Summer Math Packet

for

Post Algebra 2 Honors

(for students who have completed Algebra 2 Honors this past year)

Name__________________________________
Please read the directions (separate document) completely before starting your packet!

**Print out the packet** so you can record your work. This will be turned in to your teacher in August.

REMEMBER – ALL ANSWERS (letter choice or student generated response) MUST BE INPUTTED ONLINE AT THE WEBSITE www.classmarker.com. If you lose or forget your username and password, email Mr. Toth at ttoth@communityschoolnaples.org.

Even though you will be inputting your answers online we have included a blank “answer sheet” to help organize your answers. You can write your letter choice (or numeric value for student generated responses) in the blank next to each problem number as you work out your solutions. When you actually log in to input answers, this should make the process much smoother and less prone to error. Obviously, it is of utmost importance to make sure you are entering answers in the correct tests.

*Please make notes and comments about the problems that caused difficulty so that you can recall the process you undertook when we go over the packets in the fall.

*If you encounter any typos or errors, please email me with the problem and the issue at ttoth@communityschoolnaples.org
## Test 4

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For Student-Produced Responses (Non-Multiple Choice)

Directions: For Student-Produced Response questions 9-18, use the grids at the bottom of the answer sheet page on which you have answered questions 1-8.

Each of the remaining 10 questions requires you to solve the problem and enter your answer by marking the circles in the special grid, as shown in the examples below. You may use any available space for scratchwork.

- Mark no more than one circle in any column.
- Because the answer sheet will be machine-scored, you will receive credit only if the circles are filled in correctly.
- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- No question has a negative answer.
- Mixed numbers such as \(3 \frac{1}{2}\) must be gridded as \(3.5\) or \(\frac{7}{2}\). (If \(\frac{3\sqrt{2}}{6}\) is gridded, it will be interpreted as \(\frac{3}{2}\), not \(\frac{3}{2}\).)

Note: You may start your answers in any column, space permitting. Columns not needed should be left blank.

Decimal Answers: If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid. For example, if you obtain an answer such as \(0.6666\ldots\), you should record your result as \(.666\) or \(.67\). A less accurate value such as \(.66\) or \(.67\) will be scored as incorrect.

Acceptable ways to grid \(\frac{2}{3}\) are:
Test 4
Section 2
1. When Ms. Yun arrived at the grocery store, there were 5 packages of hot dog rolls left on the shelf. One package contained 12 rolls, and each of the others contained 8 rolls. If Ms. Yun bought all 5 packages, how many hot dog rolls did she purchase at the store?

   A. 32
   B. 36
   C. 44
   D. 48
   E. 52

2. A, B, and C are points on a line in that order. If \( AB = 30 \) and \( BC \) is 20 more than \( AB \), what does \( AC \) equal?

   A. 50
   B. 60
   C. 70
   D. 80
   E. 90

3. If \( x + 3 + a \), then \( 2x + 6 = \)

   A. \( a + 3 \)
   B. \( a + 6 \)
   C. \( 2a \)
   D. \( 2a + 3 \)
   E. \( 2a + 6 \)

Questions 4-5 refer to the following graph.

4. For which student was the change in scores from test I to test II the greatest?

   A. A
   B. B
   C. C
   D. D
   E. E
5. What was the average (arithmetic mean) of the scores of the 5 students on test II?
   A. 60
   B. 65
   C. 68
   D. 70
   E. 72

6. On the number line above, t, u, v, w, x, y, and z are coordinates of the indicated points. Which of the following is closest in value to \(|u + v|\)?
   A. t
   B. w
   C. x
   D. y
   E. z

7. If \(x = \frac{1}{2}\), what is the value of \(\frac{1}{x} + \frac{1}{x - 1}\)?
   A. -4
   B. 0
   C. 1
   D. 2
   E. 3

8. In the figure above, \(RS = ST\) and the coordinates of \(S\) are \((k, 3)\). What is the value of \(k\)?
   A. -3
   B. \(-\sqrt{3}\)
   C. 0
   D. \(\sqrt{3}\)
   E. 3
9. The table above gives values of the quadratic function \( f \) for selected values of \( x \). Which of the following defines \( f \)?

A. \( f(x) = x^2 + 1 \)
B. \( f(x) = x^2 + 2 \)
C. \( f(x) = 2x^2 - 2 \)
D. \( f(x) = 2x^2 - 1 \)
E. \( f(x) = 2x^2 + 1 \)

10. How old was a person exactly 1 year ago if exactly \( x \) years ago the person was \( y \) years old?

A. \( y - 1 \)
B. \( y - x - 1 \)
C. \( x - y - 1 \)
D. \( y + x + 1 \)
E. \( y + x - 1 \)

11. The sequence above may be changed in either of two ways. Either two adjacent letters may be interchanged or the entire sequence may be reversed. What is the least number of such changes needed to put the letters into alphabetical order left to right?

A. 2
B. 3
C. 4
D. 5
E. 6

12. How many cubical blocks, each with edges of length 4 centimeters, are needed to fill a rectangular box that has inside dimensions 20 centimeters by 24 centimeters by 32 centimeters?

A. 38
B. 96
C. 192
D. 240
E. 384
13. If $0 < n < 1$, which of the following gives the correct ordering of $\sqrt{n}, n$, and $n^2$?

A. $\sqrt{n} < n < n^2$
B. $\sqrt{n} < n^2 < n$
C. $n < \sqrt{n} < n^2$
D. $n < n^2 < \sqrt{n}$
E. $n^2 < n < \sqrt{n}$

14. In the figure above, what is the median of the slopes of $\overline{OA}$, $\overline{OB}$, $\overline{OC}$, $\overline{OD}$, and $\overline{OE}$?

A. $\frac{4}{3}$
B. 1
C. $\frac{3}{4}$
D. $\frac{3}{5}$
E. $\frac{1}{2}$

15. When it is noon eastern standard time (EST) in New York City, it is 9:00 A.M. Pacific standard time (PST) in San Francisco. A plane took off from New York City at noon EST and arrived in San Francisco at 4:00 P.M. PST on the same day. If a second plane left San Francisco at noon PST and took exactly the same amount of time for the trip, what was the plane’s arrival time (EST) in New York City?

A. 10:00 P.M. EST
B. 9:00 P.M EST
C. 7:00 P.M EST
D. 6:00 P.M EST
E. 4:00 P.M EST
16. In the rectangle $PQRS$ above, arcs $QT$ and $RT$ are quarter circles with centers at $P$ and $S$, respectively. If the radius of each quarter circle is 1, what is the area of the shaded region?

A. $1 - \frac{\pi}{4}$
B. $2 - \frac{\pi}{2}$
C. $2 - \frac{\pi}{4}$
D. $\frac{\pi}{4}$
E. $\frac{2}{3}$

17. The graph of $y = f(x)$ is shown above. Which of the following could be the graph of $y = f(x + 2)$?
18. In the figure above, $AB = BC$ and $DE = EF = DF$. If the measure of $\angle ABC$ is $50^\circ$, what is the measure of $\angle DFA$?

A. 30°
B. 35°
C. 40°
D. 45°
E. 50°

19. If $a$, $b$, $c$, and $f$ are four nonzero numbers, then all of the following proportions are equivalent EXCEPT

A. $\frac{a}{f} = \frac{b}{c}$
B. $\frac{f}{c} = \frac{b}{a}$
C. $\frac{c}{a} = \frac{f}{b}$
D. $\frac{a}{c} = \frac{b}{f}$
E. $\frac{af}{bc} = \frac{1}{1}$

20. For all numbers $x$ and $y$, let the operation $\Box$ be defined by $x \Box y = xy - y$. If $a$ and $b$ are positive integers, which of the following can be equal to zero?

I. $a \Box b$
II. $(a + b) \Box b$
III. $a \Box (a + b)$

A. I only
B. II only
C. III only
D. I and II
E. I and III
1. If \( x - y = 8 \), \( y = 3z \), and \( z = 2 \), what is the value of \( x \)?

A. -14  
B. -2  
C. 2  
D. 3  
E. 14

2. Todd is older than Marta but younger than Susan. If \( t \), \( m \), and \( s \) represent ages, in years, of Todd, Marta, and Susan, respectively, which of the following is true?

A. \( m < t < s \)  
B. \( s < m < t \)  
C. \( s < t < m \)  
D. \( t < m < s \)  
E. \( t < s < m \)

3. If the areas of two regions are equal and the sum of the areas of the regions is 5, what is the average (arithmetic mean) of the areas of the two regions?

A. 0  
B. \( \frac{5}{2} \)  
C. \( \frac{5}{4} \)  
D. 5  
E. 10

4. Let \( S \) be the set of all integers that can be written as \( n^2 + 1 \), where \( n \) is a nonzero integer. Which of the following integers is in \( S \)?

A. 16  
B. 28  
C. 35  
D. 39  
E. 50
5. In the figure above, point $O$ is the center of the circle. If $x = 40$, what is the value of $y$?

A. 40  
B. 50  
C. 60  
D. 70  
E. 80

6. A “simple square” is any integer greater than 1 that has only three positive integer factors— itself, its square root, and 1. Which of the following is a simple square?

A. 121  
B. 100  
C. 81  
D. 64  
E. 33

7. In $\triangle XYZ$ above, $XZ$ is $\frac{6}{7}$ of $h$, the length of the altitude. What is the area of $\triangle XYZ$ in terms of $h$?

A. $\frac{h^2}{3}$  
B. $\frac{3h^2}{7}$  
C. $\frac{3h}{7}$  
D. $\frac{6h^2}{7}$  
E. $\frac{12h^2}{7}$
8. If $a$ and $b$ are positive integers and \( \left( \frac{1}{a^2b^3} \right)^6 = 432 \), what is the value of $ab$?

A. 6
B. 12
C. 18
D. 24
E. 36

9. What is the greatest three-digit integer that has a factor of 10?

10. A recipe for chili for 20 people requires 4 pounds of beans. At this rate, how many pounds of beans are required to make chili for 150 people?

11. When the positive even integer $n$ is increased by 50 percent of itself, the result is between 10 and 20. What is one possible value of $n$?

12. The perimeter of a rectangular plot of land is 250 meters. If the length of one side of the plot is 40 meters, what is the area of the plot, in square meters?

13. A school ordered $600 worth of light bulbs. Some of the light bulbs cost $1 each and the others cost $2 each. If twice as many $1 bulbs as $2 bulbs were ordered, how many light bulbs were ordered altogether?

14. If $4(x + y)(x - y) = 40$ and $x - y = 20$, what is the value of $x + y$?

15. In a rectangular coordinate system, the center of a circle has coordinates (5, 12), and the circle touches the x-axis at one point only. What is the radius of the circle?

16. The table above gives the voter registration data for the town of Bridgeton at the time of a recent election. In the election, 40 percent of the voting-age population actually voted. If the turnout for an election is defined to be the fraction \( \frac{\text{number who actually voted}}{\text{number of registered voters}} \), what was the turnout for this election?
17. The three-dimensional figure above has two parallel bases and 18 edges. Line segments are to be drawn connecting vertex B with each of the other 11 vertices in the figure. How many of these segments will not lie on an edge of the figure?

18. In the figure above, ABCD is a rectangle. Points A and C lie on the graph \( y = pc^3 \), where \( p \) is a constant. If the area of ABCD is 4, what is the value of \( p \)?

**Test 4**

**Section 8**

1. If \( 3(n - 4) = 18 \), what is the value of \( n \)?

A. \( \frac{14}{3} \)

B. \( \frac{22}{3} \)

C. 6

D. 10

E. 22

2. For a class ring, each senior can choose from 4 types of stones and 3 types of metals. How many combinations of stone and a metal are there?

A. 7

B. 8

C. 10

D. 12

E. 16

17
The sum of $3a$ and the square root $b$ is equal to the square of the sum of $a$ and $b$.

3. Which of the following is an expression for the statement above?

A. $3a + b^2 = \sqrt{a + b}$
B. $3a + \sqrt{b} = (a + b)^2$
C. $3a + \sqrt{b} = a^2 + b^2$
D. $\sqrt{3a + b} = a^2 + b^2$
E. $\sqrt{3a} + \sqrt{b} = (a + b)^2$

4. Kerry has a cordless telephone receiver that can operate within a range of 1,000 feet from the telephone’s base. Kerry takes the receiver from the base and walks 800 feet due north. From that point she walks due east and stops at the maximum range of the receiver. In which of the following directions can Kerry walk and still be within range of the receiver?

   I. Due north
   II. Due south
   III. Due west

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

5. If $\frac{x}{4} = \frac{2x}{a}$ and $x \neq 0$, what is the value of $a$?

A. 8
B. 4
C. 2
D. 1
E. 1/4

6. In the figure above, $l \parallel m$ and $r = 50$. What is the value of $s + t + u$?

A. 230
B. 240
C. 250
D. 270
E. 310
7. In the xy-coordinate plane, line $l$ is perpendicular to the y-axis and passes through the point $(5, -3)$. Which of the following is an equation of line $l$?

A. $x = 0$
B. $x = 5$
C. $y = -3$
D. $y + 3 = x + 5$
E. $y - 3 = x + 5$

8. The total daily profit $p$, in dollars, from producing and selling $x$ units of a certain product is given by the function $p(x) = 17x - (10x + b)$, where $b$ is a constant. If 300 units were produced and sold yesterday for a total profit of $1,900, what is the value of $b$?

A. $-200$
B. $-100$
C. $0$
D. $100$
E. $200$

9. The number that results when an integer is multiplied by itself CANNOT end in which of the following digits?

A. 1
B. 4
C. 5
D. 6
E. 8

10. A bag contains only red marbles, blue marbles, and yellow marbles. The probability of randomly selecting a red marble from this bag is $\frac{1}{4}$, and the probability of randomly selecting a blue marble is $\frac{1}{6}$. Which of the following could be the total number of marbles in the bag?

A. 10
B. 12
C. 18
D. 20
E. 30

11. When the sum of a list of prices is divided by the average (arithmetic mean) of the prices, the result is $k$. What does $k$ represent?

A. The sum of the prices
B. Half the sum of the prices
C. The average of the prices
D. The number of prices
E. Half the number of prices
12. If the area of the square in the figure above is 81 and the perimeter of each of the 4 triangles is 30, what is the perimeter of the figure outlined by the solid line?

A. 36  
B. 72  
C. 80  
D. 84  
E. 120

13. The graph of \( y = g(x) \) is shown above. If \( g(2) = k \), which of the following could be the value of \( g(k) \)?

A. 2  
B. 2.5  
C. 3  
D. 3.5  
E. 5

14. If \( 0 \leq x \leq 8 \) and \( -1 \leq y \leq 3 \) which of the following gives the set of all possible values of \( xy \)?

A. \( xy = 4 \)  
B. \( 0 \leq xy \leq 24 \)  
C. \( -1 \leq xy \leq 11 \)  
D. \( -1 \leq xy \leq 24 \)  
E. \( -8 \leq xy \leq 24 \)

15. In the figure above, what is the sum, in terms of \( n \), of the degree measures of the four angles marked with arrows?

A. \( n \)  
B. \( 2n \)  
C. \( 180-n \)  
D. \( 360-n \)  
E. \( 360-2n \)
16. After the first term, each term in a sequence is 3 greater than \( \frac{1}{3} \) of the preceding term. If \( t \) is the first term of the sequence and \( t \neq 0 \), what is the ratio of the second term to the first term?

A. \( \frac{t + 9}{3} \)
B. \( \frac{t + 3}{3} \)
C. \( \frac{t + 9}{3t} \)
D. \( \frac{t + 3}{3t} \)
E. \( \frac{9 - 2t}{3} \)

Test 5
Section 3

1. According to a certain recipe, 25 pounds of flour are needed to make 300 rolls. At this rate, how many pounds of flour are needed to make 12 rolls?

A. 1
B. 2
C. 3
D. 4
E. 6

2. If \( xy = 10 \), what is the value of \( 2 \cdot \frac{x}{y} \cdot y^2 \)?

A. 5
B. 8
C. 10
D. 12
E. 20

3. If \( x + y = 30 \) and \( x > 8 \), then which of the following must be true?

A. \( y > 0 \)
B. \( y < 22 \)
C. \( y = 22 \)
D. \( y > 22 \)
E. \( x < 30 \)
4. The coordinates of points $P$, $Q$, and $R$ in the $xy$-plane are given above. What is the perimeter of $\triangle PQR$?

A. 12
B. 14
C. $6 + \sqrt{20}$ (approximately 10.67)
D. $6 + \sqrt{32}$ (approximately 11.66)
E. $\sqrt{164}$ (approximately 12.81)

5. The first 5 terms in the sequence are shown above. Each term after the first is formed by adding 9 to the term immediately preceding it. Which terms in this sequence is equal to $8 + (26 - 1)9$?

A. The 8th
B. The 9th
C. The 25th
D. The 26th
E. The 27th

6. Three lines intersect in a point as shown in the figure above. Which of the following pairs of angles measures is NOT sufficient for determining all six angle measures?

A. $t$ and $z$
B. $t$ and $y$
C. $s$ and $x$
D. $r$ and $t$
E. $r$ and $s$

7. The sum of two numbers that differ by 1 is $t$. In terms of $t$, what is the value of the greater of the two numbers?

A. $\frac{t - 1}{2}$
B. $\frac{t}{2}$
C. $\frac{t + 1}{2}$
D. $\frac{t}{2} + 1$
E. $\frac{2t - 1}{2}$
8. The table above shows how many students in a class of 12 preschoolers had 0, 1, 2, or 3 siblings. Later, a new student joined the class, and the average (arithmetic mean) number of siblings per student became equal to the median number of siblings per student. How many siblings did the new student have?

A. 0  
B. 1  
C. 2  
D. 3  
E. 4

9. If $2(x - 3) = 8$, what does $\frac{x - 3}{x + 3}$ equal?

10. When twice a number is decreased by 3, the result is 253. What is the number?

11. Outdoor Sneaker Company manufactures only white sneakers and black sneakers, both of which are available as either high-tops or low-tops. On the basis of the information in the table above, how many black sneakers did Outdoor Sneaker Company manufacture in July?

12. In the figure above, $PQRS$ is a rectangle, and points $Q$ and $R$ lie on the graph of $y = ax^2$, where $a$ is a constant. If the perimeter of $PQRS$ is 10, what is the value of $a$?

13. If $ab + b = a + 2c$, what is the value of $b$ when $a = 2$ and $c = 3$?
14. In the figure above, $m \parallel n$ and $l$ bisects $\angle ABC$. If $45 < y < 55$, what is one possible value for $x$?

15. The Acme Plumbing Company will send a team of 3 plumbers to work on a certain job. The company has 4 experienced plumbers and 4 trainees. If a team consists of 1 experienced plumber and 2 trainees, how many different such teams are possible?

16. The figure above consists of two circles that have the same center. If the shaded area is $64\pi$ square inches and the smaller circle has a radius of 6 inches, what is the radius, in inches, of the larger circle?

17. If $p$, $r$, and $s$ are three different prime numbers greater than 2, and $n = p \times r \times s$, how many positive factors, including 1 and $n$, does $n$ have?

18. At time $t = 0$, a ball was thrown upward from an initial height of 6 feet. Until the ball hit the ground, its height, in feet, after $t$ seconds was given by the function $h$ above, in which $c$ and $d$ are positive constants. If the ball reached its maximum height of 106 feet at time $t = 2.5$, what was the height, in feet, of the ball at time $t = 1$?
Test 5
Section 7

1. If $k$ is a positive integer divisible by 3, and if $k < 60$, what is the greatest possible value of $k$?

   A. 55  
   B. 56  
   C. 57  
   D. 58  
   E. 59

2. The letter H is symmetric with respect to two different lines, as shown by the dotted lines in the figure above. Which of the following letters is symmetric with respect to at least two different lines?

   A. W  
   B. L  
   C. M  
   D. X  
   E. Y

3. Bobby receives $2 for each chore he does during the week, plus a weekly allowance of $10. If Bobby receives no other money, which of the following expressions represents the total dollar amount Bobby receives for a week in which he has done $n$ chores?

   A. $10 + n$  
   B. $(10 + 2)n$  
   C. $10n + 2$  
   D. $10 + 2n$  
   E. $(10 + n)2$

4. The smallest squares in Figure A and Figure B are all equal in size. If the area of Figure A is 26 square centimeters, what is the area of Figure B?

   A. 12 sq cm  
   B. 14 sq cm  
   C. 16 sq cm  
   D. 18 sq cm  
   E. 20 sq cm
5. According to the graph above, which salesperson had the greatest increase in the number of units sold from 1998 to 1999?

A. Albert  
B. Goldberg  
C. Patel  
D. Smith  
E. Wang

6. If the average (arithmetic mean) of 6, 6, 12, 16, and \( x \) is equal to \( x \), what is the value of \( x \)?

A. 6  
B. 8  
C. 9  
D. 10  
E. 11

7. In the figure above, what is the value of \( x \)?

A. 55  
B. 60  
C. 65  
D. 70  
E. 75
8. A computer program randomly select a positive two-digit integer. If the integer selected is odd, twice that integer is printed. If the integer selected is even, the integer itself is printed. If the integer printed is 26, which of the following could have been the integer selected?

I. 13  
II. 26  
III. 52

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

9. How many seconds are there in $m$ minutes and $s$ seconds?

A. $60m + s$  
B. $m + 60s$  
C. $60(m + s)$  
D. $\frac{m + s}{60}$  
E. $\frac{m}{60} + s$

10. If $(2x - 2)(2 - x) = 0$, what are all the possible values of $x$?

A. 0 only  
B. 1 only  
C. 2 only  
D. 1 and 2 only  
E. 0, 1, and 2

11. If $x^3 = y^9$, what is $x$ in terms of $y$?

A. $\sqrt[3]{y}$  
B. $y^2$  
C. $y^3$  
D. $y^6$  
E. $y^{12}$
12. In the $xy$-coordinate system above, which of the following line segments has a slope of $-1$?

A. $\overline{OA}$
B. $\overline{OB}$
C. $\overline{OC}$
D. $\overline{OD}$
E. $\overline{DC}$

13. Kyle’s lock combination consists of 3 two-digit numbers. The combination satisfies the three conditions below.

One number is odd.
One number is a multiple of 5.
One number is the day of the month of Kyle’s birthday.

If each number satisfies exactly one of the conditions, which of the following could be the combination to the lock?

A. 14-20-13
B. 14-25-13
C. 15-18-16
D. 20-15-20
E. 34-30-21

$$\sqrt{x + 9} = x - 3$$

14. For all value of $x$ greater than 3, the equation above is equivalent to which of the following?

A. $x = x^2$
B. $x = x^2 + 18$
C. $x = x^2 - 6x$
D. $x = x^2 - 6x + 9$
E. $x = x^2 - 6x + 18$
15. How many integers in the set of all integers from 1 to 100, inclusive, are not the square of an integer?

A. 19
B. 50
C. 81
D. 89
E. 90

16. The figure above shows the route of Diane’s trip from her house to her job. Diane travels 16 miles from A to B, 15 miles from B to C, and 4 miles from C to D. If she were able to travel from A to D directly, how much shorter, in miles, would the trip be?

A. 5
B. 8
C. 10
D. 11
E. 15

17. One circle has a radius of $\frac{1}{2}$ and another circle has a radius of 1. What is the ratio of the area of the larger circle to the area of the smaller circle?

A. 2:1
B. 3:1
C. 3:2
D. 4:1
E. 5:2

18. If the sum of the consecutive integers from -22 to $x$, inclusive, is 72, what is the value of $x$?

A. 23
B. 25
C. 50
D. 75
E. 94
19. If $k$, $n$, $x$, and $y$ are positive numbers satisfying $x^{-\frac{4}{3}} = k^{-2}$ and $y^{\frac{4}{3}} = n^{2}$, what is $(xy)^{\frac{2}{3}}$ in terms of $n$ and $k^2$?

A. $\frac{1}{nk}$
B. $\frac{n}{k}$
C. $\frac{k}{n}$
D. $nk$
E. 1

20. The figures above show the graphs of the function $f$ and $g$. The function $f$ is defined by $f(x) = x^3 - 4x$. The function $g$ is defined by $g(x) = f(x + h) + k$, where $h$ and $g$ are constants. What is the value of $hk$?

A. -6
B. -3
C. -2
D. 3
E. 6

Test 5
Section 9

1. If 6 cars out of 10 on an assembly line are red, what is the probability that a car selected at random from the assembly line will be red?

A. $\frac{2}{3}$
B. $\frac{3}{5}$
C. $\frac{1}{2}$
D. $\frac{2}{5}$
E. $\frac{1}{6}$
2. If $AB = BC$ and $BD$ bisects $AC$ in the figure above, which of the following CANNOT be concluded?

A. $w = x$
B. $w = z$
C. $x = y$
D. $AD = DC$
E. $BD \perp AC$

3. If 30 percent of $m$ is 40, what is 15 percent of $m$?

A. 15
B. 20
C. 25
D. 30
E. 35

4. If $n$ is any negative number, which of the following must be positive?

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

5. The ratio 1.2 to 1 is equal to which of the following ratios?

A. 1 to 2
B. 12 to 1
C. 5 to 6
D. 6 to 5
E. 6 to 50
6. The legend of a certain pictograph shows \( \begin{array}{c} \text{3} \\ \text{5 million} \end{array} = \text{5 million new homes.} \) Approximately how many new homes are represented by the symbols \( \begin{array}{c} \text{3} \\ \text{5 million} \end{array} ? \)

A. 3.5 million  
B. 10.5 million  
C. 15.5 million  
D. 17.5 million  
E. 35 million

7. If \( a \) and \( b \) are positive integers and \( a^2 - b^2 = 7 \), what is the value of \( a? \)

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

8. On the number line above, which of the following corresponds to \( |u - w| \)?

A. \( t \)  
B. \( v \)  
C. \( x \)  
D. \( y \)  
E. \( z \)

9. A number \( n \) is increased by 5 and the result is multiplied by 5. This result is decreased by 5. Finally, that result is divided by 5. In terms of \( n \), what is the final result?

A. \( n - 5 \)  
B. \( n - 1 \)  
C. \( n \)  
D. \( n + 4 \)  
E. \( 5(n + 5) \)

10. Phillip used four pieces of masking tape, each 6 inches long, to put up each of his posters. Phillip had a 300-foot roll of masking tape when he started. If no tape was wasted, which of the following represent the number of feet of masking tape that was left on the roll after he put up \( n \) posters? (12 inches = 1 foot).

A. \( 300 - 6n \)  
B. \( 300 - 2n \)  
C. \( 300 - n \)  
D. \( 300 - \frac{1}{2}n \)  
E. \( 300 - \frac{1}{4}n \)
11. In the $xy$-coordinate plane, line $m$ is the reflection of line $l$ about the $x$-axis. If the slope of line $m$ is $-\frac{4}{5}$, what is the slope of line $l$?

A. $\frac{5}{4}$
B. $\frac{4}{5}$
C. $\frac{1}{5}$
D. $-\frac{4}{5}$
E. $-\frac{5}{4}$

12. If $n = 3p$, for what value of $p$ is $n = p$?

A. 0
B. $\frac{1}{3}$
C. 1
D. 3
E. $n$ can never equal $p$.

13. In the figure above, if $z = 30$, what is the value of $x + y$?

A. 60
B. 150
C. 180
D. 210
E. 330
14. In the function $f$ is defined by $f(x) = x^2 + bx + c$, where $b$ and $c$ are positive constants, which of the following could be the graph of $f$?

![Graph Options]

(A) ![Graph A]  
(B) ![Graph B]  
(C) ![Graph C]  
(D) ![Graph D]  
(E) ![Graph E]

15. The cube shown above has edges of length 2, and $A$ and $B$ are midpoints of two of the edges. What is the length of $AB$ (not shown)?

A. $\sqrt{2}$  
B. $\sqrt{3}$  
C. $\sqrt{5}$  
D. $\sqrt{6}$  
E. $\sqrt{10}$

16. Let $u = x^2 - x$ for all values of $x$. If $u = a - 2$, what is the value of $a$?

A. 1  
B. $\frac{1}{2}$  
C. $\frac{3}{2}$  
D. $\frac{6}{5}$  
E. 3
Test 6
Section 3

1. Which of the following numbers is between $\frac{1}{5}$ and $\frac{1}{4}$?
   A. 0.14
   B. 0.15
   C. 0.19
   D. 0.21
   E. 0.26

2. The following are coordinates of points in the $xy$-plane. Which of these points is nearest the origin?
   A. (0, -1)
   B. $\left(0, \frac{1}{2}\right)$
   C. $\left(\frac{1}{2}, \frac{-1}{2}\right)$
   D. $\left(\frac{1}{2}, \frac{1}{2}\right)$
   E. (-1, -1)

3. In the figure above, if $AB$ is a line, what is the value of $y$?
   A. 108
   B. 114
   C. 117
   D. 120
   E. 135

4. If $6,565 = 65(x + 1)$, then $x =$
   A. 10
   B. 11
   C. 100
   D. 101
   E. 100
5. If \( m^5 \cdot m^7 = m^{28} \) and \( (m^5)^y = m^{15} \), what is the value of \( x + y \)?

A. 7  
B. 12  
C. 14  
D. 24  
E. 31

6. According to the graph above, which of the following is closest to the decrease per year in the number of homes sold between 1987 and 1990?

A. 7,000  
B. 11,500  
C. 14,000  
D. 17,500  
E. 42,000

7. In the figure above, \( \overline{AE} \) and \( \overline{CD} \) are each perpendicular in \( \overline{CE} \). If \( x = y \), the length of \( \overline{AB} \) is 4, and the length of \( \overline{BD} \) is 8, what is the length of \( \overline{CE} \)?

A. \( 3\sqrt{2} \) (approximately 4.24)  
B. \( 6\sqrt{2} \) (approximately 8.49)  
C. \( 8\sqrt{2} \) (approximately 11.31)  
D. \( 10\sqrt{2} \) (approximately 14.14)  
E. \( 12\sqrt{2} \) (approximately 16.97)
8. The price of ground coffee beans is $d$ dollars for 8 ounces and each ounce makes $c$ cups of brewed coffee. In terms of $c$ and $d$, what is the dollar cost of the ground coffee beans required to make 1 cup of brewed coffee?

A. \( \frac{d}{8c} \)

B. \( \frac{cd}{8} \)

C. \( \frac{8c}{d} \)

D. \( \frac{8d}{c} \)

E. \( 8cd \)

9. If \( \frac{10}{a} = \frac{b}{12} \), what is the value of \( ab \)?

10. In the sequence above, each term after the 1\(^{st}\) term is \( \frac{1}{5} \) of the term preceding it. What is the 5\(^{th}\) term of this sequence?

11. Five points, \( A, B, C, D, \) and \( E \), lie on a line, not necessarily in that order. \( \overline{AB} \) has length of 24. Point \( C \) is the midpoint of \( \overline{AB} \), and point \( D \) is the midpoint of \( \overline{AC} \). If the distance between \( D \) and \( E \) is 5, what is one possible distance between \( A \) and \( E \)?

12. What is the greatest of 5 consecutive integers if the sum of these integers equals 185?

13. A salesman’s monthly gross pay consists of $1,200 plus 20 percent of the dollar amount of his sales. If his gross pay for one month was $2,500, what was the dollar amount of his sales for that month? (Disregard the $ sign when gridding your answer.)

14. Naomi makes silver jewelry. For one style of earrings she cuts wedges from a silver disk, as shown in the figure above. Each wedge makes a 40° angle at the center of the disk. If the weight of each uncut disk is a uniformly distributed 2.5 grams, how many grams does each wedge weigh?
15. If $x^2 - y^2 = 10$ and $x + y = 5$, what is the value of $x - y$?

16. In the figure above, what is the area of the shaded square?

17. For all positive values $j$ and $k$, let $j\Theta k$ be defined as the whole number remainder when $j$ is divided by $k$. If $13\Theta k = 2$, what is the value of $k$?

18. The average (arithmetic mean) of the test scores of a class of $p$ students is 70, and the average of the test scores of a class of $n$ students is 92. When the scores of both classes are combined, the average score is 86. What is the value of $\frac{p}{n}$?

**Test 6**

**Section 7**

1. In a certain game, points are assigned to every word. Each $q$, $x$, and $z$ in a word is worth 5 points, and all other letters are worth 1 point each. What is the sum of the points assigned to the word “exquisite”?

   A. 21  
   B. 17  
   C. 16  
   D. 13  
   E. 9

2. If $2x - 10 = 20$, then $x - 5 =$

   A. 5  
   B. 10  
   C. 15  
   D. 20  
   E. 30

3. If $t$ represents an odd integer, which of the following expressions represents an even integer?

   A. $t + 2$  
   B. $2t - 1$  
   C. $3t - 2$  
   D. $3t + 2$  
   E. $5t + 1$
4. For the triangle above, the perimeter of $\triangle ABC$ equals the perimeter of $\triangle DEF$. If $\triangle ABC$ is equilateral, what is the length of $\overline{AB}$?

A. 4  
B. 5  
C. 7  
D. 9  
E. 15

5. The circle graph above represents all the jeans that were sold by a retail store in 2001, according to their brands. If the store sold 900 pairs of jeans other than brands $J$, $K$, $L$, $M$, and $N$, how many pairs of jeans did it sell altogether?

A. 1,500  
B. 2,250  
C. 3,000  
D. 3,600  
E. 4,500

6. If there is no waste, how many square yards of carpeting is needed to cover a rectangular floor that is 12 feet by 18 feet? (1 yard = 3 feet)

A. 8  
B. 16  
C. 24  
D. 30  
E. 216
7. A certain scale only registers weights that are greater than 6 pounds. A person who wanted to know the weights of a puppy, a kitten, and a bunny weighted them in pairs and go the following results.

- The kitten and the bunny weighted 7 pounds.
- The kitten and the puppy weighted 8 pounds.
- The bunny and the puppy weighed 9 pounds.

What is the weight of the puppy?

A. 2 pounds  
B. 3 pounds  
C. 4 pounds  
D. 5 pounds  
E. 6 pounds

8. On a blueprint, \( \frac{1}{4} \) inch represents 16 feet. If a driveway is 40 feet long, what is its length, in inches, on a map?

A. \( \frac{3}{8} \)  
B. \( \frac{5}{8} \)  
C. \( \frac{3}{4} \)  
D. \( 2 \frac{1}{2} \)  
E. 10

9. In the \( xy \)-coordinate system, \((p, 0)\) is one of the points of intersection of the graphs of \( y = -x^2 - 9 \). If \( p \) is positive, what is the value of \( p \)?

A. 3  
B. 6  
C. 9  
D. 18  
E. 81

10. The Smith Metal Company’s old machine makes 300 bolts per hour. Its new machine makes 450 bolts per hour. If both machines begin running at the same time, how many minutes will it take the two machines to make a total of 900 bolts?

A. 36  
B. 72  
C. 120  
D. 144  
E. 180
11. The table above gives values of the linear function \( g \) for selected values of \( t \). Which of the following defines \( g \)?

A. \( g(t) = \frac{1}{2} t + 1 \)
B. \( g(t) = -\frac{1}{2} t + 1 \)
C. \( g(t) = -t + 1 \)
D. \( g(t) = -t + 2 \)
E. \( g(t) = -2t + 2 \)

12. The results of a survey of 16 students at Thompson High School are given in the grid above. It shows the distance, to the nearest mile, that students at various grade levels travel to school. According to this grid, which of the following is true?

A. There is only one student who travels 2 miles to school.
B. Half of the students travel less than 4 miles to school.
C. More 12\textsuperscript{th} graders than 11\textsuperscript{th} graders travel 6 or more miles to school.
D. The students who travel less than 3 miles to school are all 12\textsuperscript{th} graders.
E. Of the students who travel 7 or more miles to school, half are 9\textsuperscript{th} graders.

13. How many positive three-digit integers have the hundreds digit equal to 3 and the units digit (ones digit) equal to 4?
14. The figure above shows the graph of the line \( y = mx + b \), where \( m \) and \( b \) are constants. Which of the following best represents the graph of the line \( y = -3mx + b \)?

15. If the volume of a cube is 8, what is the shortest distance from the center of the cube to the base of the cube?
   
   A. 1  
   B. 2  
   C. 4  
   D. \( \sqrt{2} \)  
   E. \( 2\sqrt{2} \)

16. If \( y = \frac{5x^3}{z} \), what happens to the value of \( y \) when both \( x \) and \( y \) are doubled?
   
   A. \( y \) is not changed.  
   B. \( y \) is halved.  
   C. \( y \) is doubled.  
   D. \( y \) is tripled.  
   E. \( y \) is multiplied by 4.
17. Lake purchased an automobile for $5,000 and the value of the automobile decreases by 20 percent each year. The value, in dollars, or the automobile $n$ years from the date of purchase is given by the function $V$, where $V(n) = 5000 \left(\frac{4}{5}\right)^n$. How many years from the date of purchase will the value of the automobile be $3,200? 
A. One 
B. Two 
C. Three 
D. Four 
E. Five

18. In the figure above, three wires are braided. That is, by starting in the order $A$, $B$, $C$, the outer left wire $A$ is brought over wire $B$ to the middle position, forming the order shown in step 1, then the outer right wire $C$ is brought to the new middle position shown in step 2, and so on, alternately bringing each new left and each new right wire to the middle. At what numbered step does the braid first repeat the original order $A$, $B$, $C$? 
A. 3 
B. 4 
C. 5 
D. 6 
E. 7

19. In a set of eleven different numbers, which of the following CANNOT affect the value of the median? 
A. Doubling each number 
B. Increasing each number by 10 
C. Increasing the smallest number only 
D. Decreasing the largest number only 
E. Increasing the largest number only

20. In the figure above, are $SBT$ is one quarter of a circle with center $R$ and radius 6. If the length plus the width of rectangle $ABCR$ is 8, then the perimeter of the shaded region is 
A. $8 + 3\pi$ 
B. $10 + 3\pi$ 
C. $14 + 3\pi$ 
D. $1 + 6\pi$
E. $12 + 6\pi$

**Test 6**  
**Section 9**

1. For which of the following values of $m$ will the value of $3m - 1$ be greater than 10?

A. 4  
B. 3  
C. 2  
D. 1  
E. 0

2. If $a \times k = a$ for all values of $a$, what is the value of $k$?

A. $-a$  
B. -1  
C. 0  
D. 1  
E. $a$

3. In the figure above, $l \parallel m$. If $x = 80$ and $y = 70$, what is the value of $z$?

A. 30  
B. 60  
C. 75  
D. 90  
E. 150

4. The scenic route from Mia’s home to her office is 5 kilometers longer than the direct route. When she goes by the scenic route and returns by the direct route, the round trip is 35 kilometers. How many kilometers is the direct route?

A. 5  
B. 12.5  
C. 15  
D. 20  
E. 22.5
5. A complete cycle of a traffic light takes 80 seconds. During each cycle, the light is green for 40 seconds, amber for 10 seconds, and red for 30 seconds. At a randomly chosen time, what is the probability that the light will not be red?

A. \( \frac{7}{8} \)  
B. \( \frac{5}{8} \)  
C. \( \frac{1}{2} \)  
D. \( \frac{3}{8} \)  
E. \( \frac{1}{8} \)

6. For a certain hot-water heater, the increase in heating expenses is directly proportional to the increase in water-temperature setting. If heating expenses increase by $24 when the water-temperature setting is increased by 20 degrees Fahrenheit, by how much will heating expenses increase when the water-temperature setting is increased by 15 degrees Fahrenheit?

A. $16  
B. $18  
C. $19  
D. $20  
E. $21

7. In the triangles above, what is the average (arithmetic mean) of \( u, v, w, x, \) and \( y \)?

A. 21  
B. 45  
C. 50  
D. 52  
E. 54

8. If \( x, x^2, \) and \( x^3 \) lie on a number line in the order shown above, which of the following could be the value of \( x \)?

A. -2  
B. \( \frac{1}{2} \)  
C. \( \frac{3}{4} \)  
D. 1  
E. \( \frac{3}{2} \)
9. In the figure above, line $l$ passes through the origin. What is the value of $\frac{k}{h}$?

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

\[|m - 3| = 5\]  
\[|k + 7| = 15\]

10. In the equations above, $m < 0$ and $k < 0$. What is the value of $m - k$?

A. -24  
B. -14  
C. 8  
D. 16  
E. 20

11. According to the table above, car engine oil with a rating of 5W flows how many times as fast as car engine oil with a rating of 20W?

A. 2  
B. 4  
C. 8  
D. 16  
E. 32
12. In the figure above, points $P$, $A$, and $B$ are equally spaced on line $l$ and points $P$, $Q$, and $R$ are equally spaced on line $m$. If $PB = 4$, $PR = 6$, and $AQ = 4$, what is the perimeter of quadrilateral $QABR$?

A. 13  
B. 14  
C. 15  
D. 16  
E. 17

Questions 13-14 refer to the following functions $g$ and $h$.

$$g(n) = n^2 + n$$
$$h(n) = n^2 - n$$

13. $g(5) - h(4) = $

A. 0  
B. 8  
C. 10  
D. 18  
E. 32

14. Which of the following is equivalent to $h(m + 1)$?

A. $g(m)$  
B. $g(m) + 1$  
C. $g(m) - 1$  
D. $h(m) + 1$  
E. $h(m) - 1$

15. A store charges $28 for a certain type of sweater. This price is 40 percent more than the amount it costs the store to buy one of these sweaters. At an end-of-season sale, store employees can purchase any remaining sweaters at 30 percent off the store’s cost. How much would it cost an employee to purchase a sweater of this type at this sale?

A. $8.40  
B. $14.00  
C. $19.60  
D. $20.00  
E. $25.20
16. In rectangle $ABCD$, point $E$ is the midpoint of $BC$. If the area of quadrilateral $ABED$ is $\frac{2}{3}$, what is the area of rectangle $ABCD$?

A. $\frac{1}{2}$  
B. $\frac{3}{4}$  
C. $\frac{8}{9}$  
D. 1  
E. $\frac{8}{3}$

Test 7  
Section 2

Set $X = \{30, 31, 32, 33\}$  
Set $Y = \{32, 33, 34, 35, 36\}$

1. Sets $X$ and $Y$ are shown above. How many numbers in set $X$ are also in set $Y$?

A. Two  
B. There  
C. Four  
D. Seven  
E. Nine

2. If Peg traveled 10 miles in 2 hours and Linda traveled twice as far in half the time, what was Linda’s average speed, in miles per hour?

A. 5  
B. 10  
C. 20  
D. 30  
E. 40

3. If $x = k(k - 2)$, then $x + 1 =$

A. $k^2 - k$  
B. $k^2 - 3k$  
C. $k^2 - 2k + 1$  
D. $k^2 + 2k + 1$  
E. $k^2 - 1$
4. The figure above shows the graph of the line $y = ax + b$, where $a$ and $b$ are constants. Which of the following best represents the graph of the line $y = 2ax + b$?

5. In the figure above, the perimeter of the triangle is $4 + 2\sqrt{2}$. What is the value of $x$?

A. 2
B. 4
C. $\sqrt{2}$
D. $2\sqrt{2}$
E. $2 + \sqrt{2}$
6. The scores on Tuesday’s history test for 16 students are shown in the table above. Sam, who was the only student absent on Tuesday, will take the test next week. If Sam receives a score of 95 on the test, what will be the median score for the test?

A. 90  
B. 87.5  
C. 85  
D. 82.5  
E. 80

7. Ahmad has containers of two different sizes. The total capacity of 16 containers of one size is $x$ gallons, and the total capacity of 8 containers of the other size is also $x$ gallons, and $x > 0$. In terms of $x$, what is the capacity, in gallons, of each of the larger containers?

A. $4x$  
B. $2x$  
C. $\frac{x}{2}$  
D. $\frac{x}{8}$  
E. $\frac{x}{16}$

8. Rectangle $ABCD$ lies in the $xy$-coordinate plane so that its sides are not parallel to the axes. What is the product of the slopes of all four sides of rectangle $ABCD$?

A. -2  
B. -1  
C. 0  
D. 1  
E. 2
9. An hour-long television program included 20 minutes of commercials. What fraction of the hour-long program was not commercials?

10. If the product of 0.3 and a number is equal to 1, what is the number?

11. Let \( \triangle_{xyz} \) be defined as \( \triangle_{xyz} = x^y - z^y \) for all positive integers \( x, y, \) and \( z \). What is the value of \( \triangle_{3,10,5} \)?

12. In the figure above, \( PQST \) is a rectangle and \( URST \) is a square. \( PU = 5 \) and \( UT \) is a positive integer. If the area of \( PQST \) must be more than 10 but less than 30, what is one possible value of \( UT \)?

13. A company sells boxes of balloons in which the balloons are red, green or blue. Luann purchased a box of balloons in which \( \frac{1}{3} \) of them were red. If there were half as many green balloons in the box as red ones and 18 balloons were blue, how many balloons were in the box?

14. The three distinct points \( P, Q, \) and \( R \) lie on line \( l \); the four distinct points \( S, T, U, \) and \( V \) lie on a different line that is parallel to line \( l \). What is the total number of different lines that can be drawn so that each line contains exactly two of the seven points?

15. If \( 2^x + 2^x + 2^x + 2^x = 2^7 \), what is the value of \( x \)?

16. Each of 5 people had a blank card on which they wrote a positive integer. If the average (arithmetic mean) of these integers is 15, what is the greatest possible integer that could be on one of the cards?

17. Alice and Corinne stand back-to-back. They each take 10 steps in opposite directions away from each other and stop. Alice then turns around, walks toward Corinne, and reaches her in 17 steps. The length of one of Alice’s steps is how many times the length of one of Corinne’s steps? (All of Alice’s steps are the same length and all of Corinne’s steps are the same length.)

18. Let the function \( f \) be defined by \( f(x) = x^2 + 18 \). If \( m \) is a positive number such that \( f(2m) = 2f(m) \), what is the value of \( m \)?
Test 7
Section 5

2, 6, 14, 30, …

1. In the sequence above, the first term is 2. Each number after the first is obtained by adding 1 to the preceding number and then doubling the result. What is the sixth number in the sequence?

   A. 122
   B. 123
   C. 124
   D. 125
   E. 126

2. If \(a(x + y) = 45\) and \(ax = 15\), what is the value of \(ay\)?

   A. 3
   B. 5
   C. 15
   D. 25
   E. 30

3. On the speedometer above, what is the speed, in miles per hour, indicated by the needle position?

   A. 32.5
   B. 37.5
   C. 40
   D. 55
   E. 60

4. How many different positive three-digit integers can be formed if the three digits 4, 5, and 6 must be used in each of the integers?

   A. Three
   B. Four
   C. Six
   D. Eight
   E. Nine
5. The three-dimensional figure represented above consists of rectangular and triangular faces. Each rectangular face has area $r$ and each triangular face has area $t$. What is the total surface area of the figure in terms of $r$ and $t$?

A. $2r + t$
B. $3r + 2t$
C. $4r + 3t$
D. $6rt$
E. $r^3t^2$

6. If $n$ is a positive integer and $\frac{n + 1}{2^n} = \frac{1}{2}$, then $n =$

A. 1
B. 2
C. 3
D. 4
E. 5

7. The average (arithmetic mean) of the weights of 14 books in $p$ pounds. In terms of $p$, what is the total weight of the books, in pounds?

A. $14 + p$
B. $p - 14$
C. $\frac{p}{14}$
D. $\frac{14}{p}$
E. $14p$

8. Point $B$ is the midpoint of $AC$ in the figure above. What is the value of $t$?

A. 1
B. 1.5
C. 2
D. 2.5
E. 3
9. If \( k(3x + 3)(x - 1) = 0 \) and \( x > 1 \), what is the value of \( k \)?

A. \( \frac{-3}{2} \)
B. 0
C. \( \frac{2}{3} \)
D. 1
E. 2

10. If all men in the Williams family are over six feet tall, which of the following statements must be true?

A. No man under six feet tall is a member of the Williams family.
B. All men over six feet tall are members of the Williams family.
C. All men who are not members of the Williams family are under six feet tall.
D. Every member of the Williams family over six feet tall is a man.
E. There is one man in the Williams family under six feet tall.

11. What is the radius of a circle that has a circumference of \( \pi \) ?

A. \( \frac{1}{4} \)
B. \( \frac{1}{2} \)
C. 1
D. 2
E. 4

12. If \( y \) is directly proportional to \( x^2 \) and \( y = \frac{1}{8} \) when \( x = \frac{1}{2} \), what is the positive value of \( x \) when \( y = \frac{9}{2} \)?

A. \( \frac{3}{4} \)
B. \( \frac{3}{2} \)
C. \( \frac{9}{4} \)
D. 3
E. 9
13. If \(4x = 6u = 5v = 7w > 0\), which of the following is true?

A. \(x < v < u < w\)
B. \(x < u < v < w\)
C. \(x < v < w < u\)
D. \(w < u < v < x\)
E. \(u < v < w < x\)

14. The function \(h\) be defined by \(h(t) = 2(t^3 - 3)\). When \(h(t) = -60\), what is the value of \(2 - 3t\)?

A. 35
B. 11
C. 7
D. -7
E. -11

15. If \(x\) is divisible by 3 and \(y\) is divisible by 5, which of the following must be divisible by 15?

I. \(xy\)
II. \(3x + 5y\)
III. \(5x + 3y\)

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

16. In the figure above, \(y + z =\)

A. 180
B. 195
C. 215
D. 230
E. 245
The sum of three consecutive odd integers is 111.

17. If \( n \) represents the least of the three integers, which of the following equations represents the statement above?

- A. \( 3n = 111 \)
- B. \( 3n + 2 = 111 \)
- C. \( 3n + 4 = 111 \)
- D. \( 3n + 6 = 111 \)
- E. \( 3n + 9 = 111 \)

18. The figure above shows part of a circle whose circumference is 45. If arcs of length 2 and length \( b \) continue to alternate around the entire circle so that there are 18 arcs of each length, what is the degree measure of each of the arcs of length \( b \)?

- A. 4°
- B. 6°
- C. 10°
- D. 16°
- E. 20°

19. The cost of maintenance on an automobile increases each year by 10% and Andrew paid $300 this year for maintenance on his automobile. If the cost \( c \) for maintenance on Andrew’s automobile \( n \) years from now is given by the function \( c(n) = 300x^n \), what is the value of \( x \)?

- A. 0.1
- B. 0.3
- C. 1.1
- D. 1.3
- E. 30

20. In the five line segments in the figure above are all congruent, what is the ratio of the length of \( \overline{AC} \) (not shown) to the length of \( \overline{BD} \)?

- A. \( \sqrt{2} \) to 1
- B. \( \sqrt{3} \) to 1
- C. \( \sqrt{2} \) to 2
- D. \( \sqrt{3} \) to 2
- E. \( \sqrt{3} \) to \( \sqrt{2} \)
Test 7
Section 8
1. If 6,700 = 100(6k + 7), then k =

A. \( \frac{1}{10} \)
B. 1
C. 10
D. 100
E. 1,000

2. If 3 more than \( n \) is a negative number and if 5 more than \( n \) is a positive number, which of the following could be the value of \( n \)?

A. -5
B. -4
C. -3
D. 0
E. 4

3. In the figure above, if \( x = 70 \) and \( y = 40 \) and the dotted lines bisect the angles with measures \( x^\circ \) and \( y^\circ \), what is the value of \( z \)?

A. 30
B. 40
C. 45
D. 50
E. 55

4. A piece of fruit is to be chosen at random from a basket of fruit. The probability that the piece of fruit chosen will be an apple is \( \frac{2}{5} \). Which of the following could NOT be the number of pieces of fruit in the basket?

A. 20
B. 35
C. 52
D. 70
E. 80
5. A square and an equilateral triangle have equal perimeters. If the square has sides of length 3, what is the length of one side of the triangle?

   A. 2  
   B. 3  
   C. 4  
   D. 5  
   E. 6

6. If \(x = -1\) and \(k > 0\), which of the following has the greatest value?

   A. \(2kx\)  
   B. \(4kx^2\)  
   C. \(6kx^3\)  
   D. \(8kx^4\)  
   E. \(10kx^5\)

7. Josephine’s daily exercise routine consists of swimming, cycling, and running, in that order. She runs faster than she swims and cycles faster than she runs. If she does not rest between the activities, which of the following could be the graph of the distance she covers during the entire time of her exercise routine?

8. In the \(xy\)-coordinate system, \((\sqrt{6}, k)\) is one of the points of intersection of the graphs of \(y = x^2 - 7\) and \(y = -x^2 + j\), where \(j\) is a constant. What is the value of \(j\)?

   A. 5  
   B. 4  
   C. 3  
   D. 2  
   E. 1
9. If $|2 - x| < 3$, which of the following is a possible value of $x$?
   A. 4
   B. 5
   C. 6
   D. 7
   E. 8

10. If all the interior angles of the polygon above are congruent, then $x =$
   A. 60
   B. 65
   C. 72
   D. 80
   E. 84

11. The length of a drawing of a tool is $\frac{3}{8}$ of the length of the actual tool. If the length of the drawing of the tool is 6 inches, what is the length, in inches, of the actual tool?
   A. $2 \frac{1}{4}$
   B. $8 \frac{1}{4}$
   C. 16
   D. $18 \frac{1}{4}$
   E. 22

12. If $\frac{x + 3}{2}$ is an integer, then $x$ must be
   A. a negative integer
   B. a positive integer
   C. a multiple of 3
   D. an even integer
   E. an odd integer
13. In the $xy$-plane above, points $Q$ and $S$ are the centers of the circles, which are tangent to the $x$-axis. What is the slope of $QS$ (not shown)?

A. $\frac{1}{8}$  
B. $\frac{1}{4}$  
C. $\frac{1}{2}$  
D. $\frac{7}{8}$  
E. 1

14. If $n$ and $p$ are integers greater than 1 and if $p$ is a factor of both $n + 3$ and $n + 10$, what is the value of $p$?

A. 3  
B. 7  
C. 10  
D. 13  
E. 30

15. In the cube shown above, points $B$, $C$, and $E$ are midpoints of three of the edges. Which of the following angles has the least measure?

A. $\angle XAY$  
B. $\angle XBY$  
C. $\angle XCY$  
D. $\angle XDY$  
E. $\angle XEY$

16. If $xy = 7$ and $x - y = 5$, then $x^2 y - xy^2 =$

A. 2  
B. 12  
C. 24  
D. 35  
E. 70
**Test 8**

**Section 1**

1. Which of the following *cannot* be the lengths of a 30°-60°-90° triangle?
   A. \( \frac{21}{13}, \frac{42}{13}, \frac{21}{13}, \sqrt{3} \)
   B. 23, 46, 46 \( \sqrt{3} \)
   C. 27, 54, 27 \( \sqrt{3} \)
   D. 6, 12, 6 \( \sqrt{3} \)

Perform the operation(s) and simplify.

2. \( \frac{x}{x^2 - 36} \div \frac{6}{36 - x^2} \)
   A. \( \frac{x + 6}{x - 6} \)
   B. \( \frac{1}{x - 6} \)
   C. \( \frac{x - 6}{x + 6} \)
   D. \( \frac{1}{x + 6} \)

3. \( \frac{15r^2 + 22r + 8}{5r^2 + 16r - 16} \cdot \frac{5r^2 - 4r}{4 - 9r^2} \)
   A. \( \frac{r(5r + 4)}{(2 - 3r)(r + 4)} \)
   B. \( \frac{(5r - 4)(5r + 4)}{(2 - 3r)(r + 4)} \)
   C. \( \frac{r(5r - 4)}{(2 - 3r)(r + 4)} \)
   D. \( \frac{r}{(2 - 3r)(r + 4)} \)

4. Given \( \tan \theta = \frac{7}{24} \) and \( \sin \theta < 0 \), find \( \cos \theta \).
   A. \( \cos \theta = -\frac{7}{25} \)
   B. \( \cos \theta = \frac{7}{25} \)
   C. \( \cos \theta = -\frac{24}{25} \)
   D. \( \cos \theta = \frac{24}{25} \)
Identify the quadrant in which $\theta$ lies.

5. $\tan < 0$ and $\sec < 0$
   A. Quadrant III
   B. Quadrant I
   C. Quadrant IV
   D. Quadrant II

Factor by grouping.

6. $6x^4 + 7x^3 - 36x - 42$
   A. $(x^4 - 6)(6x + 7)$
   B. $(x^4 - 6)(6x - 7)$
   C. $(x^3 - 6)(6x - 7)$
   D. $(x^3 - 6)(6x + 7)$

7. $3x^6 - 9x^4 + 2x^5 - 6x^3$
   A. $x^3(3x-2)(x^2+3)$
   B. $x^3(3x-2)(x^2+3)(x+2)$
   C. $x^3(3x+2)(x^2-3)(x+2)$
   D. $x^3(3x+2)(x^2-3)$

Completely factor the expression.

8. $25d^2 - 60d + 36$
   A. $(5d-6)(5d+1)$
   B. $(5d+6)^2$
   C. $(5d-6)^2$
   D. $(5d-6)(5d+6)$

9. $4x^2 - 9y^2$
   A. $(2x + 3y)(2x - 3y)$
   B. $(2x - 3y)(2x + 3y)$
   C. $(2x + 3y)(2x + 3y)$
   D. $(2x - 3y)^2$
Factor the trinomial.

10. \((f+g)x^2+3x(f+g)-4(f+g)\)
   A. \((f+g)(x-1)(x+4)\)
   B. \((f+g)(x+1)(x-4)\)
   C. \(-\left(f+g\right)\left(x^2-3x-4\right)\)
   D. \((x-1)(x+4)\)

Find the domain of the expression.

11. \(\frac{-4}{3-x}\)
   A. All real numbers \(x\) such that \(x \neq -3\)
   B. All real numbers \(x\) such that \(x \neq 0\)
   C. All real numbers \(x\) such that \(x \neq 4\)
   D. All real numbers \(x\) such that \(x \neq 3\)

12. \(4x+5\)
   A. All real numbers \(x\) such that \(x \geq 4\)
   B. All real numbers \(x\) such that \(x \geq 0\)
   C. All real numbers \(x\) such that \(x \geq 0\)
   D. All real numbers \(x\) such that \(x \leq 0\)

Simplify the complex fraction.

13. \(\frac{3}{x^2+2x-8} + \frac{1}{x^2+12x+32}\)
   A. \(\frac{3x^2+32x+56}{2(x+9)(2x+11)}\)
   B. \(\frac{2x^2-6x+1}{6(x-4)(x+3)}\)
   C. \(\frac{6(x-4)(x+3)}{2x^2-6x+1}\)
   D. \(\frac{2(x+9)(2x+11)}{3x^2+32x+56}\)
14. \( \frac{(4-x^2)^{12} + 7x^2(4-x^2)^{-10}}{4-x^2} \)

A. None of these  
B. \( \frac{4 + 6x^2}{(4-x^2)^{32}} \)  
C. \( \frac{1 + 7x^2}{(4-x^2)^{32}} \)  
D. \( \frac{4 + 9x^2}{(4-x^2)^{32}} \)

Find all real solutions of the equation. Check your solutions in the original equation.

15. \( 14x^4 - 45x^2 + 25 = 0 \)

A. \( \pm \sqrt{\frac{5}{2}}, \pm \sqrt{\frac{5}{7}} \)  
B. \( \pm \sqrt{\frac{5}{7}}, \pm \frac{5}{7} \)  
C. \( \pm 4, \pm \frac{5}{7} \)  
D. \( \pm \sqrt{\frac{3}{10}}, \pm \sqrt{\frac{5}{2}} \)

Use the quadratic formula to solve the equation

16. \( 2x^2 + 1 = 6x \)

A. \( -3 \pm \sqrt{11} \)  
B. \( 3 \pm \sqrt{7} \)  
C. \( 3 \pm \sqrt{11} \)  
D. \( -3 \pm \sqrt{7} \)  

Find the reference angle \( \theta \).

17. \( \theta = \frac{5\pi}{4} \)

A. \( \frac{3\pi}{4} \)  
B. \( -\frac{\pi}{4} \)  
C. \( \frac{\pi}{4} \)  
D. \( \frac{5\pi}{4} \)
Multiply or find the special product.

18. \((-2x + y^3)^3\)
   A. \(-8x^3 + 4x^2y^3 - 2xy^6 + y^9\)
   B. \(-8x^3 + 12x^2y^3 - 6xy^6 + y^9\)
   C. \(x^3 - 6x^2y^3 - 12xy^6 + 3y^9\)
   D. \(-8x^3 + y^9\)

Let \(\theta\) be an acute angle. Use the given function value and trigonometric identities to find the indicated trigonometric function.

19. If \(\cos \theta = \frac{40}{41}\), find \(\sec \theta\)
   A. \(\frac{41}{40}\)
   B. \(\frac{40}{9}\)
   C. \(\frac{41}{9}\)
   D. \(\frac{9}{41}\)

Use the fundamental trigonometric identities to determine the simplified form of the expression.

20. \(\frac{\sec}{\csc}\)
   A. \(\sin\)
   B. \(\tan\)
   C. \(\cot\)
   D. \(\cos\)

Factor the expression and use the fundamental identities to simplify.

21. \(\cos^2 x + \cos^2 x \tan^2 x\)
   A. 1
   B. \(\tan^2 x\)
   C. \(\sin^2 x\)
   D. \(\cos^2 x\)

Use trigonometric substitution to write the algebraic expression as a trigonometric function of \(\theta\), where \(0 < \theta < \frac{\pi}{2}\).

22. \(\sqrt{2x^2 - 8}, x = 2 \sec \theta\)
   A. \(4\sqrt{2} \sin \theta\)
   B. \(8 \tan^2 \theta\)
   C. \(2\sqrt{2} \tan \theta\)
   D. \(2\sqrt{2} + 2 \cos \theta\)
Identify the expression that completes the equation so that it is an identity.

23. \[
\frac{1 + \cos u}{\sin u} + \frac{\sin u}{1 + \cos u} =
\]
A. \(2\csc u\)
B. \(-2\sin u\)
C. \(2 + \cos u\)
D. 0

24. \[
\frac{\cos x}{1 - \sin x} =
\]
A. \(1 + \sin x\)
B. \(1 + \sec x\)
C. \(\sin x\)
D. \(1 + \csc x\)

Identify the function that has the given amplitude and period.

25. Amplitude = 4.5, period = \(\pi\)
A. \(y = 2.25 \cos \pi x\)
B. \(y = 4.5 \cos 2x\)
C. \(y = 2.25 \cos 2x\)
D. \(y = 4.5 \cos \pi x\)

26. Find the exact value of \(\cos 300^\circ\) and \(\sin 300^\circ\).
A. \(\cos = -\frac{1}{2}, \sin = \frac{\sqrt{3}}{2}\)
B. \(\cos = \frac{1}{2}, \sin = -\frac{\sqrt{3}}{2}\)
C. \(\cos = -\frac{\sqrt{3}}{2}, \sin = \frac{1}{2}\)
D. \(\cos = \frac{\sqrt{3}}{2}, \sin = -\frac{1}{2}\)

Write the measure in radians. Express the answer in terms of \(\pi\).

27. \(320^\circ\)
A. \(\frac{16\pi}{9}\)
B. \(\frac{9\pi}{16}\)
C. \(\frac{9}{16}\)
D. \(\frac{16}{9\pi}\)
28. Find the degree measure of an angle of 4.23 radians.
   A. 62º  
   B. 242º  
   C. 118º  
   D. 28º  

29. Find the amplitude of the sine curve shown below.

   A. \(2\pi\)  
   B. 8  
   C. 2  
   D. 4  

30. Write the equation for the sine function shown below.

   A. \(y = \sin \theta\)  
   B. \(y = \sin 3\theta\)  
   C. \(-\sin 6\theta\)  
   D. \(-\sin 3\theta\)  

Write a cosine function for the graph.

31.  
   A. \(y = -2 \cos \frac{\theta}{3}\)  
   B. \(y = 2 \cos 3\theta\)  
   C. \(y = 2 \cos \frac{\theta}{3}\)  
   D. \(-2 \cos 3\theta\)  

32. Use the graph of \(y = \tan \theta\) to find the value of \(y = \tan \frac{1}{8} \pi\). Round to the nearest tenth if necessary. If the tangent is undefined at that point, write undefined.

   A. 0  
   B. 1  
   C. 0.4  
   D. 2.4
Graph the function in the interval from 0 to $2\pi$.

33. $y = 2\cos\left(\theta - \frac{\pi}{6}\right) + 2$

A.

[Graph A]

B.

[Graph B]

C.

[Graph C]

D.

[Graph D]
34. Find the measure of $x$ in the right triangle.

A. 22.4°
B. 67.6°
C. 20.9°
D. 69.1°

35. Use the Law of Sines. Find $b$ to the nearest tenth.

A. 47.3
B. 41.6
C. 18.6
D. 23.1

36. Use the Law of Cosines. Find $m\angle A$ to the nearest tenth of a degree.

A. 33.9°
B. 57.7°
C. 46.3°
D. 85.7°

37. Find all zeros of $2x^4 - 5x^3 + 53x^2 - 125x + 75 = 0$.

A. $-1, -\frac{3}{2} \pm 5i$
B. $1, \frac{3}{2} \pm 5i$
C. $1, \frac{3}{2}, \pm 5$
D. $-1, -\frac{3}{2} \pm 5$

38. Identify the polynomial function that has zeros at 2, −3, and −1 and matches the graph below.

A. $f(x) = -x^3 - 2x^2 + 5x - 6$
B. $f(x) = x^3 + 2x^2 - 5x - 6$
C. $f(x) = x^2 + x + 2$
D. $f(x) = -2x^2 + 3x + 1$
Find all real zeros of the polynomial function.

39. \( f(x) = -6x^4 + 150x^2 \)
   A. \( x = 0, x = \pm 5 \)
   B. \( x = 0, x = 5 \)
   C. \( x = 0, x = 25 \)
   D. \( x = 0, x = \pm 25 \)

40. Use synthetic division to determine which of the following polynomials is not a factor of \( x^3 - 4x^2 - 25x + 100 \).
   A. \( x - 4 \)
   B. \( x - 5 \)
   C. \( x + 4 \)
   D. \( x + 5 \)