T M S C A   M I D D L E   S C H O O L

M A T H E M A T I C S

T E S T   # 4 ©

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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. Which of the choices below has the greatest value?
A. 3,010 – 89   B. 2,913 + 7.5   C. 5,001 – 3,076   D. 4,000 – 1,852   E. 1,904 + 1,001

2. In twenty-nine years, Michelle's great-grandmother will celebrate her ninety-eighth birthday. How old is Michelle's great-grandmother now?
A. 72   B. 83   C. 69   D. 91   E. 79

3. Mark took a quiz where each true/false question was worth 6 points and each multiple choice question was worth 8 points. What was Mark's score if he correctly answered 8 true/false and 5 multiple choice questions?
A. 92   B. 90   C. 94   D. 86   E. 88

4. Ahem is going to split his 444 pieces of candy equally amongst three friends and himself. How many pieces of candy will each person receive?
A. 111   B. 76   C. 68   D. 88   E. 84

5. *Egg World* sells eggs in 6-pack cartons or 12-pack cartons. What is the least number of cartons needed for *Egg World* to sell 54 eggs?
A. 4 cartons   B. 5 cartons   C. 6 cartons   D. 9 cartons   E. 12 cartons

6. What is the prime factorization of the sum of the digits of the number 2,976?
A. $2^2 \cdot 3^2$ B. 24   C. $4 \cdot 6$ D. $2^3 \cdot 3$ E. $2^2 \cdot 3^3 \cdot 7$

7. Clayton is writing the word *Mathematics,* in which he will write one letter each day. Clayton will write the first letter on a Tuesday. What day of the week will he finish writing the word *Mathematics*?
A. Wednesday   B. Thursday   C. Saturday   D. Friday   E. Monday

8. Find the area of the shaded region in the picture below.
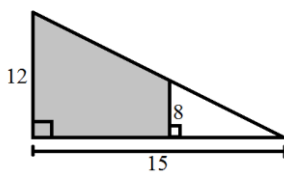
A. 40 units^2 B. 50 units^2 C. 60 units^2 D. 90 units^2 E. 180 units^2

9. Callie has a cube and a triangular prism. How many total edges are there in Callie's objects?
A. 18   B. 14   C. 11   D. 24   E. 21

10. Miguel saved dimes on six consecutive days. On the first day, Miguel saved 1 dime, and on each consecutive day he saved twice as many dimes as the day before. By the end of the sixth day, how much money did Miguel have?
A. $6.10   B. $5.90   C. $0.63   D. $7.10   E. $6.30

11. Melissa drew an angle on a sheet of paper. Rachel then drew an angle that measured twice the complement of Melissa's angle, which came out to be 46°. What was the measure of Melissa's angle?
A. 67° B. 44° C. 23° D. 113° E. 92°

12. Anya's three brothers' ages are 23, 42, and 22. What is the mean age of the three brothers?
A. 33   B. 32   C. 31   D. 30   E. 29

13. Sydney wrote down all the numbers from 1 to 30, inclusive. How many total digits did Sydney write down?
A. 42   B. 53   C. 51   D. 31   E. 59

14. Shamika sleeps for one-quarter of the day. Shamika's little sister sleeps for two-thirds of twice as much as Shamika. What percentage of the day does Shamika's sister sleep of a day?
A. 25% B. 66 ⅔% C. 40% D. 33 ⅓% E. 75%

15. Jason rolls a number cube labeled 1 – 6, and it lands with the number 4 facing up. What is the sum of the lateral faces of the number cube?
A. 12 B. 14 C. 10 D. 16 E. 18

16. Zack has a piece of wood measuring 321 centimeters. He cut off 120 millimeters. How much of the piece of wood remain?
A. 311 cm B. 314 cm C. 309 cm D. 201 cm E. 301 cm

17. What is the value of the reciprocal of the number 0.42?
A. $\frac{21}{50}$ B. $\frac{5}{11}$ C. $\frac{50}{21}$ D. $\frac{11}{5}$ E. $\frac{100}{21}$

18. 27 small cubes were put together to form one large cube. If the lateral faces of the large cube were painted red, how many of the small cubes has only one of their faces painted red?
A. 24 B. 4 C. 8 D. 6 E. 18

19. $n \cdot n^2 \cdot n^7 \cdot n \cdot n \cdot n$ is _____ when written in exponential form.
A. n^{11} B. n^{10} C. n^{13} D. n^{12} E. n^{18}

20. Square $ABCD$ has a side length of 10 inches. Point E is 10 inches from point D and 3 inches from $\overline{BC}$. What is the area of ΔDEA?
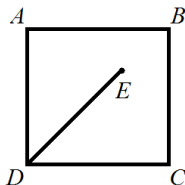
A. 15 in^2 B. 30 in^2 C. 35 in^2 D. 40 in^2 E. 25 in^2

21. It takes 24 ounces of lime juice to make five tubs of sorbet. How many tubs will 96 ounces of lime juice make?
A. 16 B. 17 C. 18 D. 19 E. 20

22. Use the stem-and-leaf plot below to find the median of the data.

$$\begin{array}{c|cccc} 2 & 1 & 1 & 6 & 9 \\ 3 & 3 & 5 & 5 \\ 4 & 4 & 4 & 6 \end{array} \qquad key: 2|1 = 21$$

A. 34 B. 25 C. 67 D. 44 E. 26

23. Name the polynomial $3x - 2x^2$.
A. linear monomial B. linear binomial C. quadratic trinomial D. quadratic binomial E. cubic binomial

24. The point (-7, 8) is reflected over the *y*-axis and then over the *x*-axis. What are the point's new coordinates?
A. (7, 8) B. (-7, 8) C. (8, -7) D. (7, -8) E. (-7, -8)

25. Quadrilateral $ABCD$ has vertices A(-5, 4), B(8, 4) and C(-7, -3). What are the coordinates of point D to make quadrilateral $ABCD$ a parallelogram?
A. (-5, 3) B. (6, -3) C. (10, -3) D. (2, 4) E. (12, 0)

26. Lindsey guessed that 40 is 30% of 120. What is the positive difference between her guess and the actual amount of 30% of 120?

A. 16   B. 4   C. 12   D. 2   E. 10

27. In the isosceles trapezoid below, the measure of $\angle ACD$ is $74°$. What is the measure of $\angle DBA$?
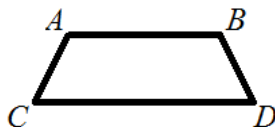
A. $16°$ B. $174°$ C. $116°$ D. $74°$ E. $106°$

28. Timothy goes to the bank and deposits five $20 bills, eight $10 bills and fifteen $5 bills into a simple interest account at 3% for 10 years. How much interest will he acquire after the ten years?

A. $76.75   B. $331.50   C. $331.75   D. $76.50   E. $105.00

29. The jets won 12 out of 20 games they played last season. Which of the following represents the ratio of the Jets' losses to wins?

A. 2:3   B. 2:5   C. 5:2   D. 3:5   E. 1:3

30. $m^{\frac{7}{3}}$ is equivalent to which of the following?

A. $\sqrt[7]{m^3}$ B. $\sqrt[3]{m^7}$ C. $\left(\sqrt[7]{m}\right)^3$ D. $m^{-\frac{7}{3}}$ E. $m^{-\frac{3}{7}}$

31. Three consecutive positive integers sum to 219. What is the prime factorization of the smallest integer?

A. $2^3 \cdot 3^3$ B. $2^2 \cdot 3^3$ C. $2^4 \cdot 3^3$ D. $2^3 \cdot 3^2$ E. $2^2 \cdot 3^2$

32. A grocery store sells whole chickens for $2.13 per pound. What would be the cost of a chicken that weighs 3⅓ pounds?

A. $7.40   B. $7.35   C. $7.10   D. $6.80   E. $7.30

33. Steve's tree in his front yard if 650 centimeters tall. How many meters tall is Steve's tree?

A. 6,500   B. 650   C. 65   D. 6.5   E. 0.65

34. ΔABC was dilated by a scale factor of ½ with the origin as the center of dilation to create $\Delta A'B'C'$. Which rule best represents the dilation that was applied to ΔABC to create $\Delta A'B'C'$?

A. $(x,y) \rightarrow \left(x + \frac{1}{2}, y + \frac{1}{2}\right)$ B. $(x,y) \rightarrow \left(x - \frac{1}{2}, y - \frac{1}{2}\right)$ C. $(x,y) \rightarrow \left(\frac{1}{2}x, \frac{1}{2}y\right)$ D. $(x,y) \rightarrow (2x, 2y)$ E. $(x,y) \rightarrow (x,y)$

35. How many cubes were needed to create the figure below?
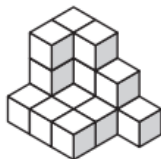
A. 12   B. 10   C. 18   D. 17   E. 15

36. What is the area of a triangle with vertices located at (-2, 3), (8, 3) and (8, 8)?

A. 25 units^2 B. 40 units^2 C. 50 units^2 D. 15 units^2 E. 45 units^2

37. Which linear equation below possesses a positive slope?

A. $-4x - 2y = 8$ B. $y = -½x + 6$ C. $3y - 3x = 120$ D. $5x + 2y = -7$ E. $y = -x$

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38. What are the coordinates of the vertex of the quadratic equation $y = 3(x - 7)^2 + 5$?
A. (-7, 5)   B. (3, -2)   C. (3, 5)   D. (7, 5)   E. (-4, 5)

39. Three bilps and four wilps equal $47. Six bilps and two wilps equal $46. How much is one bilp?
A. $5.00   B. $8.00   C. $6.00   D. $7.00   E. $9.00

40. The geometric mean of the numbers 24 and 6 is one more than a number M. What is the value of M?
A. 144   B. 29   C. 14   D. 13   E. 11

41. Anita decreased her daily intake of water from 64 ounces to 56 ounces. By what percentage did Anita decrease the amount of water she drank?
A. 24%   B. 12.5%   C. 8.5%   D. 18.25%   E. 10.5%

42. What is the 17th term of the arithmetic sequence -51, -32, -13…?
A. 234   B. 253   C. 272   D. 215   E. 197

43. Solve the equation: $(x - 4)(x - 4) + 12 = 3x$
A. {7}   B. {-7}   C. {4, 7}   D. {-7, 4}   E. {-4, -7}

44. Simplify: $\dfrac{(ac^3)^{-1}}{(2a^2c)^{-2}}$

A. $\dfrac{4a^3}{c}$ B. $\dfrac{4c}{a^3}$ C. $\dfrac{4a^2}{c}$ D. $\dfrac{c}{4a^2}$ E. $4a^3c$

45. If $f(x) = 2x^2 - x + 4$, then what is the value of $f(3) - f(-2)$?
A. 19   B. -7   C. 14   D. 6   E. 5

46. Erin walks passed a pet shop and in the window sees puppies and birds. She counted 20 heads and 48 legs of all the puppies and birds she saw. How many more birds did Erin see than puppies?
A. 12   B. 16   C. 8   D. 10   E. 4

47. Factor completely: $x^4 - 8x^2 - 9$

A. $(x + 1)(x - 9)$ B. $(x^2 + 1)(x^2 - 9)$ C. $x^2(x + 1)(x - 9)$ D. $(x + 10(x - 1)(x + 3)(x - 3)$ E. $(x^2 + 1)(x + 3)(x - 3)$

48. The expression $\dfrac{x}{3} - \dfrac{x}{8}$ is equivalent to which of the following?

A. $\dfrac{-5x}{24}$ B. $\dfrac{5x}{8}$ C. $\dfrac{-3x}{8}$ D. $\dfrac{x}{11}$ E. $\dfrac{5x}{24}$

49. What is the range of the function $f(x) = |x| - 7$?
A. $y \le -7$ B. $y \ge -7$ C. $y \le 7$ D. $y \ge 7$ E. $y = 7$

50. In the picture below, the radius of Circle P is equal to the length of XY. What is the measure of $\angle XZY$?
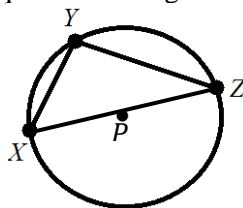
A. 45° B. 60° C. 90° D. 30° E. 15°

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

6. Given the number 2,976, we see that $2 + 9 + 7 + 6 = 24$. The prime factorization of 24 is equal to $2^3 \cdot 3$.

17. $0.42 = \frac{42}{100} = \frac{21}{50}$. The reciprocal of $\frac{21}{50}$ is $\frac{50}{21}$.

23. $3x - 2x^2$ is a polynomial made p of two terms and has a degree of 2. Therefore, the polynomial $3x - 2x^2$ is classified as a quadratic binomial.

29. The jets won 12 out of 20 games they played last season, and therefore lost 8 games. The ration of losses to wins is 8:12, which can be simplified to 2:3.

30. Since $a^{\frac{m}{n}} = \sqrt[n]{a^m}$ or $\left(\sqrt[n]{a}\right)^m$, then $m^{\frac{7}{3}} = \sqrt[3]{m^7}$.

40. The geometric mean of a and b is equal to $\sqrt{ab}$. Therefore the geometric mean of 24 and 6 is equal to $\sqrt{24 \cdot 6} = \sqrt{144} = 12$. 12 is one more than the number 11, and thus $M = 11$.

43. One method to solve $(x - 4)(x - 4) + 12 = 3x$ is to first multiply the binomials and then we get $x^2 - 8x + 16 + 12 = 3x$. Combining like terms and subtracting $3x$ from both sides gives us $x^2 - 11x + 28 = 0$. We can now factor the trinomial to get $(x - 7)(x - 4) = 0$. Setting each factor equal to 0 and solving each gives us the solutions 7 and 4 and therefore, our solution set is $\{4, 7\}$.

48. In order to subtract fractions, you must have common denominators. The common denominator of 3 and 8 is 24. $\frac{x}{3} = \frac{8x}{24}$ and $\frac{x}{8} = \frac{3x}{24}$. $\frac{8x}{24} - \frac{3x}{24} = \frac{8x - 3x}{24} = \frac{5x}{24}$.

50. Let P is the center of the circle and draw segment $\overline{YP}$. $\overline{PZ}$. $\overline{XP}$ and $\overline{YP}$ are all radii. Now we have ΔXPY and since XY is equal to the radius of the circle, ΔXPY is an equilateral triangle and $m\angle XPY = 60°$. $\angle XZY$ is an inscribed angle with endpoints of the central angle, $\angle XPY$, and thus is $\frac{1}{2}m\angle XPY = 30°$.