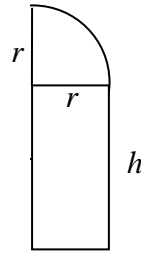


1)  $P$  is the perimeter of the window made up of the a quarter circle and rectangle. What is  $r$  in terms of  $h$  and  $P$ ?



- a.  $\frac{P - 2h}{4\pi}$       b.  $\frac{2P - 2h}{2 + \pi}$       c.  $\frac{2P - 4h}{4 + \pi}$       d.  $\frac{2P - 4h}{2 + \pi}$

2) An angle  $\theta$  is in standard position in the  $xy$ -plane if its vertex is at the origin, one of its rays is the positive  $x$ -axis, and the angle is measured counterclockwise from this ray. The terminal side of angle  $\theta$  in standard position in the  $xy$ -plane passes through the point  $(2, -\sqrt{3})$ . Which of the following is  $\csc \theta$ ?

- a.  $\frac{2\sqrt{3}}{3}$       b.  $\frac{2\sqrt{7}}{7}$       c.  $-\frac{\sqrt{21}}{7}$       d.  $-\frac{\sqrt{21}}{3}$

3) Let the relation between people in a certain community be given by “ $A$  is the ancestor of  $B$ .” This relation can be described as being

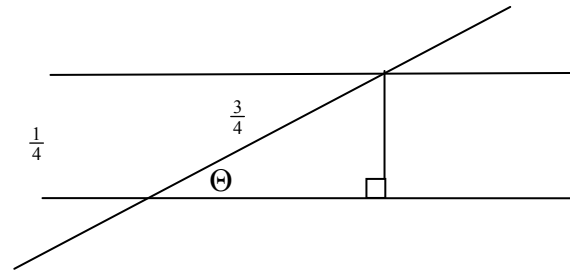
- a. Reflexive but not symmetric.      c. Both reflexive and symmetric.  
 b. Transitive but not symmetric.      d. Both transitive and symmetric.

4) The stem-and-leaf plot below organizes the number of tickets that each of ten students sold for a school play by using the tens digit of each number as the stem and the corresponding units digit as a leaf. For example, the stem 3 and the leaf 1 on the first line of the table represents 31. How many modes are there in this data?

Stem	Leaf
3	1
2	8
1	0 5 5 7
0	2 2 3 8

- a. 0      b. 1      c. 2      d. 3

5) Which answer is the closest value for  $\Theta$ ?

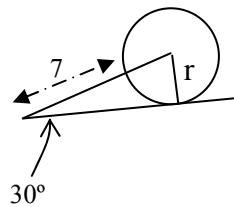


- a.  $20^\circ$       b.  $30^\circ$       c.  $40^\circ$       d.  $60^\circ$

6) What is the largest interval on which the function  $f(x) = (1 + \sqrt{9 - x^2})(\sqrt{8 - x^2 - 2x})$  is real-valued?

- a.  $-4 \leq x \leq 3$       b.  $-3 \leq x \leq 3$       c.  $-4 \leq x \leq 2$       d.  $-3 \leq x \leq 2$

7) Find the diameter of the circle.



- a. 3.5      b. 7      c. 12      d. 14

8) The result of  $10^{33} - 33$  is written in decimal notation. What is the sum of the digits?

- a. 283      b. 288      c. 292      d. 301

9) If  $\mathbf{A}$  is the matrix  $\begin{bmatrix} 1 & -2 \\ a & b \end{bmatrix}$  and  $\mathbf{A} \cdot \mathbf{A}$  is the  $2 \times 2$  zero matrix. What is the value of  $a \cdot b$ ?

- a. -2      b. 0      c.  $-\frac{1}{2}$       d.  $\frac{1}{2}$

10) A student has grades of 65, 83, and 92 on the first three exams in a mathematics course. The three exams have equal weight and count two-thirds of the final of the final grade. The final exam counts one-third of the final grade. What is the lowest grade the student can receive on the final exam and have a final grade no lower than 85?

- a. 85      b. 90      c. 95      d. 97

11) In a 60-mile trip, the first 30 miles took 40 minutes. The average speed for the entire trip was 54 mph. What is the speed in miles per hour of the last 30 miles?

- a. 58.5 mph                      b. 60.5 mph                      c. 62 mph                      d. 67.5 mph

12) Two modes of depreciation are used to depreciate the original cost of a car ( $C$  dollars) after  $t$  years ( $t \geq 1$ ).

Method 1, the car loses 20% of its current value each year, i.e.,  $V = C(0.8)^t$ .

Method 2, the car loses \$2,000 in value each year and  $V = C - 2000t$ .

For a car that originally cost \$20,000, after approximately how many years will the value be the same?

- a. 7.5                      b. 8                      c. 8.5                      d. 9

13) If a number  $x$  is added to the terms in a geometric sequence, the result is -1, 5, 2. What is the sum of the original series?

- a. -6                      b. -3                      c. 3                      d. 6

14) To estimate the Fahrenheit temperature ( $F$ ) equivalent to a given Celsius temperature ( $C$ ), a tourist adds 30 degrees to twice the Celsius temperature. In a country where the temperature range is from  $0^\circ\text{C}$  to  $30^\circ\text{C}$ , what is the greatest possible error the tourist can make using this estimation technique correctly? (The formula for converting Celsius temperature to Fahrenheit temperature is  $F = 1.8C + 32$ .)

- a.  $2^\circ\text{F}$                       b.  $3^\circ\text{F}$                       c.  $4^\circ\text{F}$                       d.  $5^\circ\text{F}$

15) In the  $xy$ -plane, what is the radius of the largest circle that can be inscribed in the ellipse

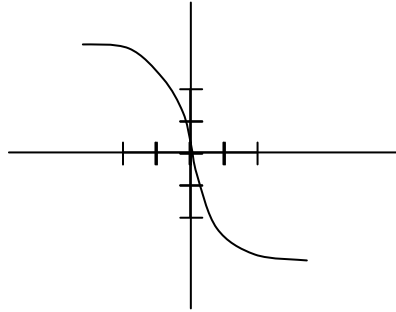
$$\frac{x^2}{2^2} + \frac{y^2}{3^2} = 1?$$

- a. 2                      b. 3                      c. 4                      d. 9

16) Which of the following sets is closed under multiplication?

- a. Rational numbers  
b. Irrational numbers  
c. Negative numbers  
d. Complex numbers with nonzero imaginary part

17) The graph of  $y = f(x)$  is shown. (Assume the marks are at one-unit intervals.)



What is the graph of  $y = f(x+1) - 2$ ?

Solutions:

1) c.  $\frac{2P - 4h}{4 + \pi}$

2) d.  $-\frac{\sqrt{21}}{3}$

3) b. Transitive but not symmetric.

4) c. 2

5) a.  $20^\circ$ .  $\sin \Theta = \frac{1/4}{3/4} = 1/3$ .  $\text{Arc sin}(1/3)$  is about  $20^\circ$ .

6) d.  $-3 \leq x \leq 2$

7) d. 14 (Use  $\sin 30^\circ = \frac{r}{r+7}$ .)

8) c. 292

9) c.  $-\frac{1}{2}$

10) c. 95

11) d. 67.5 mph

12) Substitute 20,000 for C and graph both on the graphing calculator. Think about your window. Answer is c) 8.5.

13) b. -3 Rewrite the geometric series before  $x$  was added. Then use the notion that the ratio between the successive terms of the geometric series is the same.

14) c.  $4^\circ F$

15) a. 2

16) a. Rational numbers

17) Move the graph to the left 1 unit and down 2 units.