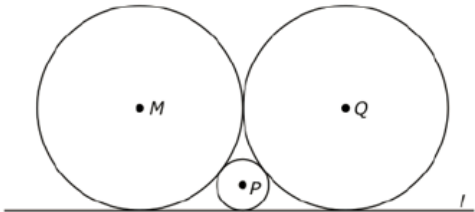


**SHOW WORK ON A SEPARATE SHEET, IF NECESSARY:**

<p>1. Which of the following has a radius less than 5 inches? Circle the letter of all that apply.</p> <p>(A) a cylindrical can with a volume of 424.12 cubic inches and a height of 15 inches</p> <p>(B) a cylindrical can with a volume of 565.49 cubic inches and a height of 5 inches</p> <p>(C) a cone with a volume of 201.06 cubic inches and a height of 12 inches</p> <p>(D) a cone with a volume of 254.47 cubic inches and a height of 12 inches</p>	<p>2. A company produces bags of chips. The acceptable weight of a bag can be expressed by <math> x - 250  \leq 0.8</math>, where <math>x</math> is the weight of the bag of chips in grams. Circle the letters of all the statements that are true.</p> <p>(A) a bag of chips that weighs 251 grams is acceptable</p> <p>(B) the difference between the maximum and minimum acceptable weights is 1.6 gram</p> <p>(C) the minimum acceptable weight of a bag of chips is 249.8 grams</p> <p>(D) a bag of chips that weighs 249.55 grams is acceptable</p>
<p>3. A function is shown below:</p> $f(x) = -x^3 - 5x^2 + 9x + 45$ <p>Circle the letters of all the statements that are true.</p> <p>(A) As <math>x</math> approaches negative infinity, <math>y</math> approaches negative infinity.</p> <p>(B) As <math>x</math> approaches positive infinity, <math>y</math> approaches negative infinity.</p> <p>(C) The function is decreasing where <math>x</math> is less than <math>-4.07</math>, and where <math>x</math> is greater than <math>0.74</math>.</p> <p>(D) The function has a relative minimum at about <math>(-4.07, -7.04)</math>.</p>	<p>4. A chord with length <math>L</math> is drawn in a circle. Which equation will find the smallest distance, <math>x</math>, from the chord to the center of the circle if <math>r</math> is the radius of the circle?</p> <p>(A) <math>L = \sqrt{r^2 - x^2}</math></p> <p>(B) <math>L = \sqrt{r^2 + x^2}</math></p> <p>(C) <math>L = 2\sqrt{r^2 - x^2}</math></p> <p>(D) <math>L = 2\sqrt{r^2 + x^2}</math></p>
<p>5. Circles <math>M</math>, <math>P</math>, and <math>Q</math> are tangent to line <math>l</math> and to each other as shown in the diagram on the right. Circles <math>M</math> and <math>Q</math> have the same radius. What is the ratio of the radius of circle <math>M</math> to the radius of circle <math>P</math>?</p> <p>(A) 3:1</p> <p>(B) 4:1</p> <p>(C) 5:1</p> <p>(D) 6:1</p>	<p>Figure for #5:</p> 

<p>6. A chord with a length of <math>c</math> units is drawn in a circle with a radius of <math>r</math> units. Which equation will find the shortest distance, <math>x</math>, from the center of the circle to the chord?</p> <p>(A) <math>x = \sqrt{r^2 - \frac{c^2}{2}}</math></p> <p>(B) <math>x = \sqrt{r^2 - \frac{c^2}{4}}</math></p> <p>(C) <math>x = \sqrt{c^2 - \frac{r^2}{2}}</math></p> <p>(D) <math>x = \sqrt{c^2 - \frac{r^2}{4}}</math></p>	<p>7. A company wants to conduct a survey of its clients about the product warranty it provides.</p> <p>* The company has 8,000 clients.</p> <p>* It plans to survey a total of 200 clients.</p> <p>Which method would provide the company with a simple random sample?</p> <p>(A) asking the first 200 clients who order its product on a random day</p> <p>(B) picking the first 40 clients who order its product each day for 5 days</p> <p>(C) numbering all of the clients from 1 to 8,000 and using a random number generator to select 200 clients</p> <p>(D) starting with the 40<sup>th</sup> client's account and taking every 20<sup>th</sup> account until 200 clients have been chosen</p>
<p>8. Suppose a research study is designed to investigate how a room's lighting affects a student's study habits. The study requires selecting 60 students from a university to complete a survey. Which method will <b>most likely</b> generate a simple random sample?</p> <p>(A) Select the first 60 students who enter the library.</p> <p>(B) Randomly identify classes that have 30 students each and select two of them.</p> <p>(C) Use an alphabetical listing of all students at the university and have a random number generator choose 60 students.</p> <p>(D) Use an alphabetical listing of all students at the university and select every 25<sup>th</sup> student until 60 students are selected.</p>	<p>9. A company wants to learn more about what customers think about the services it offers. Which procedure is <b>most likely</b> to produce an unbiased sample?</p> <p>(A) surveying the first 100 people that call the company</p> <p>(B) looking at reviews about the company on the Internet</p> <p>(C) asking 100 customers from the end of an alphabetized list to complete a phone survey</p> <p>(D) surveying a random sample of customers from a list of all customers</p>
<p>10. A company wants to know what customers think of its newest phone. Which method is <b>most likely</b> to produce an unbiased sample?</p> <p>(A) selecting the first 100 customers who preordered the phone</p> <p>(B) asking people to fill out an online survey from the company's website</p> <p>(C) surveying people that come into one of its stores</p> <p>(D) surveying random customers from a list of all customers who purchased the phone</p>	<p>11. The graph of a quadratic function has its vertex at <math>(\frac{3}{4}, \frac{25}{8})</math>. The <math>y</math>-intercept is 2. What is the distance, in units, between the two <math>x</math>-intercepts of the function?</p>

12. Identify the type of study that best describes each scenario below as: **Survey, Observation, Experiment**

A student participating in a school science fair wants to determine whether a flower will grow faster in direct sunlight. She randomly assigned half of the plants to receive direct sunlight and the other half to a dimly lit room and the growth of each plant is tracked for 6 weeks.

A local toy store conducts an investigation to determine whether right-handed people can assemble a 25-piece puzzle quicker than left-handed people. The puzzle is left out for customers to play with. When a customer plays with the puzzle, the customer's handedness and time to complete the puzzle are recorded.

A principal questions a random sample of 100 students walking through the halls to determine the average number of hours of sleep a student gets each night.

13. A cubic equation has a zero at  $-2$  and  $\frac{1}{3}$  and a factor of  $(x + 1)$ . It has a relative maximum at about  $(-1.56, 1.4)$ . Circle one option from each of the lists below to create an equation that meets those criteria.

$y =$	$2x^3$	$+8x^2$	$+3x$	$+6$
	$-2x^3$	$-8x^2$	$-3x$	$-6$
	$3x^3$	$+10x^2$	$+9x$	$+2$
	$-3x^3$	$-10x^2$	$-9x$	$-2$

14. The equation  $5 \cdot \left(\frac{1}{3}\right)^{(3x-1)} = 10$  is rewritten in the form  $\log_b d = c$ . Find  $b$ ,  $d$ , and  $c$ .

15. The function  $f(x) = \frac{3}{x}$  is shifted 7 units to the right and 4 units up, creating  $g(x) = \frac{3}{x+h} + k$ . What is the value of  $h + k$ ?

16. A school wants to find out which new lunch choice its students would prefer. Which is **most likely** to obtain a statistically unbiased sample?  
 (A) surveying a random sample of students from a list of all students  
 (B) inviting all students to indicate their choice with a text message  
 (C) placing suggestion boxes at random locations in the school  
 (D) assembling a group with one male and one female student from each grade and recording the preferences of these students

17. The height of the water at the end of a pier is monitored.  
 \* The average height of the water is 10.8 feet.  
 \* The height of the water varies by as much as 8 feet during any 24-hour day.  
 \* High tide occurs at 5:30 p.m., with the water returning to its average height at 8:30 p.m.  
 Which function gives the height,  $H$ , of the water as a function of time,  $t$ , in hours, where  $t = 0$  at 8:30 p.m.?

- (A)  $H(t) = -4 \sin\left(\frac{\pi}{12}t\right) + 10.8$
- (B)  $H(t) = -4 \sin\left(\frac{\pi}{6}t\right) + 10.8$
- (C)  $H(t) = 4 \sin\left(\frac{\pi}{12}t\right) + 10.8$
- (D)  $H(t) = 4 \sin\left(\frac{\pi}{6}t\right) + 10.8$

18. Which expression is equivalent to  $(x^2 + 5x - 19) \div (x^2 + 7x + 8)$ ?

- (A)  $1 + \frac{12x-11}{x^2+7x+8}$
- (B)  $1 - \frac{12x-11}{x^2+7x+8}$
- (C)  $1 + \frac{2x+27}{x^2+7x+8}$
- (D)  $1 - \frac{2x+27}{x^2+7x+8}$

<p><b>19.</b> What are the zeros of the function <math>x^4 - 2x^3 + x^2 - 8x - 12 = 0</math>?</p> <p>(A) <math>-1, -3, \pm 2i</math>  (B) <math>-1, -3, \pm 3i</math>  (C) <math>-1, 3, \pm 2i</math>  (D) <math>-1, 3, \pm 3i</math></p>	<p><b>20.</b> What is the remainder for <math>(x^3 - 13x - 15) \div (x + 2)</math>?</p> <p>(A) 3  (B) -37  (C) -33  (D) -45</p>
<p><b>21.</b> What are the zeros of the function <math>15x^4 + 19x^3 - 54x^2 - 76x - 24 = 0</math>?</p> <p>(A) <math>\pm 2, \frac{2}{3}, \frac{-3}{5}</math>  (B) <math>\pm 2, \frac{-2}{3}, \frac{-3}{5}</math>  (C) <math>\pm 1, \frac{-2}{3}, \frac{3}{5}</math>  (D) <math>\pm 1, 2, \frac{-2}{3}</math></p>	<p><b>22.</b> Which equation describes the graph that is produced by moving <math>y =  x </math> to the left 3 and up 2 units?</p> <p>(A) <math>y =  x + 3  - 2</math>  (B) <math>y =  x + 3  + 2</math>  (C) <math>y =  x - 3  - 2</math>  (D) <math>y =  x - 3  + 2</math></p>
<p><b>23.</b> An empty cone-shaped container has a diameter of 5 inches at the top.  * The height of the container is 8 inches.  * James pours water into the container until the surface of the water is 2 inches below the top of the container.</p> <p>What volume, to the nearest hundredth of a cubic inch, of water did James pour into the container?</p>	<p><b>24.</b> What are the zeros of <math>f(x) = 2x^2 + x - 1</math>?</p> <p>(A) <math>\frac{-1}{2}</math> and 1  (B) <math>\frac{1}{2}</math> and <math>-1</math>  (C) <math>\frac{-2}{3}</math> and 3  (D) <math>\frac{2}{3}</math> and <math>-3</math></p>
<p><b>25.</b> If <math>f(x) = 2x^2 - 5x - 12</math> and <math>f(4) = 0</math>, which statement is true?</p> <p>(A) <math>2x + 13</math> is a factor of <math>f(x)</math>.  (B) <math>2x - 13</math> is a factor of <math>f(x)</math>.  (C) <math>2x + 3</math> is a factor of <math>f(x)</math>.  (D) <math>2x - 3</math> is a factor of <math>f(x)</math>.</p>	