



**TMSCA MIDDLE SCHOOL
MATHEMATICS
REGIONAL TEST ©
MARCH 3, 2018**

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.

2017 – 2018 TMSCA Middle School Mathematics Regional Test

1. $36\frac{5}{8} + 4\frac{1}{2} + \frac{17}{2} =$ _____

- A. $50\frac{5}{8}$ B. $49\frac{3}{4}$ C. $50\frac{3}{8}$ D. $49\frac{5}{8}$ E. $49\frac{1}{4}$

2. $-54\frac{4}{5} + 17\frac{2}{3} =$ _____

- A. $-71\frac{2}{15}$ B. $-37\frac{1}{15}$ C. $-71\frac{8}{15}$ D. $-37\frac{8}{15}$ E. $-37\frac{2}{15}$

3. $546.664 \div 0.4 =$ _____ (nearest ten)

- A. 1,367 B. 1,400 C. 1,370 D. 1,360 E. 1,280

4. $3\frac{2}{3} \times \frac{7}{9} \times \frac{3}{11} =$ _____

- A. 0.78 B. 0.8 C. $0.7\bar{8}$ D. $0.\overline{78}$ E. $0.\bar{7}$

5. Shiela had \$500. She gave 30% to her friend Alice, who gave 12% of her money to her sister Frances. How much money does Frances receive?

- A. \$60 B. \$18 C. \$15 D. \$6 E. \$12

6. Yula has 2.5 meters of yarn and wants to know how many bracelets she can make if each bracelet requires 14 centimeters of yarn. How many bracelets can Yula make that are each 14 centimeters long?

- A. 16 B. 17 C. 18 D. 19 E. 20

7. Jaycee is 57 inches tall. If Martin is 9 inches taller than Jaycee, how tall is Martin?

- A. 5 feet 2 inches B. 5 feet 5 inches C. 5 feet 6 inches D. 5 feet 8 inches E. 6 feet 2 inches

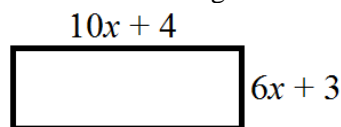
8. $12,345 \cdot 9 + 6 =$ _____

- A. 111,111 B. 111,191 C. 111,991 D. 11,011 E. 11,001

9. Which of the following relations is not a function?

- A. $\{(1, 1), (3, 1), (7, 1)\}$ B. $\{(3, 0), (5, 2), (3, 7)\}$ C. $\{(1, 2), (3, 4), (5, 6)\}$ D. $\{(9, 1), (8, 9), (4, 4)\}$ E. $\{(3, 4), (5, 4), (8, 4)\}$

10. A triangle has an area equal to one-half the area of the rectangle below. If $x = 7$, what is the area of the triangle?



- A. 1,655 units² B. 1,665 units² C. 1,675 units² D. 1,725 units² E. 1,685 units²

11. If $4.8 \times 2.15 = AB$, CD , then what is the value of $(C + D) \div A + B$?

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

12. There are 216 cookies in a dozen packages. If each package of cookies contains the same number of cookies, how many cookies are there in 31 packages of cookies?

- A. 492 B. 498 C. 558 D. 586 E. 576

13. Simplify: $4^{(8-6)} + 3^{(14-11)} - 5^{(1+1+1)} + 6^{(-8+8)}$

- A. 169 B. -81 C. -65 D. -63 E. -18

14. A number is randomly chosen from 1 to 25, inclusive. What is the probability the number chosen will be prime?

- A. 16% B. 32% C. 36% D. 24% E. 40%

15. What is the positive difference of the mean and median of the set of numbers 32, 41, 37, 52, 38 and 40?
 A. 0 B. 5 C. 3 D. 6 E. 1
16. What is the sum of the supplement and complement of an angle measuring 19.4° ?
 A. 231.2° B. 289.2° C. 227.2° D. 245.2° E. 275.2°
17. How many positive integral divisors does the number 8,000 have?
 A. 44 B. 48 C. 32 D. 18 E. 28
18. The length of a rectangle is 3×10^{-4} cm long and its width is 7×10^{-3} cm wide. What is the area of the rectangle?
 A. 2.1×10^{-6} cm² B. 2.1×10^{-7} cm² C. 2.1×10^{-8} cm² D. 2.1×10^{-12} cm² E. 2.1×10^{-1} cm²
19. What is the next term of the sequence? 2, 2, 3, 7, 12, 22, 41, 75, ...
 A. 127 B. 129 C. 132 D. 134 E. 138
20. What is an equation of the line that passes through the point $(-14, -63)$ and has a slope of 4?
 A. $y = 4x + 5$ B. $y = 4x - 7$ C. $y = \frac{1}{4}x + 14$ D. $y = 4x - 13$ E. $y = \frac{1}{4}x - 12$
21. How many elements are in A, if $A = (\{20, 18, 16, 14\} \cup \{10, 12, 14, 16\}) \cup \{3, 6, 9, 12, 15\}$?
 A. 12 B. 13 C. 0 D. 10 E. 2
22. At batting practice, Leonard hit a baseball that traveled 439.4 feet in 5.2 seconds. What was the average speed of the ball, in feet per second?
 A. 83.5 B. 86.5 C. 84.5 D. 81.5 E. 88.5
23. Which inequality has the solution set as the graph below?

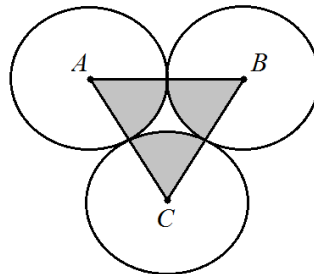
 A. $3x - 6 < 12$ B. $x + 6 \leq 10$ C. $2x - 5 < 3$ D. $-5x + 5 > 15$ E. $-2x < -8$
24. What is the degree of the polynomial $14x^5 + 4x^4 + 3x^3 + 2x^2 - 6 - x$?
 A. 15 B. 2 C. 3 D. 4 E. 5
25. Becky has 42 pieces of ribbon that are colored either pink or purple. The number of pink pieces of ribbon is three more than twice the number of purple pieces of ribbon. How many pink pieces of ribbon does Becky have?
 A. 13 B. 26 C. 33 D. 31 E. 29
26. What is the unit rate of purchasing 8 concert tickets for \$287.92?
 A. \$35.99 per ticket B. \$32.79 per ticket C. \$37.59 per ticket D. \$38.69 per ticket E. \$36.29 per ticket
27. Let m equal the sum of vertices, faces and edges of a pentagonal prism. Let n be the sum of the faces and edges of a heptagonal prism. What is the value of $m - n$.
 A. 4 B. 2 C. -10 D. -8 E. 6
28. A bag contains separate tiles, one with each letter of the alphabet on it. Magnolia will draw out one tile at random. What is the probability Magnolia will draw a vowel or a letter in the word ALGEBRA?
 A. $\frac{9}{26}$ B. $\frac{17}{26}$ C. $\frac{6}{13}$ D. $\frac{7}{26}$ E. $\frac{9}{14}$
29. $43_6 \times 23_6 = \underline{\hspace{2cm}}$ (base 6)
 A. 989 B. 1513 C. 1433 D. 1543 E. 1353

30. From shortest to longest, the side lengths of a triangle are $5\sqrt{3}$, 14 and 16 units long. How is this triangle classified?
 A. acute B. right C. isosceles D. obtuse E. equilateral

31. Simplify: $6\left(\frac{3a^3b^{-2}}{9a^5b^{-3}}\right)^{-2}$
 A. $\frac{15a^2}{b^2}$ B. $\frac{54b^2}{a^4}$ C. $\frac{54a^4}{b^2}$ D. $\frac{b^2}{54a^4}$ E. $\frac{a^4}{54b^2}$

32. What is the rate of decay for the exponential decay function $y = 62.8\left(\frac{3}{8}\right)^x$?
 A. 37.5% B. 62.8% C. 137.5% D. 0.625% E. 62.5%

33. The picture below shows three congruent circles. A , B and C are the centers of the circles and the radius of each circle is 6 cm. $\frac{1}{6}$ of each circle is shaded. If $\pi = 3$, what is the total area of the shaded portion?



A. 48 cm² B. 63 cm² C. 45 cm² D. 51 cm² E. 54 cm²

34. Let $\pi = 3$. What is the combined volumes of the figures?



A. 9,654 cm³ B. 9,526 cm³ C. 9,456 cm³ D. 3,570 cm³ E. 9,516 cm³

35. Given that digits cannot be repeated, how many numbers greater than 500 can you make from the digits 0, 2, 4, 5, 8?

A. 48 B. 120 C. 216 D. 60 E. 288

36. The area of a rectangle is 500 in². The ratio of the length of the rectangle to the width of the rectangle is 5:4. What is the perimeter of the rectangle?

A. 75 inches B. 90 inches C. 120 inches D. 60 inches E. 258 inches

37. If $A = 24x^2 - 9x + 11$ and $B = -17x^2 + 13x - 8$, find $A - B$.

A. $41x^2 - 22x + 19$ B. $41x^2 - 22x + 3$ C. $41x^2 - 4x - 19$ D. $41x^2 + 4x - 19$ E. $41x^2 + 22x + 19$

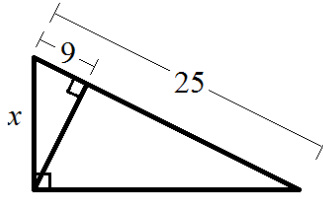
38. If $f(x) = 4x - x^2$, then find the value of $f(8) - f(-4)$.

A. -64 B. -32 C. 0 D. -16 E. 1

39. Simplify: $(3\sqrt{8} + 2\sqrt{6})(\sqrt{32} - 2\sqrt{6})$

A. $24 + 6\sqrt{3}$ B. $8 + 24\sqrt{3}$ C. $12 - 4\sqrt{3}$ D. $24 - 8\sqrt{3}$ E. $12 - 6\sqrt{3}$

40. What is the value of x ?



- A. 12 B. 15 C. 18 D. 14 E. 20

41. A line has a slope of $\frac{2}{5}$ and passes through the points $(8, 6)$ and $(x, -4)$. What is the reciprocal of the multiplicative inverse of the additive inverse of the value of x ?

- A. 14 B. $-\frac{1}{14}$ C. 17 D. $-\frac{1}{17}$ E. $\frac{1}{17}$

42. The factors of $x^3 - 8$ are $(x - 2)$ and which of the following?

- A. $x^2 - 2x + 4$ B. $x^2 + 2x + 4$ C. $x^2 + 2x - 4$ D. $-x^2 + 2x + 4$ E. $x^2 - 2x - 4$

43. The third term of an arithmetic sequence is 45 and the fifth term is 73. If the first term is a_1 , which of the following is the equation to find the n^{th} term of the sequence?

- A. $a_n = 17n$ B. $a_n = 16n - 3$ C. $a_n = 14n + 3$ D. $a_n = 11n + 6$ E. $a_n = 12n - 9$

44. What is the remainder when $2n^3 + 8n$ is divided by $n - 1$?

- A. 4 B. -2 C. -4 D. 8 E. 10

45. Michelle has 81 coins consisting of quarters and pennies. If the value of Michelle's coins is \$9.21, how many more pennies does Michelle have than quarters?

- A. 9 B. 11 C. 17 D. 13 E. 15

46. What is the area of the rhombus *PLUS*, if $PL = 13$ inches, $PU = x + 14$ inches and $LS = x$ inches?

- A. 30 in^2 B. 130 in^2 C. 240 in^2 D. 120 in^2 E. 180 in^2

47. There are eight boys and twelve girls on the science team. Half the boys and 75% of the girls own their own lab goggles. What is the probability that a science team member chosen at random will be a boy or own their own pair of lab goggles, or both?

- A. 80% B. 75% C. 85% D. 90% E. 95%

48. The formula for finding the volume of a cone can be expressed in terms of the radius, r , by which of the following?

- A. $\sqrt{\frac{3V}{\pi h}}$ B. $3V\sqrt{\pi h}$ C. $\sqrt{\frac{\pi h}{3V}}$ D. $3\sqrt{\frac{V}{\pi h}}$ E. $\frac{1}{3}\sqrt{\frac{V}{\pi h}}$

49. The function $h(t) = -16t^2 + 144$ represents the height, $h(t)$, in feet, of an object from the ground at t seconds after it is dropped. How long will the ball be in the air?

- A. 4.5 seconds B. 1.5 seconds C. 144 seconds D. 3 seconds E. 6 seconds

50. The graph of a linear equation contains the points $(-10, -2)$ and $(25, 26)$. Which of the following points also lies on the graph?

- A. $(30, 24)$ B. $(40, 38)$ C. $(0, 4)$ D. $(-15, -9)$ E. $(-30, 24)$

2017 – 2018 TMSCA Middle School Mathematics Regional Test Answer Key

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

5. Shiela had \$500 and gave 30% to her friend Alice. 30% of $\$500 = 0.3(500) = \150 . Alice received \$150. Alice gave 12% of her money to her sister Frances. 12% of $\$150 = 0.12(150) = \18 . Frances received \$18.

12. A dozen is equal to 12 items. $216 \div 12 = 18$, and $18(31) = 558$ cookies.

16. The sum of the supplement and complement of an angle can be found by $270 - 2n$, where n is the angle measure. We are given the angle measure of 19.4° , so therefore, $270 - 2(19.4) = 270 - 38.8 = 231.2^\circ$.

19. We are given the pattern, 2, 2, 3, 7, 12, 22, 41, 75, ... It follows the pattern $a, b, c, (a + b + c), b + c + (a + b + c)$, and so forth. After the third term, you add the three previous terms to get the next term. The following term of the sequence 2, 2, 3, 7, 12, 22, 41, 75, ... is $22 + 41 + 75 = 138$.

22. Since $distance = rate \times time$, we have the equation $439.4 = rate \times 5.2$. Divide both sides by 5.2 and we have a $rate$ of 84.5 ft/sec.

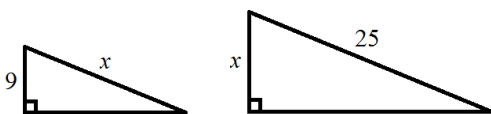
24. The degree of a term is the sum of the exponents of the variables. The degree of a polynomial is the degree of the term with the highest degree. We are given a polynomial that has 6 terms, $14x^5 + 4x^4 + 3x^3 + 2x^2 - 6 - x$. $14x^5$ has a degree of 5, $4x^4$ has a degree of 4, $3x^3$ has a degree of 3, $2x^2$ has a degree of 2, -6 has a degree of 0 and $-x$ has a degree of 1. The highest degree of any term is 5, and the degree of the polynomial $14x^5 + 4x^4 + 3x^3 + 2x^2 - 6 - x$ is 5.

$$31. 6 \left(\frac{3a^3b^{-2}}{9a^5b^{-3}} \right)^{-2} = 6 \left(\frac{9a^5b^{-3}}{3a^3b^{-2}} \right)^2 = 6(3a^{5-3}b^{-3-(-2)})^2 = 6(3a^2b^{-1})^2 = 6 \left(\frac{3a^2}{b} \right)^2 = 6 \left(\frac{9a^4}{b^2} \right) = \frac{54a^4}{b^2}.$$

36. Let x equal the constant multiplier. The area of the rectangle is 500 in^2 , and if the ratio of the length to the width of the rectangle is 5:4, then we have $5x(4x) = 500$. So, $5x(4x) = 500$ gives us $20x^2 = 500$. Divide both sides by 20 and $x^2 = 25$. Square root both sides and $x = \pm 5$. x cannot be equal to -5 because that would give us negative dimensions, and that is not allowed, therefore, $x = 5$. If $x = 5$, then $5x = 5(5) = 25$ and $4x = 4(5) = 20$. The perimeter of the rectangle is then $2(25) + 2(20) = 50 + 40 = 90$ inches.

37. If $A = 24x^2 - 9x + 11$ and $B = -17x^2 + 13x - 8$, the $A - B = (24x^2 - 9x + 11) - (-17x^2 + 13x - 8) = 24x^2 - 9x + 11 + 17x^2 - 13x + 8 = 41x^2 - 22x + 19$.

40. When given a right triangle and an altitude drawn from the right angle to the hypotenuse, it creates three similar triangles. We can draw a picture to help us see the triangles,



We see our two similar triangles and we can make our proportion, $\frac{9}{x} = \frac{x}{25}$.

To solve our proportion, first cross multiply to get $x^2 = 225$. Square root both sides and $x = \pm 15$. x cannot equal -15 because negative lengths are not allowed, thus $x = 15$.

44. The remainder of $(2n^3 + 8n) \div (n - 1)$ can be found by using long division:

$$\begin{array}{r}
 n-1 \overline{) 2n^2+8n} \rightarrow n-1 \overline{) 2n^2+8n+0} \rightarrow n-1 \overline{) 2n^2+8n+0} \rightarrow n-1 \overline{) 2n^2+8n+0} \\
 \underline{-(2n^2-2n)} \\
 10n+0 \\
 \underline{-(10n-10)} \\
 10
 \end{array}$$

So, the remainder is $\frac{10}{n-1}$.

49. Given the function $h(t) = -16t^2 + 144$. Replace $h(t)$ with 0 and we have $0 = -16t^2 + 144$. Add $16t^2$ to both sides and get $16t^2 = 144$. Divide both sides by 16 and $t^2 = 9$. Square root both sides and $t = \pm 3$. You cannot have a negative time, so the ball was in the air for 3 seconds.