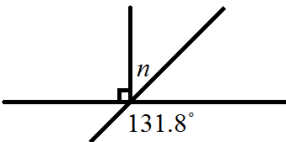# TMSCA MIDDLE SCHOOL
MATHEMATICS
# TEST #4 ©
NOVEMBER 11, 2017

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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1. $-56 + 244 =$ _____
A. 176   B. 300   C. -300 D. 194   E. 188

2. $12.56 + 187.04 =$ _____
A. 199.58   B. 199.4   C. 199.6   D. 199.06   E. 199.96

3. $5\frac{1}{4} \times 124 =$ _____
A. 650.75   B. 651.5   C. 651   D. 651.75   E. 651.25

4. $-56 \div 0.4 =$ _____
A. -140 B. $-1,400$ C. 260   D. -260 E. $-1,300$

5. Wayne measured his desk to be 2.5 feet long. How many inches long is Wayne's desk?
A. 24.6 inches   B. 24.8 inches   C. 30 inches   D. 28.6 inches   E. 28 inches

6. Mobely is asked to label the numbers $14.\overline{6}$, 14⅝, 14.63, 14½ and 14.665 on a number line. Which number would be labeled closest to the number 15?
A. 14⅝   B. $14.\overline{6}$ C. 14.62   D. 14.665   E. 14½

7. 400 students were asked what was their favorite type of music. 24 students stated their favorite music was reggae. What percentage of the students named reggae as their favorite type of music?
A. 8%   B. 24%   C. 12%   D. 6%   E. 3%

8. What is the sum of all the prime numbers between 10 and 40?
A. 180   B. 221   C. 151   D. 150   E. 191

9. What is the measure of the complement of $\angle n$?

131.8°

A. $41.8°$ B. $41.2°$ C. $46.8°$ D. $51.4°$ E. $48.2°$

10. The thickness of a dime is 0.053 inches. What is the thickness of a dime in scientific notation?
A. 0.053×10^{-3} B. 0.53×10^{-2} C. 5.3×10^{-2} D. 5.3×10^{2} E. 0.53×10^{2}

11. 87 dimes + 371 nickels = 625 pennies + _____ quarters.
A. 84   B. 72   C. 92   D. 86   E. 88

12. $DCCXIV =$ _____ (Arabic number)
A. 316   B. 714   C. 724   D. 1,214   E. 1,204

13. Simplify: $\left(\frac{1}{2} + \frac{5}{2}\right)^2 + \left(\frac{5}{4} + \frac{7}{4}\right)$
A. 8   B. 6   C. 24   D. 16   E. 12

14. 21 is what percentage of 140?
A. 18%   B. 12%   C. 17%   D. 15%   E. 9%

15. A flying fish made 16 jumps in 20 minutes. At this rate, how many jumps will the flying fish make in 4 hours?
A. 186   B. 184   C. 192   D. 208   E. 196

16. Using the picture below, which of the following is true?
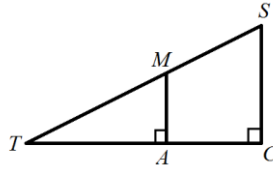
A. $\dfrac{TM}{TA} = \dfrac{MA}{TS}$
B. $\dfrac{MA}{SC} = \dfrac{MT}{ST}$
C. $\dfrac{TM}{TS} = \dfrac{TA}{AC}$
D. $\dfrac{SC}{MA} = \dfrac{MA}{TS}$
E. $\dfrac{TM}{TA} = \dfrac{TC}{TS}$

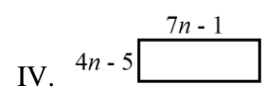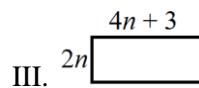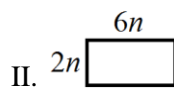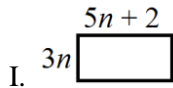17. How many positive integral divisors does the number 2,000 have?
A. 12   B. 24   C. 20   D. 28   E. 36

18. All the terms in row *A* have the same sum as all the terms in row *B*. What is the value of *n*?

A	1	2	3	4	5	67
B	8	9	10	11	12	n

A. 42   B. 24   C. 36   D. 28   E. 32

19. If *n* = 4, which rectangle(s) below has or have perimeters greater than 65 units?

I. $3n$ by $5n + 2$
II. $2n$ by $6n$
III. $2n$ by $4n + 3$
IV. $4n - 5$ by $7n - 1$

A. I and III   B. IV only   C. II and III   D. I and IV   E. I, II and IV

20. The angles in a triangle are in a ratio of 4:11:21. What is the measure of the largest angle?
A. $105°$ B. $100°$ C. $110°$ D. $84°$ E. $126°$

21. Courtney and Kayla both started a race at 4:00 pm. Courtney finished the race in 103 minutes. Kayla finished the race 29 minutes after Courtney finished. At what time did Kayla finish the race?
A. 5:44 pm   B. 5:58 pm   C. 6:12 pm   D. 6:08 pm   E. 6:06 pm

22. Marisol is buying a skirt costing $32.50 and a shirt costing $12.50. If there is a 9% tax, what will be Marisol's total bill?
A. $45.05   B. $48.05   C. $48.75   D. $49.35   E. $49.05

23. If *A* = {a, b, c, d, e} and *B* = {c, d, e, f, g}, then $A \cup B$ has _____ elements.
A. 10   B. 3   C. 7   D. 8   E. 5

24. Write the following expression without negative exponents: $13m^{-5}$
A. $\dfrac{1}{13m^5}$
B. $\dfrac{13}{m^5}$
C. $\dfrac{5}{13m}$
D. $\dfrac{13}{5m}$
E. $\dfrac{13}{m^{-5}}$

25. In $\triangle ABC$, the angle measures are $(2x)°$, $(x + 30)°$ and $(3x)°$, respectively. What would be the classification of $\triangle ABC$?
A. equilateral   B. right   C. obtuse   D. acute   E. equiangular

26. If we are currently in the month of October, what month will it be in 87 months?
A. March   B. January   C. February   D. December   E. April

27. Each day, the school cafeteria offers the main entre of pizza, hamburger or grilled cheese. The sides offered are French fries, potato chips or carrots. The drinks offered are tea, chocolate milk, whole milk, water, lemonade or orange juice. Is a student must choose one entre, one side and one drink, how many total lunch combinations are possible?
A. 54   B. 12   C. 96   D. 72   E. 60

28. Cody has a pair of dice. What is the probability Cody rolls his dice and gets a sum of 8 facing up?

A. $\frac{1}{9}$ B. $\frac{5}{36}$ C. $\frac{2}{9}$ D. $\frac{7}{36}$ E. $\frac{11}{36}$

29. The measure of an exterior angle of a regular nonagon is which of the following?
A. $140°$ B. $45°$ C. $40°$ D. $20°$ E. $120°$

30. What is the surface area of the triangular prism below?

12 inches

5 inches

15 inches

13 inches
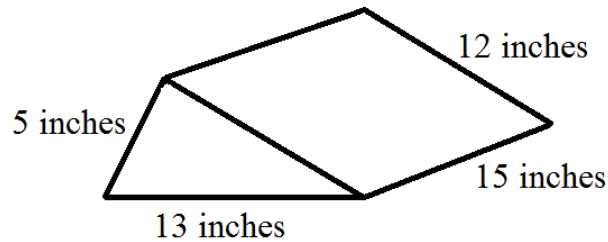
A. 510 in^2 B. 525 in^2 C. 575 in^2 D. 475 in^2 E. 520 in^2

31. $213_5 =$ _____ (base 10)
A. 258   B. 158   C. 58   D. 78   E. 63

32. If $f(x) = x^4$, then find the value of $6f(3)$.
A. 243   B. 729   C. 104,976   D. 486   E. 72

33. Find the value of B, if $(4x + 1)(x - 7) = 4x^2 + Bx - 7$.
A. -27 B. -28 C. -29 D. 28   E. -10

34. A square and a regular pentagon each have the same side length measure. If the perimeter of the square is 76 inches, what is the perimeter of the pentagon?
A. 361 inches   B. 152 inches   C. 380 inches   D. 95 inches   E. 88 inches

35. What is the growth rate of the exponential growth function $y = 87\left(\frac{7}{4}\right)^x$?

A. 87%   B. 175%   C. 1.75%   D. 75%   E. 25%

36. The area of a rectangle is $18x^2 + 9x - 14$ units^2. Which of the following could be the length of the rectangle?
A. $6x - 7$ units   B. $3x + 2$ units   C. $6x + 2$ units   D. $3x - 7$ units   E. $3x - 2$ units

37. What are the coordinates of the midpoint between the points $(-2, 3)$ and $(1, 4)$?
A. $\left(-1, \frac{7}{2}\right)$ B. $\left(\frac{1}{2}, \frac{1}{2}\right)$ C. $\left(-\frac{1}{2}, \frac{1}{2}\right)$ D. $\left(-\frac{1}{2}, \frac{7}{2}\right)$ E. $(0.5, 3.5)$

38. Which formula gives the nth term of the sequence?   2, 3, 5, 8, 12, 17, …

A. $\frac{n^2+n+2}{2}$ B. $\frac{n^2-n+2}{2}$ C. $\frac{n^2+n+4}{2}$ D. $\frac{n^2-n-4}{2}$ E. $\frac{n^2-n+4}{2}$

39. Find the value of x, if $\frac{1}{x} + \frac{1}{x} = 14$.

A. $\frac{1}{7}$ B. 7   C. 28   D. $\frac{1}{28}$ E. $\frac{1}{14}$

40. Simplify: $\dfrac{12}{\sqrt{6}}$

A. $2\sqrt{6}$ B. $\dfrac{1}{\sqrt{2}}$ C. $\dfrac{\sqrt{2}}{6}$ D. $\dfrac{\sqrt{3}}{6}$ E. $\dfrac{\sqrt{6}}{2}$

41. What is the units digit of 3^{11}?
A. 3   B. 9   C. 7   D. 1   E. 0

42. What is the value of the discriminant of the quadratic equation $7x = 2x^2 + 5$?
A. 9   B. 89   C. 1.75   D. -36 E. -3

43. How many permutations can be made of 7 objects taken 3 at a time?
A. 5,040   B. 35   C. 120   D. 21   E. 210

44. If $a \odot b = -a^2 + 4b$, then find the value of $(-9) \odot (-12)$?
A. 33   B. 129   C. 96   D. -33 E. -129

45. A merchant wishes to mix cinnamon and sugar together to get a mixture of 90 ounces worth $4.00 per ounce. If sugar costs $3.00 per ounce and cinnamon costs $6.00 per ounce, how many ounces of cinnamon does the merchant need?
A. 60 ounces   B. 45 ounces   C. 30 ounces   D. 24 ounces   E. 48 ounces

46. What is the value of c, if $\dfrac{3}{8} = \dfrac{a}{24} = \dfrac{a+b}{72} = \dfrac{b+c}{216}$?

A. 57   B. 63   C. 72   D. 54   E. 75

47. What is the area of a triangle with its vertices located at $(-1, -3)$, $(5, -1)$ and $(4, 3)$?
A. 13 units^2 B. 12 units^2 C. 18 units^2 D. 15 units^2 E. 11.5 units^2

48. The table below shows points that lie on a line. What is the x-intercept of the line?

x	-8	0	8	24
y	-15	-10	-5	5

A. 12   B. 14   C. 16   D. 18   E. 20

49. At *All or Nothing Sporting Goods*, a ski jacket is on sale for $16.00. A week later, the same jacket is at regular price for $36.00. What is the percent increase from the sale price to the regular price?
A. 225%   B. 175%   C. 150%   D. 125%   E. 200%

50. The area of trapezoid *ABCD* is 1,008 cm^2. What is the measure of $\overline{CD}$?
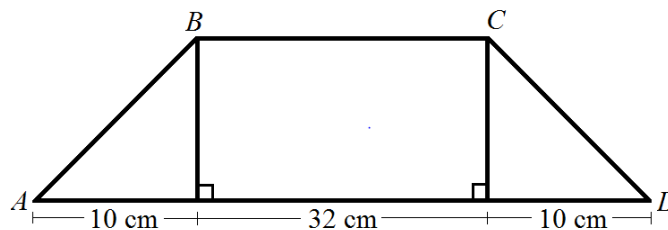
B   C

A   D
10 cm   32 cm   10 cm

A. 28 cm   B. 26 cm   C. 18 cm   D. 24 cm   D. 30 cm

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

15. There are 60 minutes in an hour, so 60 divided by 20 is equal to 3. There are 3 sets of 20 minutes in 1 hour, so there are 12 sets of 20 minutes in 4 hours. 12 multiplied by 16 is equal to 192. A flying fish will make 192 jumps in 4 hours.

16. Using the picture,
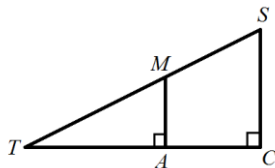
we can see two similar triangles, $\Delta TMA \sim \Delta TSC$. Therefore, the only true similarity statement is $\frac{MA}{SC} = \frac{MT}{ST}$.

20. There are three angles in a triangle. Let x be our constant multiplier, so 4:11:21 is $4x$, $11x$ and $21x$. The sum of the angles in a triangle is $180°$, so $4x + 11x + 21x = 180 = 36x = 180$. Divide 180 by 36 and $x = 5$. Therefore, the largest angle of the triangle is $21x = 21(5) = 105°$.

22. $32.50 + $12.50 = $45.00. There is a 9% tax, so 9% of 49 is $49(0.09) = 4.05. The total bill Marisol will have to pay is $45.00 + $4.05 = $49.05.

24. The negative exponent rule states that negative exponents in the numerator get moved to the denominator and become positive, or the negative exponents in the denominator get moved to the numerator and become positive. Algebraically, $a^{-n} = \frac{1}{a^n}$. We are given $13m^{-5}$, so by using the negative exponent rule, $13m^{-5} = 13 \cdot \frac{1}{m^5} = \frac{13}{m^5}$.

32. If $f(x) = x^4$, then $6f(3) = 6(3^4) = 6(81) = 486$.

35. An exponential growth function is in the form $y = a \cdot b^x$, where b is the growth factor and $b > 1$. We are given the equation $y = 87 \left(\frac{7}{4}\right)^x$, so the growth factor is $\frac{7}{4} = 1.75$. To find the growth rate, subtract 1 from the growth factor and then multiply by 100. $1.75 - 1 = 0.75$ and $0.75(100) = 75\%$. The growth rate of $y = 87 \left(\frac{7}{4}\right)^x$ is 75%.

39. $\frac{1}{x} + \frac{1}{x} = \frac{2}{x}$ and if $\frac{1}{x} + \frac{1}{x} = 14$, then $\frac{2}{x} = 14$. Change 14 to $\frac{14}{1}$ and we have the proportion if $\frac{2}{x} = \frac{14}{1}$. Now solve the proportion by first cross multiplying to get $14x = 2$. Divide both sides by 14 and $x = \frac{2}{14} = \frac{1}{7}$.

40. You cannot have a radical in the denominator of a fraction. We must change $\frac{12}{\sqrt{6}}$ by multiplying by $\frac{\sqrt{6}}{\sqrt{6}}$. This is called rationalizing the denominator. Therefore, $\frac{12}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{12\sqrt{6}}{6}$. Finally, simplify $\frac{12\sqrt{6}}{6} = 2\sqrt{6}$.

42. First subtract $7x$ from both sides to get $0 = 2x^2 + 5 - 7x$. Now, rewrite the equation into standard form. $0 = Ax^2 + Bx + C$. $2x^2 + 5 - 7x = 2x^2 - 7x + 5$. To find the discriminant of a quadratic equation, use $B^2 - 4AC$. So, $A = 2$, $B = -7$ and $C = 5$ and $(-7)^2 - 4(2)(5) = 49 - 4(2)(5) = 49 - 40 = 9$.

43. To find the number of permutations of n objects taken r at a time, use $_nP_r = \frac{n!}{(n-r)!}$. We are given 7 objects taken 3 at a time, so $_7P_3 = \frac{7!}{(7-3)!} = \frac{7!}{4!} = 7 \cdot 6 \cdot 5 = 210$.

49. To find the percent increase, use $\frac{change\ in\ amount}{original\ amount}$. Our original amount is 16, so $\frac{36-16}{16} = \frac{20}{16} = \frac{5}{4} = 1.25$. Now we must change 1.25 into a percentage by multiplying by 100. $1.25(100) = 125\%$ increase from 16 to 36.