TMSCA MIDDLE SCHOOL MATHEMATICS TEST #1 ©

OCTOBER 21, 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. 65 + 128 = _____
A. 273 B. 213 C. 193 D. 183 E. 182

2. 304 – 78 = _____
A. 226 B. 236 C. 382 D. 222 E. 232

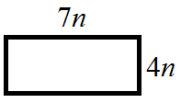
3. 68 × 73 = _____
A. 4,191 B. 4,141 C. 4,964 D. 4,684 E. 4,984

4. 1,566 ÷ 29 = _____
A. 66 B. 48 C. 46 D. 58 E. 54

5. $\angle MNP$ has a measure of 42.7°. What is the measure of the complement of $\angle MNP$?
A. 48.3° B. 137.3° C. 138.3° D. 47.3° E. 42.3°

6. The LCM of the numbers 24 and 54 is which of the following?
A. 1,296 B. 6 C. 39 D. 216 E. 168

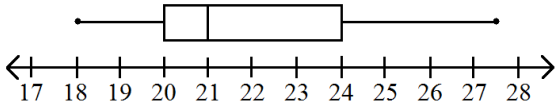
7. If n = 1.5 units, what is the area of the rectangle below?



A. 28 units^2 B. 63 units^2 C. 56 units^2 D. 42 units^2 E. 252 units^2

8. Shayna wants to convert 84% into a decimal and a fraction. Which of the following are the correct conversions?
A. 0.84, $\frac{25}{42}$ B. 0.84, $\frac{21}{50}$ C. 0.84, $\frac{21}{25}$ D. 0.84, $\frac{21}{250}$ E. 0.84, $\frac{7}{25}$

9. What value is one-half that of the median of the box-and-whisker plot below?



A. 12 B. 10 C. 21 D. 10.5 E. 13.75

10. If Brissa walked 1 mile on Monday and ½ a mile on Tuesday. How many total yards did Brissa walk?
A. 1,760 yds B. 2,200 yds C. 2,224 yds D. 2,640 yds E. 2,860 yds

11. Which of the following numbers is classified as a rational number, integer and whole number?
A. ¼ B. – ½ C. –5 D. 4.8 E. 1

12. In a magic square, the three numbers in each row, each column, and in each diagonal sum to the same value. What is the value of a in the magic square below?

13		
	10	a
9		7

A. 11 B. 12 C. 8 D. 13 E. 18

13. Simplify: $(5^2 - 4^2)^2 + (3^2 - 4^1)^2$
A. 106 B. 8 C. 74 D. 505 E. 386

14. What value is 12.5% of 608?
A. 76 B. 95 C. 84 D. 64 E. 68

15. A person who weighs 144 pounds on Earth weighs 24 pounds on the moon. How much would a person who weighs 222 pounds on Earth weigh on the moon?
A. 39 pounds B. 27 pounds C. 33 pounds D. 37 pounds E. 41 pounds

16. 7.6 feet = _____ inches
A. 114 B. 91.2 C. 136.8 D. 88.2 E. 114.2

17. Find n, if $240 = 2^4 \cdot 3 \cdot 5 \cdot 7^n$.
A. 0 B. 1 C. 2 D. 3 E. 4

18. Change 0.00000811 into scientific notation.
A. 8.11×10^{-6} B. 8.11×10^{6} C. 8.11×10^{-7} D. 8.11×10^{7} E. 81.1×10^{-5}

19. A quadrilateral has angle measures of $77.12^\circ, 101.6^\circ, 69.87^\circ$ and x°. What is the value of x?
A. 291.41 B. 201.41 C. 111.41 D. 101.41 E. 121.41

20. If $a \square b = -8ab^2$, then find the value of $5 \square (-3)$.
A. -360 B. 360 C. -23 D. 240 E. -240

21. The mean of four numbers is 17.5. If three of the numbers are 15, 18 and 16, what is the fourth number?
A. 19 B. 18 C. 23 D. 21 E. 20

22. Simplify: $2x^4 \cdot 3x^3$
A. $6x^7$ B. $5x^7$ C. $5x^{12}$ D. $6x^{12}$ E. $6x^{64}$

23. Timothy walks into his local deli and sees 4 different breads, 11 different cold cuts, 4 condiments and 3 relishes. If Timothy wants to make a sandwich with one bread, one cold cut, 1 condiment and 1 relish, how many different sandwiches can Timothy create?
A. 22 B. 132 C. 176 D. 528 E. 1,056

24. What are the coordinates of the midpoint between the points (10, 8) and $(4, -6)$?
A. (7, 1) B. $(7, -7)$ C. $(14, -1)$ D. $(7, -1)$ E. (14, 1)

25. If $A = \{2, 4, 6, 8, 10\}$ and $B = \{1, 2, 3, 4, 5\}$, then $A \cap B$ has _____ elements.
A. 10 B. 8 C. 0 D. 25 E. 2

26. What is the sum of the first 7 terms of the sequence? 0, 3, 6, 9, 12, …
A. 63 B. 84 C. 66 D. 72 E. 78

27. La Toya wants to write down all the distinct positive integral divisors of the number 144. How many different numbers will La Toya end up writing down?
A. 18 B. 15 C. 17 D. 16 E. 12

28. What is the sum of the number of edges of a rectangular prism and a hexagonal prism?
A. 24 B. 26 C. 30 D. 20 E. 14

29. Solve the inequality: $4m + 18 < 42$
A. $m > 6$ B. $m < -7.5$ C. $6 > m$ D. $15 < m$ E. $m > 15$

30. Which of the following relation(s) is not a function?

I. {(1, 9), (7, 8), (1, 4)} II. {(7, 6), (5,4), (3, 2)} III. {(7, 8), (7, 9), (7, 10)} IV. {(4, 2), (5, 2), (6, 2)}

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

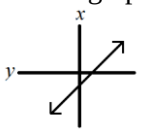
31. Simplify: $\frac{6!}{3!}$

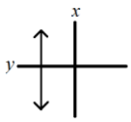
A. 60 B. 3! C. 2! D. 120 E. 720

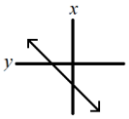
32. What are the new coordinates of the point (17, -11) after it is rotated 90° counter-clockwise?

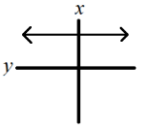
A. (11, 17) B. (-17, 11) C. (-11, 17) D. (17, 11) E. (11, -17)

33. Which graph below illustrates a line with a negative slope?

A. 

B. 

C. 

D. 

E. none of the graphs

34. 130_{10} = _____ (base 7)

A. 246 B. 244 C. 264 D. 224 E. 262

35. What is the growth factor of the exponential function $y = 23.6(4.06)^x$?

A. 23.6 B. 0.236 C. 4.06 D. 3.06 E. 306

36. How many zeros are there at the end of the number that has the prime factorization $2^4 \cdot 5^8 \cdot 7 \cdot 11$?

A. 4 B. 6 C. 8 D. 5 E. 7

37. You are asked to choose two cards from a standard deck of cards. What is the probability of drawing a red card, then without replacement, drawing a second red card?

A. $\frac{1}{4}$ B. $\frac{1}{3}$ C. $\frac{4}{13}$ D. $\frac{23}{51}$ E. $\frac{25}{102}$

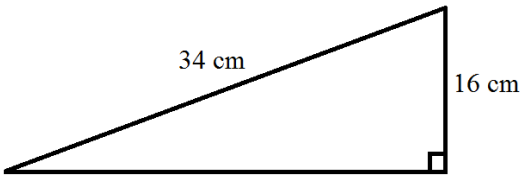
38. If $g(x) = x^3 + 2x$, then find the value of $g(-3)$.

A. -33 B. 21 C. -21 D. -15 E. 3

39. Factor completely: $32m^4 - 24m^3$

A. $2m^3(16m - 12)$ B. $2m^2(16m^2 - 12m)$ C. $4m^3(8m - 6)$ D. $8m^3(4m - 3)$ E. $24m^3(8m - 1)$

40. What is the length of the third side of the triangle?



A. 37.6 cm B. 32 cm C. 29 cm D. 30 cm E. 27 cm

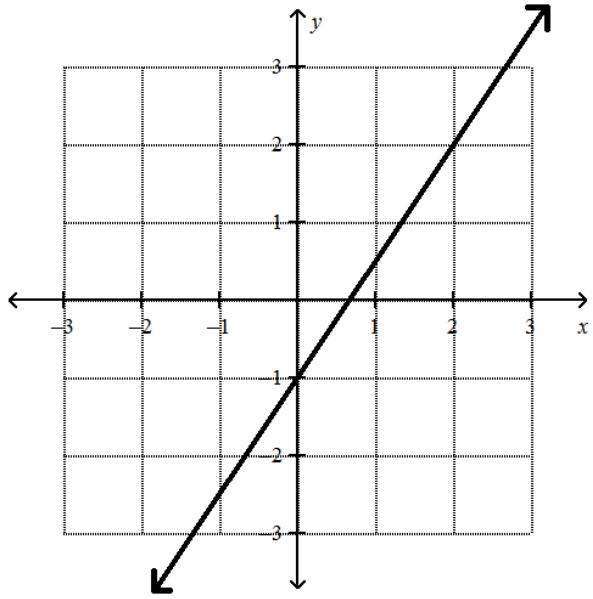
41. How many positive numbers less than 12 are relatively prime to 12?

A. 0 B. 3 C. 4 D. 6 E. 2

42. What is the area of a square with a diagonal of 14 inches?

A. 56 inches^2 B. 98 inches^2 C. 112 inches^2 D. 196 inches^2 E. 84 inches^2

43. What is the slope of the line in the graph below?



A. 0.5 B. 0.75 C. 1.5 D. $4.\overline{3}$ E. $1.\overline{3}$

44. If the first digit of a five-digit suitcase lock is 3 and the last digit is 7, how many different lock combinations can be created, if digits can repeat?
A. 1,000 B. 720 C. 504 D. 960 E. 850

45. Luke measures a rectangle to have a perimeter of 46 cm. Luke then notices that the length of the rectangle is 3 cm more than 3 times the rectangle's width. What is the length of Luke's rectangle?
A. 5 cm B. 13 cm C. 8 cm D. 15 cm E. 18 cm

46. $\frac{15a^2b^3}{6ab^2} \cdot \frac{12a^2b}{5a^3b}$ = _____
A. $\frac{6}{b}$ B. $6b$ C. $\frac{6a}{b}$ D. $6ab$ E. $\frac{6b}{a}$

47. Marcy wants to find the volume of a cylinder with a radius of 11 cm and a height of 25 cm. If Marcy lets $\pi = 3$, what will be the volume of her cylinder?
A. 9,075 cm^3 B. 2,376 cm^3 C. 4,752 cm^3 D. 7,128 cm^3 E. 9,504 cm^3

48. Which circle equation has a radius of 16 units?
A. $(x-1)^2+(y+3)^2=16$ B. $x^2+y^2=32$ C. $(x+2)^2+y^2=\sqrt{2}$ D. $(x-1)^2+(y+1)^2=64$ E. $x^2+y^2=256$

49. Simplify: $7\sqrt{128}$
A. $71\sqrt{2}$ B. $448\sqrt{2}$ C. $56\sqrt{2}$ D. $224\sqrt{2}$ E. $14\sqrt{14}$

50. What is the value of the *y*-coordinate of the solution of the system $\begin{cases} {}^1/_3 x - {}^1/_2 y = 7 \\ {}^1/_6 x + {}^1/_3 y = 0 \end{cases}$?
A. $y = 12$ B. $y = 8$ C. $y = -6$ D. $y = -4$ E. $y = 2$

2017 – 2018 TMSCA Middle School Mathematics Test #1 Answer Key

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

2017-2018 TMSCA Middle School Mathematics Test #1 Selected Answers

8. 84% = 0.84 and $\frac{84}{100} = 0.84$ and $\frac{21}{25}$.

13. $(5^2 - 4^2)^2 + (3^2 - 4^1)^2 = (25 - 16)^2 + (9 - 4)^2 = 9^2 + 5^2 = 81 + 25 = 106$.

17. $240 = 2 \cdot 120 = 2 \cdot 2 \cdot 60 = 2 \cdot 2 \cdot 2 \cdot 30 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 15 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 = 2^4 \cdot 3 \cdot 5$. So, if 240 is equal to $2^4 \cdot 3 \cdot 5 \cdot 7^n$, then 7^n must be equal to 1. In order for 7^n be equal to 1, *n* must equal 0 because $7^0 = 1$.

22. The product rule of exponents states that to multiply two exponents with the same base, you keep the base and add the exponents. Algebraically, the rule is $a^m \cdot a^n = a^{m+n}$. We are given $2x^4 \cdot 3x^3$, so by using the product rule, $2x^4 \cdot 3x^3 = 2 \cdot x^4 \cdot 3 \cdot x^3 = 2 \cdot 3 \cdot x^4 \cdot x^3 = 6 \cdot x^{4+3} = 6x^7$.

24. To find the midpoint between the points (*a*, *b*) and (*c*, *d*), use $\left(\frac{a+c}{2}, \frac{b+d}{2}\right)$. We are given the points (10, 8) and (4, −6), so substitute and $\left(\frac{10+4}{2}, \frac{8+(-6)}{2}\right) = \left(\frac{14}{2}, \frac{2}{2}\right) = (7, 1)$.

25. The symbol ∩ means intersection. The intersection of two sets, *A* and *B*, is the set that contains all elements of set *A* that also belong in set *B*. If *A* = {2, 4, 6, 8, 10} and *B* = {1, 2, 3, 4, 5}, then $A \cap B = \{2, 4\}$, which has 2 elements.

31. The exclamation point ! means factorial. Factorial of an integer means the product of the integer and all the integers below it greater than 0. $6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ and $3! = 3 \cdot 2 \cdot 1$, so $\frac{6!}{3!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1} = \frac{720}{6} = 120$.

35. An exponential growth function is in the form $y = a \cdot b^x$, where *a* = initial amount and *b* >1. The growth factor is *b*. In the exponential growth equation $y = 23.6(4.06)^x$, the growth factor is 4.06.

36. To find how many zeros are there at the end of the number that has the prime factorization $2^4 \cdot 5^8 \cdot 7 \cdot 11$, identify how many pairs of $2 \cdot 5$ there are. Since we see that there are four 2's and eight 5's, we have four pairs of $2 \cdot 5$. Now, $(2 \cdot 5)^4 = 10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$. $2^4 \cdot 5^8 \cdot 7 \cdot 11 = 10{,}000 \cdot 5^4 \cdot 7 \cdot 11$, which will end in 4 zeros.

38. If $g(x) = x^3 + 2x$, then $g(-3) = (-3)^3 + 2(-3) = -27 - 6 = -33$.

39. Factor $32m^4 - 24m^3$ by pulling out the GCF. The GCF of 32 and 24 is 8 and the GCF of m^4 and m^3 is m^3. The GCF of both terms is then $8m^3$. Now, dividing both terms by the GCF gives $\frac{32m^4}{8m^3} = 4m$ and $\frac{24m^3}{8m^3} = 3$. Therefore, $32m^4 - 24m^3 = 8m^3(4m - 3)$.

42. The formula to calculate the area of a square given its diagonal is $A = \frac{d^2}{2}$. We are given the diagonal of the square to be 14 inches, so the area of the square is $A = \frac{d^2}{2} = \frac{14^2}{2} = \frac{196}{2} = 98$ inches^2.

47. The formula to find the volume of a cylinder is $V = \pi r^2 h$. If π = 3, *r* = 11 and *h* = 25, then the volume of the cylinder is $V = \pi r^2 h = 3(11)^2(25) = 3(121)(25) = 363(25) = 9{,}075$ cm^3.

48. The equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$, with center at (*h*, *k*) and radius of *r*. We are asked which circle equation has a radius of 16. So, we are looking for a circle equation with $r^2 = 256$, which is $x^2 + y^2 = 256$.

49. $7\sqrt{128} = 7 \cdot \sqrt{128} = 7 \cdot \sqrt{64 \cdot 2} = 7 \cdot 8\sqrt{2} = 56\sqrt{2}$.