's height above the ground is given by the quadratic function $h(x) = -16x^2 + 64x + 80$. How long will it take for the rocket to hit the ground?
 A. 4 seconds B. 5 seconds C. 4.5 seconds D. 5.5 seconds E. 6 seconds

2019 – 2020 TMSCA Middle School Mathematics Test #13 Answer Key

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

10. $\$100 - \$26.94 - \$32.17 - \$37.69 = \$3.20$.

16. A closed dot is represented by either \leq or \geq . Since the shading of the graph is to the right of 3, this represents greater than. Therefore, the inequality that matches the graph is $n \geq 3$.

17. The formula to find the area of a rhombus, given its two diagonals, is $A = \frac{d_1 \cdot d_2}{2}$. We are given a rhombus with diagonals of 14 units and 30 units. The area of the rhombus is then $\frac{14 \cdot 30}{2} = \frac{420}{2} = 210$ units².

21. Since 1 ton = 2,000 pounds, 14.5 tons = $14.5 \times 2000 = 29,000 = 2.9 \times 10^4$ pounds.

28. There are 7 letters in the word *ALGEBRA*, 3 vowels and 4 consonants. The probability of drawing a vowel on the first draw is $\frac{3}{7}$. Without replacement, the probability of drawing a second vowel on the second draw is $\frac{2}{6}$. Without replacement again, the probability of drawing a consonant on the third draw is $\frac{4}{5}$. Therefore, the probability of drawing a vowel on the first draw, a vowel on the second draw, a consonant on the third draw, without replacement each time is equal to $\frac{3}{7} \cdot \frac{2}{6} \cdot \frac{4}{5} = \frac{3}{7} \cdot \frac{1}{3} \cdot \frac{4}{5} = \frac{12}{105} = \frac{4}{35}$.

32. $11,111,111^2 = 123,456,787,654,321$. The digit 8 is used only once. Every other digit is used twice.

33. To change the linear equation $y = -\frac{7}{8}x - 12$ into standard form, $Ax + By = C$, first multiply the entire equation by 8 to get $8\left(y = -\frac{7}{8}x - 12\right)$, $8y = -7x - 96$. Now, add $7x$ to both sides and get $7x + 8y = -96$.

37. There are 16 outcomes if a coin is flipped four time. They are HHHH, HTHH, THHH, HTHT, HHHT, HHTH, TTHH, THTH, HHTT, HHTH, TTTH, THHT, HTTT, TTTT, TTHT, and THTT. There are 6 outcomes of getting 2 heads, 4 outcomes of getting heads three times and 1 outcome of getting all heads. The probability of flipping a coin and getting at least 2 heads is $\frac{11}{16}$, so odds are 11:5.

38. In the equation $20 - 3x^2 = -9x$, first add $9x$ to both sides and get $20 - 3x^2 + 9x = 0$. Now, rewrite the equation in standard form, $Ax^2 + Bx + C = 0$, as $-3x^2 + 9x + 20 = 0$. We see that $A = -3$, $B = 9$, and $C = 20$. To find the sum of the roots of a quadratic equation, use $\frac{-B}{A}$. After substituting, we get the sum of the roots of the equation to be $\frac{-9}{-3} = 3$.

42. $(x^2 + 3x - 1)(x^2 + 2x + 2) = x^2(x^2) + 2x(x^2) + 2(x^2) + 3x(x^2) + 3x(2x) + 3x(2) - 1(x^2) - 1(2x) - 1(2) = x^4 + 2x^3 + 2x^2 + 3x^3 + 6x^2 + 6x - x^2 - 2x - 2 = x^4 + 5x^3 + 7x^2 + 4x - 2$. If $(x^2 + 3x - 1)(x^2 + 2x + 2) = Ax^4 + Bx^3 + Cx^2 + Dx + E$, then $A = 1$, $B = 5$, $C = 7$, $D = 4$, and $E = -2$. Therefore, $ABC + CDE$ is equal to $(1)(5)(7) + (7)(4)(-2) = 35 + (-56) = 35 - 56 = -21$.

50. We are looking for the positive root of the quadratic function. The trinomial $-16x^2 + 64x + 80$ can be factored to $-16(x + 1)(x - 5)$. Setting each factor equal to 0 and we get $x + 1 = 0$ and $x - 5 = 0$. Solving each equation gives $x = -1$ and 5. The rocket cannot hit the ground in negative time, so it will take 5 seconds for the bottle-rocket to hit the ground.