TMSCA MIDDLE SCHOOL MATHEMATICS
TEST #10 ©
FEBRUARY 3, 2018

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. $911 - 564 - 119 = $ _____
A. 226   B. 228   C. 229   D. 225   E. 227

2. $-19 + 501 + 87 = $ _____
A. 569   B. 619   C. 609   D. 579   E. 529

3. $4.5 \times 2.4 \times 1.1 = $ _____
A. 11.88   B. 10.88   C. 10.80   D. 11.68   E. 12.18

4. $720 \div 0.6 \div (-0.3) = $ _____
A. $-4{,}400$ B. $4{,}000$ C. $-3{,}600$ D. -40 E. $-4{,}000$

5. Cameron fills his motorcycle gas tank up with 21 quarts of gasoline. How many gallons did Cameron need?
A. 5 ⅛ gallons   B. 5 ⅜ gallons   C. 4 ⅞ gallons   D. 5 ¼ gallons   E. 5 ¾ gallons

6. What value is 0.4% of 48?
A. 1.92   B. 19.2   C. 192   D. 0.192   E. 0.0192

7. What is the sum of the digits of the sum of $499 + 597$?
A. 43   B. 16   C. 22   D. 21   E. 15

8. Which of the following is the correct prime factorization of the number 6,400?
A. $2^5 \cdot 5^2 \cdot 8$ B. $2^8 \cdot 3^2 \cdot 5^2$ C. $2^8 \cdot 5^2$ D. $2^6 \cdot 5$ E. $2^7 \cdot 5^3$

9. Which expression(s) are not in correct scientific notation?
         I. 47×10^6 II. 67.4×10^{-4} III. 2.7×10^{-7} IV. 7.1×10^{16}
A. I only   B. III and IV   C. II and III   D. I and II   E. I and IV

10. There are 112 slices of gum in 7 packs of gum. If there are the same number of slices of gum per pack, how many packs of gum are there if there are 304 slices of gum?
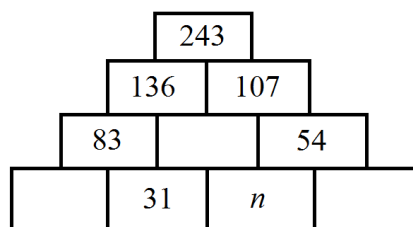A. 19   B. 21   C. 18   D. 20   E. 23

11. Use the pattern to find the value of n?

A. 33   B. 21   C. 22   D. 23   E. 19

12. $18^3 = $ _____
A. 5,852   B. 5,762   C. 5,912   D. 5,792   E. 5,832

13. Simplify: $\dfrac{2^3 \div 0.5 - 6}{5|15 - 24| - 5}$
A. ⅛   B. ⅜   C. ½   D. ¼   E. ⅔

14. $-22 + (-21) + (-20) + \cdots + 1 + 2 + 3 = $ _____
A. -234 B. -253 C. -245 D. -247 E. -249

15. Mike is downloading a song from his computer. The download is 45% complete. What fraction of the song still remains to be downloaded?

A. $\frac{3}{5}$ 　　　　 B. $\frac{9}{20}$ 　　　　 C. $\frac{11}{20}$ 　　　　 D. $\frac{14}{25}$ 　　　　 E. $\frac{9}{25}$

16. What is the remainder when 678,991,207 is divided by the number 9?

A. 3 　　　　 B. 4 　　　　 C. 5 　　　　 D. 6 　　　　 E. 7

17. The picture below shows two overlapping rectangles, which enclose 5 regions. What is the maximum number of regions that can be enclosed by two overlapping rectangles?
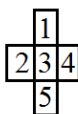
A. 8 　　　　 B. 11 　　　　 C. 10 　　　　 D. 7 　　　　 E. 9

18. Which of the following sequences below is a geometric sequence?

A. 34, 37, 40, 43, … 　　 B. $\frac{1}{4},\frac{3}{4},\frac{5}{4},\frac{7}{4}, …$ 　　 C. 5, 10, 15, 20, … 　　 D. 71, 67, 63, 59, … 　　 E. $8,\frac{8}{3},\frac{8}{9},\frac{8}{27}, …$

19. Shania is 5 feet tall and casts an 8 feet long shadow. At the exact same time, Shania's friend, Lucy, is standing next to Shania. If Lucy is 6 feet tall, how long is Lucy's shadow?

A. 9.4 feet 　　　　 B. 9.6 feet 　　　　 C. 9.24 feet 　　　　 D. 9.18 feet 　　　　 E. 9.5 feet

20. What is the sum of the supplement and complement of $\angle A$, if $m\angle A = 63.24°$?

A. $116.52°$ 　　　 B. $206.52°$ 　　　 C. $143.52°$ 　　　 D. $161.52°$ 　　　 E. $156.52°$

21. What is the volume of the rectangular prism?
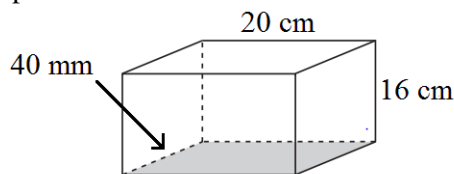
A. 1,280 cm^3 　　　 B. 2,560 cm^3 　　　 C. 12,800 cm^3 　　　 D. 3,520 cm^3 　　　 E. 928 cm^3

22. Each storage container weighs 1,500 pounds. If there are 94 storage containers, what is the total amount of weight of the storage containers? Express the answer in scientific notation.

A. 1.09×10^5 　　 B. 1.41×10^5 　　 C. 1.09×10^6 　　 D. 1.41×10^6 　　 E. 1.41×10^3

23. Without using an overline bar, what is the largest number that can be written using Roman numerals?

A. 4,998 　　　　 B. 4,999 　　　　 C. 3,999 　　　　 D. 9,999 　　　　 E. 5,999

24. Holly writes down the list of numbers 12, 8, x, 7, 11, 14. Holly wants to find the value of x that will make the mean of the first three numbers of the list equal to the mean of the last four numbers of the list. What is the value of x?

A. 16 　　　　 B. 18 　　　　 C. 10 　　　　 D. 14 　　　　 E. 12

25. What is the value of the y-intercept of the linear equation $3y - 6x = 12$?

A. 4 　　　　 B. -2 　　　　 C. ¼ 　　　　 D. $-\frac{1}{2}$ 　　　　 E. $-\frac{1}{4}$

26. $(11 + 22)^3 =$ _____ (nearest hundred).

A. 35,800 　　　　 B. 35,700 　　　　 C. 35,600 　　　　 D. 36,000 　　　　 E. 35,900

27. $\triangle ABC \sim \triangle XYZ$. $\frac{AC}{XZ}$ is proportional to which of the following?

A. $\frac{YZ}{BC}$ 　　　　　 B. $\frac{XY}{AB}$ 　　　　　 C. $\frac{AB}{XY}$ 　　　　　 D. $\frac{AB}{AC}$ 　　　　　 E. $\frac{XY}{XZ}$

28. What is the percent decrease if 64 widgets is reduced to 40 widgets?
A. 32.5% 　　　　　 B. 35% 　　　　　 C. 36.75% 　　　　　 D. 38.25% 　　　　　 E. 37.5%

29. What is the parent function of all quadratic functions?
A. $f(x) = x^2$ 　　　　 B. $f(x) = x$ 　　　　 C. $f(x) = a(x-h)^2 + k$ 　　　 D. $f(x) = a \cdot b^x$ 　　　 E. $f(x) = x^3$

30. Which formula gives the nth term of the sequence? $-\frac{1}{2}, 1, 4\frac{1}{2}, 10, \ldots$

A. $\frac{2n^2 - 3n}{2}$ 　　　 B. $\frac{2n^2 - 3n}{3}$ 　　　 C. $\frac{2n^2 - n + 3}{2}$ 　　　 D. $\frac{2n^2 + n + 3}{2}$ 　　　 E. $\frac{2n^2 + n + 3}{3}$

31. 60% of Lilly's friends like chocolate ice-cream and 48% like both chocolate ice-cream and strawberry ice-cream. What is the probability that a friend of Lilly likes chocolate ice-cream also likes strawberry ice-cream?
A. 80% 　　　　　 B. 12% 　　　　　 C. 28% 　　　　　 D. 75% 　　　　　 E. 70%

32. An isosceles triangle has a base length of 48 cm and a side length of 25 cm. What is the area of the triangle?
A. 176 cm^2 　　　 B. 600 cm^2 　　　 C. 168 cm^2 　　　 D. 336 cm^2 　　　 E. 154 cm^2

33. Jamie has two brothers, one is six years older than Jamie and one is six years younger than Jamie. If the product of the two brothers is 288, how old is Jamie?
A. 16 　　　　　 B. 22 　　　　　 C. 15 　　　　　 D. 14 　　　　　 E. 18

34. $83_9 - 36_8 = $ _____ (base 10)
A. 45 　　　　　 B. 48 　　　　　 C. 39 　　　　　 D. 42 　　　　　 E. 43

35. Pooja bought a new car for $36,000. The value of Pooja's car depreciates 4% every year. Which function models the value of Pooja's new car after x years?
A. $y = 36000(1.04)^x$ 　 B. $y = 36000(4)^x$ 　　 C. $y = 36000(0.04)^x$ 　 D. $y = 36000(1.96)^x$ 　 E. $y = 36000(0.96)^x$

36. Simplify: $7((x^{-3}y^4z^0)^{-2})^3$
A. $\frac{7x^6}{y^8}$ 　　　　 B. $\frac{7x^{24}}{y^{18}}$ 　　　　 C. $\frac{7x^8}{y^{12}}$ 　　　　 D. $\frac{7y^{24}}{x^{18}}$ 　　　　 E. $\frac{7x^{18}}{y^{24}}$

37. Marcy has five cards numbered 1 through 5. Marcy places the cards in a bag. If Marcy reaches in the bag and pulls out three cards, without replacement, how many different three-digit numbers could Marcy make?
A. 36 　　　　　 B. 60 　　　　　 C. 48 　　　　　 D. 125 　　　　　 E. 100

38. The slope of a line is $-\frac{5}{4}$ and passes through the points $(-12, m)$ and $(4, -3)$. What is the value of m?
A. -15.8 　　　 B. -23 　　　 C. 14 　　　 D. 17 　　　 E. 11.6

39. Find m, if $x^{16} - 1 = (x^8 + 1) \cdot (x^4 + 1) \cdot m \cdot (x + 1) \cdot (x - 1)$.
A. $x^4 + 1$ 　　　 B. $x^4 - 1$ 　　　 C. $x^2 + 1$ 　　　 D. $x^2 - 1$ 　　　 E. $x^8 - 1$

40. Angel was given $4,000 when she turned 3 years old. Her parents invested it at a 2.5% interest rate compounded annually. No deposits or withdrawals were made. Which expression can be used to determine how much money Angel had in the account when she turned 18?
A. $4000(1 + 2.5)^{18}$ 　　 B. $4000(1 + 0.025)^{18}$ 　 C. $4000(1 + 2.5)^{15}$ 　　 D. $4000(1 + 0.25)^{15}$ 　 E. $4000(1 + 0.025)^{15}$

41. Solve for x: $-3\left|\frac{4-m}{3}\right| + 2 = 8$

A. $\{-10, 10\}$ B. $\{10\}$ C. $\{5\}$ D. $\{-10, 5\}$ E. no solution

42. Which equation can be used to solve for x?
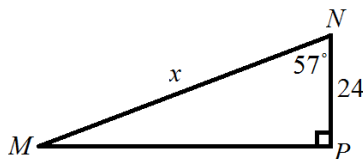
A. $\cos(57) = \frac{24}{x}$ B. $\tan(57) = \frac{24}{x}$ C. $\sin(57) = \frac{24}{x}$ D. $\sin(57) = \frac{x}{24}$ E. $\cos(57) = \frac{x}{24}$

43. The solution to the system $\begin{cases} 6x - y = 5 \\ y = 11x \end{cases}$ is (a, b) and the solution to the system $\begin{cases} 3x + y = -7 \\ x = y - 5 \end{cases}$ is (c, d). What is the value of $ac - bd$?

A. -17 B. -5 C. 19   D. 36   E. 25

44. Which of the following quadratic equations has a graph of a parabola that intersects the x-axis at only one point?
A. $y = 2x^2 + 4x$ B. $y = x^2 + 6x + 9$ C. $y = 9x^2 - 16$ D. $y = x^2 + 2x - 8$ E. $y = x^2 + 2$

45. An equilateral triangle with a side length of 12 inches is inscribed inside a circle. What is the diameter of the circle?

A. $8\sqrt{3}$ inches   B. $6\sqrt{3}$ inches   C. $4\sqrt{3}$ inches   D. $10\sqrt{2}$ inches   E. $9\sqrt{2}$ inches

46. Shelby is buying a shirt that costs $24.50 and a shirt that costs $13.50. Shelby has a coupon that is good for 20% off of all the clothes she is buying. If there is a 5% tax, what will be Shelby's total bill?
A. $32.16   B. $32.90   C. $36.48   D. $31.92   E. $34.56

47. What is the value of n, if $n! = 2^{10} \times 3^5 \times 5^2 \times 7 \times 11$?
A. 15   B. 12   C. 13   D. 18   E. 16

48. An advertising company is making a model to try and win new business from a surfing company. The model starts with cutting a semicircle out of wood with a diameter of 20 feet. Next, a smaller semicircle will be cut out of the larger one that has a diameter of 10 feet. What is the distance around the remaining piece of wood? Let $\pi = 3$.

10 ft   10 ft
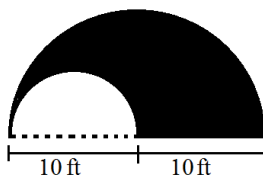
A. 45 ft   B. 50 ft   C. 55 ft   D. 60 ft   E. 75 ft

49. Simplify: $\frac{y^2 + 3y - 4}{y + 4}$

A. $y + 1$ B. $y - 1$ C. $y + 2$ D. $y - 4$ E. $y + 4$

50. Central Park Middle School has a student council of five boys and five girls. How many ways are there to form a committee consisting of two boys and three girls from the student council?
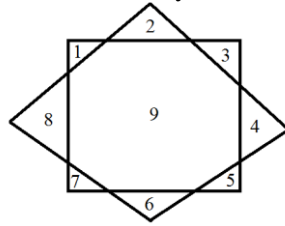A. 100   B. 1,200   C. 125   D. 150   E. 120

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

7. $499 + 597 = 1,096$. $1 + 0 + 9 + 6 = 16$.

17. 9 is the maximum number of regions that can be enclosed by two overlapping rectangles, as shown below.

18. $8, \frac{8}{3}, \frac{8}{9}, \frac{8}{27}, \ldots$ is the only geometric sequence. It has a common ratio of $\frac{1}{3}$.

20. To find the sum of the supplement and complement of an angle, subtract twice the angle measure from 270. We are asked to find the sum of the supplement and complement of an angle measuring $63.24°$. Following our rule, $270 - 2(63.24) = 270 - 126.48 = 143.52°$.

21. First assign l (length) = 40 mm, w (width) = 20 cm and h (height) = 16 cm. Now, change 40 mm to 4 cm. The volume of a rectangular prism is $V = lwh$. Substituting into the formula and $V = lwh = 4(20)(16) = 1,280$ cm^3.

23. 3,999 is the largest number that can be written in Roman numerals without using an overline bar.

29. The parent function of all quadratic functions is $f(x) = x^2$ or $y = x^2$.

31. If 60% of Lilly's friends like chocolate ice-cream and 48% like both chocolate ice-cream and strawberry ice-cream, then $\frac{48}{60} = \frac{4}{5} = 0.8 = 80\%$ of her friends that like chocolate ice-cream also like strawberry ice-cream.

33. If x = Jamie's age, then we have $(x + 6)(x - 6) = 288$. Multiply this out and $(x - 6)(x + 6) = x^2 - 36 = 288$. Add 36 to both sides and $x^2 = 324$. Square root both sides and Jamie is 18 years old.

41. Given $-3 \left|\frac{4-m}{3}\right| + 2 = 8$, first, subtract 2 from both sides and get $-3 \left|\frac{4-m}{3}\right| = 6$. Now, divide both sides by -3 and get $\left|\frac{4-m}{3}\right| = -2$. The answer is then "no solution" because the absolute value of any value cannot be equal to a negative number.

45. Because the triangle is an equilateral triangle, the central angles are all $120°$.
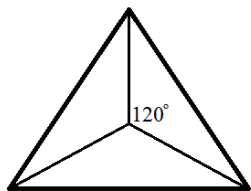
The ratio of an isosceles triangle with an included angle of $120°$ is as follows.
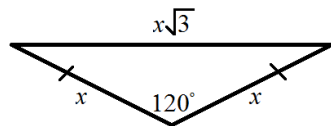
We are given that the triangle has a side length of 12 inches, so we make the equation $12 = x\sqrt{3}$. We divide by $\sqrt{3}$ and then get $\frac{12}{\sqrt{3}} = x$. Rationalize the denominator by multiplying by $\frac{\sqrt{3}}{\sqrt{3}}$ and we get $x = \frac{12}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{12\sqrt{3}}{3} = 4\sqrt{3}$. This value is also the radius of the circle. Double the radius to find the diameter, and thus, $2(4\sqrt{3}) = 8\sqrt{3}$ inches.

46. $24.5 + 13.5 = 38$. 20% of $38 = 0.2(38) = 7.6$. $38 - 7.6 = 30.4$. 5% of $30.4 = 1.52$. $30.4 + 1.52 = 31.92$. Shelby's total bill will be $31.92.