# TMSCA MIDDLE SCHOOL MATHEMATICS TEST #3 ©

# NOVEMBER 5, 2016

## 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. Anita has 239 pounds of apples, 41 pounds of oranges and 389 pounds of bananas. How may total pounds of fruit does Anita have?
A. 689          B. 678          C. 669          D. 599          E. 679

2. Marcie wants to subtract one-half of 98 from 234. What value will Marcie calculate?
A. 186          B. 136          C. 49          D. 59          E. 185

3. $246 \times 4 = 82 \times$ _____
A. 34          B. 24          C. 18          D. 16          E. 12

4. Which expression below produces the largest quotient?
A. $904 \div 4$          B. $456 \div 1.5$          C. $800 \div 25$          D. $1,736 \div 14$          E. $504 \div 0.2$

5. Let $A$ equal the GCF of 96 and 33 and let $B$ equal the LCM of those same numbers. Find the value of $B - A$.
A. 1,053          B. 526          C. 129          D. 3,168          E. 2,115

6. Cole is buying a snack that costs \$3.50. If there is a 6% tax, how much total will Cole have to pay for his snack?
A. \$3.68          B. \$4.11          C. \$3.79          D. \$3.83          E. \$3.71

7. $1,302 \div 14 =$ _____ (Roman numeral)
A. XCVIII          B. CXVIII          C. XMIII          D. XCIII          E. XCXIII

8. The net shown below is cut out and folded to form a number cube. Which number face will be opposite the face marked with a 6?
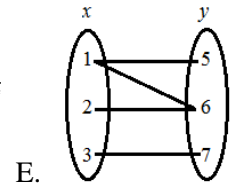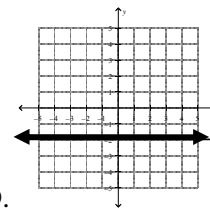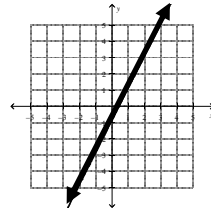
| | 2 | | |
|---|---|---|---|
| 4 | 6 | 8 | |
| | | 10 | 12 |
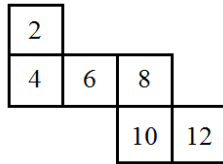
A. 2          B. 4          C. 8          D. 10          E. 12

9. The expression $\sqrt{16} + \sqrt{289} - \sqrt{324} + \sqrt{49}$ is equivalent to all but which of the following?
A. $2^2 + 2 \cdot 3$          B. $2(2+3)^0$          C. $3^2 + 1$          D. $2^4 - 2 \cdot 3$          E. $19 - 3^2$

10. If $(3x + 4y) - (-2y - 5x) + (-x + 7y) = Ax + By$, then find the value of $AB + 3^2$.
A. 66          B. 99          C. 9          D. 100          E. 73

11. $0.\overline{34} =$ _____ (fraction)
A. $\frac{17}{45}$          B. $\frac{34}{99}$          C. $\frac{17}{50}$          D. $\frac{17}{495}$          E. $\frac{17}{90}$

12. A trapezoid has bases measuring 12 inches and 20 inches and a height of 7 inches. A parallelogram has a height of 22 inches and a base of 13 inches. How much larger is the area of the parallelogram than the area of the trapezoid?
A. 168 in$^2$          B. 286 in$^2$          C. 112 in$^2$          D. 146 in$^2$          E. 174 in$^2$

13. If $x \boxtimes y = \frac{x^2 + y^2}{4}$, then find the value of $-2 \boxtimes 8$.
A. 9          B. 17          C. 15          D. 11          E. 12

14. The complement of a $56°$ angle is $x°$. What is the value of $x^2$?
A. 1,156          B. 12,260          C. 15,376          D. 1,482          E. 3,750

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15. Which representation does not show $y$ as a function of $x$?

| $x$ | 3 | 5 | 7 | 9 | 11 |
|-----|---|---|---|---|----|
| $y$ | 6 | 7 | 8 | 8 | 13 |

A.                                    B. {(3, 2), (4, 3), (5, 2), (1, 7)}   C.                                    D.                                    E.

16. Pat has $12.60 in her pocket that consists of 48 dimes and the rest nickels.  Riley has half as many nickels as Pat along with 14 quarters.  How much money does Riley have?
A. $7.40                 B. $78.00                 C. $14.60                 D. $3.80                 E. $6.80

17. What is the sum of all the perfect squares less than or equal to 200?
A. 1,014                 B. 1,216                 C. 1,015                 D. 1,105                 E. 1,117

18. $9 + 11 + 13 + \ldots + 27 =$ _____
A. 171                   B. 162                   C. 180                   D. 182                   E. 209

19. If $\frac{2}{3}x - 5 = 39$, then find the value of $\frac{1}{2}x - 411$.
A. -378                  B. -385.5                C. -395.5                D. -345                  E. $-400$

20. Anita is holding a prism that has 11 faces, 27 edges and 18 vertices.  Which prism is Anita holding?
A. rectangular prism     B. octagonal prism       C. hexagonal prism       D. heptagonal prism      E. nonagonal prism

21. Using the box-and-whisker plot below, what is the value of the interquartile range subtracted from the range?

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     22  23  24  25  26  27  28  29  30
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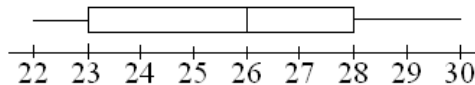
A. 1                     B. 12                    C. 7                     D. 3                     E. 5

22. What is the unit's digit of $8^{24}$?
A. 8                     B. 2                     C. 6                     D. 4                     E. 0

23. $\frac{3}{4}$ of $\frac{1}{2}$ of 30% of 12,000,000,000 = _____ (scientific notation)
A. $1.35 \times 10^9$    B. $3.6 \times 10^9$     C. $1.8 \times 10^9$     D. $1.85 \times 10^9$    E. $4.25 \times 10^9$

24. What is the sum of the 18th and 24th terms of the sequence?    -21, -17, -13, -9, …
A. 112                   B. 116                   C. 118                   D. 120                   E. 122

25. A right triangle has legs measuring seven inches and twenty-four inches.  If all the side lengths of the triangle were doubled, what would be the new perimeter of the triangle?
A. 56 inches             B. 63 inches             C. 88 inches             D. 112 inches            E. 119 inches

26. What is the sum of the range of the function $f(x) = 3x - 19$, when the domain is {-27, -3, 18}?
A. -78                   B. -128                  C. -163                  D. -93                   E. -20

27. *Feel the Ocean Pool Cleaning* charges $75.00 for an initial visit plus $95.00 per hour for labor.  Mitchel's bill for his pool repair was $645.  How many hours of labor was Mitchel charged for his repair?
A. 8                     B. 7                     C. 10                    D. 6                     E. 9

28. Stacy deposits $420 into a simple interest account for 10 years at 5%. Matt deposits $360 into a simple interest account for 10 years at 6.5%. How much more interest will matt acquire than Stacy?
A. $18.00     B. $60.00     C. $24.00     D. $36.00     E. $28.00

29. In the picture below, $AB = 57$. How long is a line segment drawn perpendicular to $\overline{AB}$ that is five times as long as $CB$?

A —— $4x$ —— C —— $x - 3$ —— B

A. 48 units     B. 45 units     C. 40 units     D. 50 units     E. 35 units

30. What is the sum of all the two-digit multiples of the number 13?
A. 378     B. 351     C. 364     D. 377     E. 390

31. $3{,}904 \div 32 = $ _____ (base 9)
A. 145     B. 122     C. 433     D. 156     E. 127

32. Using the graph below, find the value of $f(-3) + f(7)$.
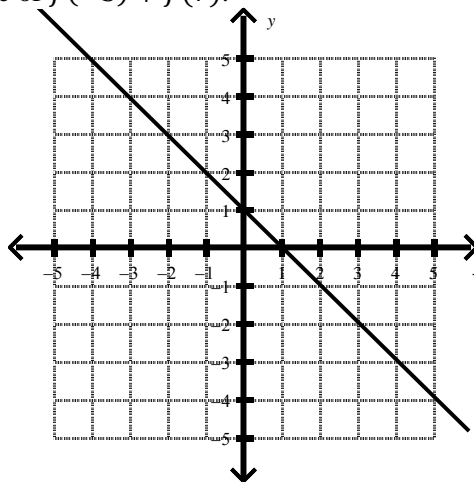
A. -5     B. -2     C. 3     D. -7     E. 4

33. Simplify: $3\left(\dfrac{4a^2 b^5}{2a^{-1}b}\right)$
A. $5a^2 b^4$     B. $6a^2 b^4$     C. $6a^3 b^5$     D. $6a^3 b^4$     E. $2a^3 b^5$

34. On a number line, $X$ and $Y$ are located at 16 and 40, respectively. $Z$ is the midpoint of $\overline{XY}$ and $W$ is the midpoint of $\overline{XZ}$. Find the measure of $\overline{XZ}$.
A. 6 units     B. 24 units     C. 12 units     D. 28 units     E. 14 units

35. The odds of winning the state playoffs is 3:11. What is the probability of not winning the state playoffs?
A. 8:11     B. 4:7     C. 3:7     D. 11:14     E. 9:14

36. A parabola with an equation of $y = 4x^2 + 8 - 24x$ is translated to the left five units. What is the equation of parabola's axis of symmetry after the translation?
A. $x = -1$     B. $x = -2$     C. $x = -3$     D. $x = 3$     E. $x = -5$

37. What is the measure of an interior angle of a regular octagon?
A. $180^{\circ}$     B. $120^{\circ}$     C. $135^{\circ}$     D. $155^{\circ}$     E. $165^{\circ}$

38. What is the circumference of a circle with an equation of $2(x+4)^2 + 2(y-7)^2 = 338$?

A. $26\pi$ units    B. $169\pi$ units    C. $26\sqrt{2}\pi$ units    D. $13\sqrt{2}\pi$ units    E. $2\sqrt{26}\pi$ units

39. The geometric mean of the numbers 32 and 18 is how much greater than -7?

A. 32    B. 18    C. 43    D. 11    E. 31

40. Line $M$ passes through the points (-16, -15) and (12, 6).  What is the new $y$-intercept of $M$, after $M$ is translated to the right eight units?

A. -9    B. -11    C. 5    D. -13    E. 2

41. What are the roots of the equation $y = x^2 + 6x - 14$?

A. $-3 \pm \sqrt{23}$    B. $3 \pm \sqrt{23}$    C. $-3 \pm 2\sqrt{23}$    D. $3 \pm 2\sqrt{23}$    E. $-6 \pm 2\sqrt{23}$

42. The angles in a triangle are in a ratio of 5:9:22.  What is the complement of the smallest of these angles?

A. $65°$    B. $45°$    C. $25°$    D. $58°$    E. $85°$

43. At a school festival, student tickets cost $1.50 and adult tickets cost $4.00.  On Friday, 900 people attended the festival and on Saturday 1,300 people attended the festival.  The total sales for both days was $5,050.  How many more students attended the festival over the two days than adults?

A. 800    B. 700    C. 900    D. 1,000    E. 300

44. Which of the following equations models a fish population of 45,000 decreasing at a rate of 30% for 8 years?

A. $y = 45000(1.3)^8$    B. $y = 45000(1.8)^{0.3}$    C. $y = 45000(0.3)^8$    D. $y = 45000(0.7)^8$    E. $y = 45000(8)^{0.3}$

45. $\frac{7}{9x} + \frac{2}{x} =$ _____

A. $\frac{9}{10x}$    B. $\frac{14}{9x^2}$    C. $\frac{1}{x^2}$    D. $\frac{16}{9x}$    E. $\frac{25}{9x}$

46. If $3\sqrt{250} = A\sqrt{10}$ and $4\sqrt{40} = B\sqrt{10}$, what is the value of $A + B$?

A. 23    B. 9    C. 13    D. 19    E. 17

47. The equation $|2x - 11| = 89$ has two solutions, $A$ and $B$.  If $A < B$, what is the value of $B - A$?

A. 11    B. 100    C. 50    D. 89    E. 78

48. The sum of four consecutive positive integers is 254.  What is the value of one-third of the second smallest integer if one-half of the smallest integer and one-fifth of the largest integer sum to 44?

A. 33    B. 61    C. 35    D. 24    E. 21

49. What is the volume of the cone below in terms of $\pi$?



9 in    12 in    15 in
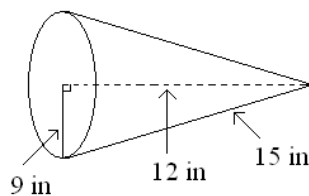
A. $324\pi$ in$^3$    B. $972\pi$ in$^3$    C. $486\pi$ in$^3$    D. $216\pi$ in$^3$    E. $432\pi$ in$^3$

50. If $A = \frac{24}{\sqrt{6}}$, then find the value of $\frac{12}{A}$.

A. $\frac{\sqrt{6}}{3}$    B. $\frac{\sqrt{6}}{2}$    C. $\frac{2\sqrt{6}}{3}$    D. $\frac{3\sqrt{6}}{2}$    E. $\frac{3\sqrt{6}}{4}$

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

14. The complement of a $56°$ angle is $90 - 56 = 34$. $34^2 = 1,156$.

26. We are given the function $f(x) = 3x - 19$ and a domain of {-27, -3, 18}. To find the range values, substitute each domain value in for $x$. The range values are then $f(-27) = 3(-27) - 19 = -100$, $f(-3) = 3(-3) - 19 = -28$ and $f(18) = 3(18) - 19 = 35$. Thus our range values are -100, -28 and 35. Their sum is $-100 + (-28) + 35 = -93$.

27. *Feel the Ocean Pool Cleaning* charges $75.00 for an initial visit plus $95.00 per hour for labor. Make an equation to model this, $y = 95x + 75$, where $y$ equals total cost and $x$ equals number of hours of labor. We are given a total of $645. Substitute this in for $y$, and we have the equation $645 = 95x + 75$. Now, subtract 75 from both sides and we get $570 = 95x$. Dividing by 95 and we get $x = 6$ hours of labor.

30. The two-digit multiples of 13 are 13, 26, 39, 52, 65, 78, and 91. The sum of all the two-digit multiples of 13 is $13 + 26 + 39 + 52 + 65 + 78 + 91 = 364$.

33. $3\left(\frac{4a^2 b^5}{2a^{-1}b}\right) = 3\left(\frac{2a^2 a^1 b^5}{b}\right) = 3(2a^{2+1}b^{5-1}) = 3(2a^3 b^4) = 6a^3 b^4$.

38. The equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$. We are given the equation $2(x + 4)^2 + 2(y - 7)^2 = 338$, so we must first divide both sides by 2 and get the equation $(x + 4)^2 + (y - 7)^2 = 169$. We now see our radius is 13 because $\sqrt{169} = 13$. Since we have our radius, we use the formula $C = 2\pi r$. $C = 2\pi(13) = 26\pi$ units.

39. The geometric mean of two number $a$ and $b$ is equal to $\sqrt{ab}$. We are given the numbers 32 and 18, so $\sqrt{32 \cdot 18} = \sqrt{2^5 \cdot 2 \cdot 3^2} = \sqrt{2^6 \cdot 3^2} = 2^3 \cdot 3 = 24$. Now, $24 - (-7) = 31$.

45. To add the fractions $\frac{7}{9x}$ and $\frac{2}{x}$, we must have a common denominator of $9x$. First, $\frac{2}{x} \cdot \frac{9}{9} = \frac{18}{9x}$. Now we can add the two fractions. $\frac{7}{9x} + \frac{18}{9x} = \frac{25}{9x}$.

47. To solve $|2x - 11| = 89$, rewrite using two equations. $2x - 11 = 89$ and $2x - 11 = -89$. Solving each equation and we get 50 and -39. If $A < B$, then $A = -39$ and $B = 50$. $B - A = 50 - (-39) = 89$.

50. We must simplify $\frac{24}{\sqrt{6}}$ by first rationalizing the denominator. $\frac{24}{\sqrt{6}} = \frac{24}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{24\sqrt{6}}{6}$. Next, we simplify and see that $A = \frac{24\sqrt{6}}{6} = 4\sqrt{6}$. Now we substitute into $\frac{12}{A}$ and get $\frac{12}{4\sqrt{6}}$. Simplify $\frac{12}{4\sqrt{6}}$ to get $\frac{3}{\sqrt{6}}$. We must now rationalize the denominator again and see that $\frac{3}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{6}}{6} = \frac{\sqrt{6}}{2}$.