TMSCA MIDDLE SCHOOL MATHEMATICS

TEST#11A ©

FEBRUARY 20, 2021

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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2020 – 2021 TMSCA Middle School Mathematics Test #11A

1. $132\frac{2}{5} + 35\frac{4}{5} + \frac{1}{10} =$ _____

A. $168\frac{7}{10}$ B. $168\frac{13}{20}$ C. $168\frac{3}{10}$ D. $168\frac{9}{10}$ E. $168\frac{7}{20}$

2. $-173 - (-731) - 377 =$ _____

A. -549 B. -550 C. 253 D. 176 E. 181

3. $4\frac{4}{5} \cdot \frac{3}{2} \cdot \frac{1}{4} =$ _____

A. 1.8 B. 1.25 C. 1.6 D. 1.75 E. 1.5

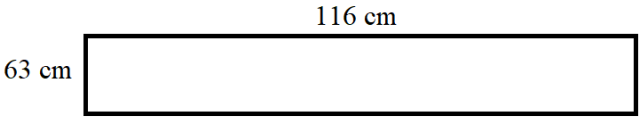
4. $26\frac{9}{10} \div 0.4 =$ _____ (nearest tenth)

A. 68.1 B. 68.2 C. 67.1 D. 67.2 E. 67.3

5. 7 miles + 135 yards = _____ feet

A. 74,730 B. 72,120 C. 37,365 D. 74,735 E. 36,065

6. An equilateral triangle has a side length of 43 cm. What is the sum of the perimeters of the triangle and the rectangle below?



A. 487 cm B. 431 cm C. 288 cm D. 564 cm E. 401 cm

7. What is the remainder when the number 211 is divided by 19?

A. 3 B. 11 C. 2 D. 16 E. 7

8. Simplify: $\frac{4-n}{3} = 24$

A. -68 B. 68 C. 76 D. 72 E. -76

9. What is the sum of the next three terms of the sequence 1, 2, 4, 7, 11, 16, 22, 29, …?

A. 127 B. 169 C. 141 D. 139 E. 137

10. What is the product of the number of diagonals from one vertex of a regular dodecagon and the total number of diagonals that can be drawn in a regular hexagon?

A. 27 B. 54 C. 121 D. 81 E. 63

11. The cost of a new shirt is $12.50. What is the total bill if the tax is 9.2%?

A. $13.75 B. $13.65 C. $13.85 D. $13.25 E. $13.45

12. Marcus is working out with a weight that weighs 360 ounces. How many pounds is the weight Marcus is using?

A. 25 pounds B. 22.5 pounds C. 27.5 pounds D. 20 pounds E. 17.5 pounds

13. The time now is 10:05 am. How many minutes will have passed when the time is 5:49 pm?

A. 428 B. 472 C. 486 D. 464 E. 456

14. What is the volume of a cube with a surface area of 384 cm^2?

A. 192 cm^3 B. 512 cm^3 C. 216 cm^3 D. 432 cm^3 E. 648 cm^3

15. 65 grams + 127 dekagrams + 19 hectograms = _____ centigrams
A. 211,000 B. 382,000 C. 323,500 D. 152,500 E. 967,500

16. If $m\angle A$ is 48° less than its supplement, what is the measure of the complement of $\angle A$?
A. 24° B. 42° C. 132° D. 28° E. 32°

17. A rhombus has an area of 306 units^2 and one diagonal measuring 34 units. What is the length of the other diagonal?
A. 16 units B. 9 units C. 18 units D. 8 units E. 17 units

18. Mindy sold one-third as many subscriptions as Callum. Callum sold 21 less subscriptions than David. David sold twice as many subscriptions as Nicky. If Nicky sold 33 subscriptions, how many subscriptions did Mindy sell?
A. 11 B. 18 C. 16 D. 15 E. 21

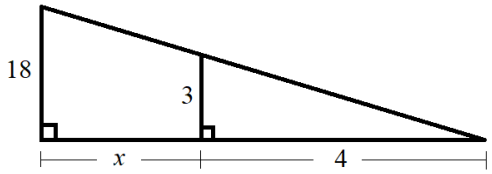
19. Of 50 people surveyed, 35 like cheese pizza, 33 like pepperoni, and 18 like both. If a person were selected at random from this group, what would be the probability the person only likes cheese pizza?
A. 36% B. 30% C. 66% D. 52% E. 34%

20. What is the value of the upper-quartile of the set of numbers 182, 193, 176, 187, 242, 219, and 147?
A. 212.5 B. 214.5 C. 197.5 D. 219 E. 206

21. What is the unit's digit of 14^5?
A. 4 B. 6 C. 8 D. 2 E. 0

22. $MDCCCLIV + CCCLXXXVII + MMMDCCLXII$ = _____ (Arabic number)
A. 6,143 B. 6,923 C. 6,123 D. 6,003 E. 6,303

23. What is the value of *x*, using the picture below?



A. 32 B. 24 C. 20 D. 16 E. 28

24. Two friends split a lunch bill of $32.00. If they leave an 18% tip, how much does each person pay?
A. $17.18 B. $17.28 C. $18.88 D. $18.68 E. $18.28

25. What is the positive difference of the LCM of the numbers 12 and 20 and the LCM of the numbers 30 and 32?
A. 420 B. 360 C. 480 D. 540 E. 390

26. What is the slope of any line perpendicular to the line with the equation $\frac{5}{3}x - \frac{1}{6}y = \frac{5}{9}$?
A. 10 B. $-\frac{1}{10}$ C. $-\frac{10}{3}$ D. $\frac{3}{10}$ E. -3

27. Noah has one green standard die and one blue standard die. What is the probability Noah rolls his pair of dice and not getting a 6 on the green die and not getting a 4 on the blue die?
A. $\frac{25}{36}$ B. $\frac{2}{3}$ C. $\frac{1}{6}$ D. $\frac{5}{6}$ E. $\frac{11}{12}$

28. $(x-1)(2x-1)+(2x+3)(x-3)=$_____
A. $4x^2-6x-8$ B. $4x^2-4x-6$ C. $2x^2-8x-6$ D. $4x^2-8x-6$ E. $4x^2-2x-8$

29. $403_{12}+116_9=$ _____$_{10}$
A. 565 B. 695 C. 495 D. 515 E. 675

30. How many miles can a bicyclist travel in 24 minutes if they travel $\frac{2}{5}$ as fast as a car going 40 miles per hour?
A. 5.8 miles B. 8.4 miles C. 5.6 miles D. 6.4 miles E. 7.6 miles

31. What is the measure of an exterior angle of a regular 18-sided polygon?
A. 36° B. 24° C. 20° D. 18° E. 16°

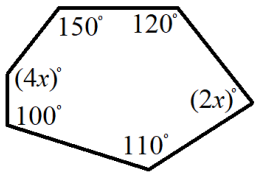
32. How many outcomes are possible if four standard dice are rolled?
A. 1,296 B. 1,324 C. 1,648 D. 1,282 E. 1,964

33. If $a \heartsuit b = \frac{3}{4}a - 6b$, what is the value of $20 \heartsuit (40 \heartsuit 4)$?
A. -7 B. -21 C. -14 D. -28 E. -35

34. What is the perimeter of the square, which can be divided into two rectangles whose areas are 122 units^2 and 134 units^2?
A. 64 units B. 256 units C. 84 units D. 48 units E. 96 units

35. Gray has a sculpture worth \$800, that will increase in value every year at a rate of 5.5%. Which function models how much the sculpture will be worth after x years?
A. $y=800(0.055)^x$ B. $y=0.055x+800$ C. $y=1.055x+800$ D. $y=800(1.55)^x$ E. $y=800(1.055)^x$

36. What is the value of x in the picture below?



A. 60 B. 20 C. 25 D. 40 E. 35

37. In terms of π, circle Q has a circumference of 18π cm. If the radius of circle Q were to be tripled, what would be the area of the new circle Q?
A. 324π cm^2 B. 729π cm^2 C. $2{,}916\pi$ cm^2 D. 576π cm^2 E. $1{,}458\pi$ cm^2

38. $\frac{\sqrt{30}}{\sqrt{45}}$ is equivalent to which of the following?
A. $\frac{2}{3}$ B. $\frac{\sqrt{3}}{2}$ C. $\frac{\sqrt{6}}{3}$ D. $\frac{\sqrt{6}}{2}$ E. $\frac{\sqrt{2}}{5}$

39. If you roll a pair of octahedron, each numbered 1 – 8, what is the probability of a sum equal to 6, 7, or 8 face up?
A. $\frac{5}{16}$ B. $\frac{1}{4}$ C. $\frac{7}{64}$ D. $\frac{7}{32}$ E. $\frac{9}{32}$

40. Which of the following sets is a Pythagorean Triple?
A. {12, 12, 15} B. {9, 41, 40} C. {14, 46, 48} D. {24, 45, 54} E. {13, 15, 21}

41. Two consecutive positive integers, *A* and *B*, have a product of 552. If *A* > *B*, find $\sqrt{A}$.
A. $2\sqrt{6}$ B. $2\sqrt{7}$ C. $\sqrt{23}$ D. $4\sqrt{2}$ E. $3\sqrt{6}$

42. What is the discriminant of the quadratic equation $0 = (x-7)(2x+5)$?
A. 199 B. 271 C. 289 D. 361 E. 343

43. What is the sum of all the numbers less than 18 that are relatively prime to 18?
A. 73 B. 64 C. 81 D. 46 E. 54

44. If $f(x) = x^{-1}, g(x) = \frac{2}{x^{-2}}$ and $h(x) = x^{-x}$, what is the value of $8f(4) + g(6) + h(-2)$?
A. 78 B. 72 C. 74 D. 84 E. 86

45. The solution to the system $\begin{cases} \frac{1}{2}a + \frac{5}{3}b = -25 \\ 2a + 3b = -34 \end{cases}$ is (a, b). What is the value of $\frac{40}{a} + \frac{b}{3}$?
A. -2 B. 4 C. -6 D. $-1/6$ E. $-5/6$

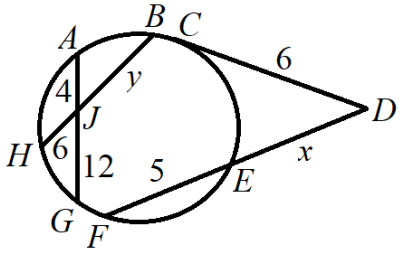
46. $\frac{12a^2b}{2ab^{-2}} \div \frac{8a^{-2}b}{a^{-1}b^3} \div \frac{2ab}{a^2b^{-1}} =$ _____
A. $\frac{3a^2}{2b^2}$ B. $\frac{3a^3}{2b^3}$ C. $\frac{3a^3b^3}{8}$ D. $\frac{3a^2b^3}{8}$ E. $\frac{3a^2}{8b^3}$

47. A circle has the equation $x^2 + y^2 - 6y = 5$. Which of the following is the same circle equation in center-radius form?
A. $x^2 + (y-6)^2 = 19$ B. $x^2 + (y-3)^2 = 14$ C. $x^2 + (y-6)^2 = 14$ D. $x^2 + (y+3)^2 = -1$ E. $x^2 + (y+3)^2 = 1$

48. A line segment with endpoints $A(-6,-1)$ and $B(-2,4)$ is extended, through *B*, to point *C*. If $BC = 3AB$, what are the coordinates of point *C*?
A. (12, 15) B. (12, 21) C. (10, 19) D. (11, 20) E. (11, 21)

49. $\frac{3x^2+6x-72}{3x^2+12x-36}$ can be simplified to which of the following?
A. $\frac{x-3}{x-2}$ B. $\frac{x-3}{x-6}$ C. $\frac{x-4}{x-6}$ D. $\frac{x-4}{x-2}$ E. $\frac{x-6}{x-4}$

50. In the circle below, $\overline{AG}$ intersects $\overline{BH}$ at point *J*, tangent $\overline{CD}$ intersects secant $\overline{FD}$ at point *D*, *AJ* = 4, *BJ* = *y*, *CD* = 6, *ED* = *x*, *FE* = 5, *GJ* = 12 and *HJ* = 6. What is the value of *x* + *y*?



A. 9 B. 16 C. 15 D. 14 E. 12

2020 – 2021 TMSCA Middle School Mathematics Test #11A Answer Key

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

12. Since 16 ounces = 1 pound, 360 ounces = $360 \div 16 = 22.5$ pounds.

14. The formula for surface area of a cube is $SA = 6s^2$, where *s* is the side length. We are given a square with a surface area of 384 cm^2. We make the equation $384 = 6s^2$. Dividing both sides by 6 and we get $s^2 = 64$, and $s = \sqrt{64} = 8$ cm. The formula for volume of a cube is $V = s^3$. Therefore, the volume of the cube, with a surface area of 384 cm^2, is $8^3 = 512$ cm^3.

24. If the bill is \$32, and they want to leave an 18% tip, the total bill is 32(1.18) = \$37.76. Since the bill will be split between the two friends, each person will pay $37.76 \div 2 = \$18.88$.

31. To find the exterior angle of a regular polygon, use $\frac{360}{n}$, where *n* is the number of sides of the polygon. We are given an 18-sided polygon, so its exterior angle measure is $\frac{360}{18} = 20^\circ$.

32. An die has 6 sides. If four dice are rolled, then there is a total of $6 \times 6 \times 6 \times 6 = 1{,}296$ outcomes.

36. The shape given is a hexagon. A hexagon has a total of (6 – 2)180 = 4(180) = 720°. We can make the equation $4x + 150 + 120 + 2x + 110 + 100 = 720$. This simplifies to $6x + 480 = 720$. Subtract 480 from both sides and get 6*x* = 240. Divide both sides by 6 and get *x* = 40.

37. The circumference of a circle is found by $C = \pi d$. Circle *Q* as a circumference of 18π cm. So, we can make the equation $18\pi = \pi d$. Dividing both sides by π, we get 18 = *d*. If the diameter is 18, then the radius is 9. Tripling 9 gives us 3(9) = 27. The formula for area of a circle is $A = \pi r^2$. In terms of π, the area of the new circle is then $27^2\pi = 729\pi$ cm^2.

38. $\frac{\sqrt{30}}{\sqrt{45}}$ can be rewritten as $\sqrt{\frac{30}{45}} = \sqrt{\frac{2}{3}} = \frac{\sqrt{2}}{\sqrt{3}}$. We have to rationalize the denominator to get $\frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$.

41. Let *x* equal the smaller positive integer. Since the two integers are consecutive, we can make the equation $x(x + 1) = 552$. This expands to $x^2 + x = 552$. Subtract 552 from both sides and get $x^2 + x - 552 = 0$. This factors to $(x - 23)(x + 24) = 0$. Setting each factor equal to 0 and solving gives us $x = -24$ and 23. Since the integers are positive, they are 23 and 24. 24 is the larger integer, so therefore, $\sqrt{24} = \sqrt{4 \cdot 6} = 2\sqrt{6}$.

43. There are 6 numbers less than 18 that are relatively prim to 18. They are 1, 5, 7, 11, 13, and 17. The sum of these numbers is 1 + 5 + 7 + 11 + 13 + 17 = 54.

44. If $f(x) = x^{-1}, g(x) = \frac{2}{x^{-2}}$ and $h(x) = x^{-x}$, then $8f(4) = 8 \cdot 4^{-1} = 8 \cdot \frac{1}{4} = 2$, $g(6) = \frac{2}{6^{-2}} = 2 \cdot 6^2 = 72$, and $h(-2) = (-2)^{-(-2)} = (-2)^2 = 4$. Therefore, $8f(4) + g(6) + h(-2) = 2 + 72 + 4 = 78$.

49. $\frac{3x^2+6x-72}{3x^2+12x-36} = \frac{3(x^2+2x-24)}{3(x^2+4x-12)} = \frac{3(x-4)(x+6)}{3(x-2)(x+6)} = \frac{x-4}{x-2}$.