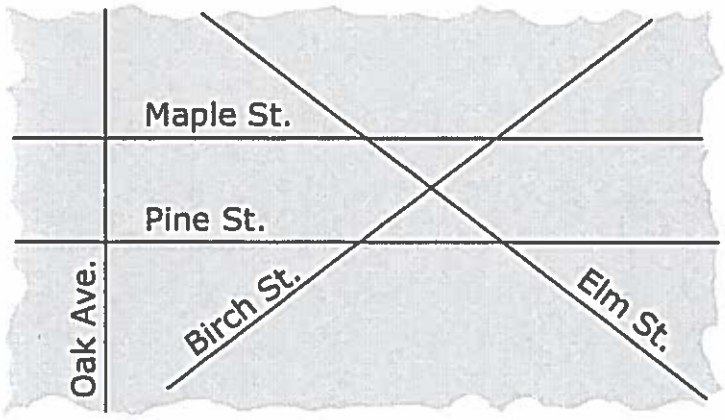
For Monday

1. The diagram represents a portion of a small city. Maple Street and Pine Street run exactly east to west. Oak Avenue runs exactly north to south. All of the streets remain straight.



Which statements must be true, based only on the given information?

Select **all** that apply.

Ⓐ Birch Street and Elm Street intersect at right angles.

Ⓑ Maple Street and Pine Street are parallel.

Ⓒ If more of the map is shown, Elm Street and Oak Avenue will not intersect.

Ⓓ Pine Street intersects both Birch Street and Elm Street.

Ⓔ Oak Avenue and Maple Street are perpendicular.

GO ON ▶

4. Right triangle *WXY* is similar to triangle *DEF*. The following are measurements in right triangle *DEF*:

$$m\angle F = 90°$$

$$DE = \sqrt{113}$$

$$DF = 7$$

$$EF = 8$$

Which expression represents cos *W*?

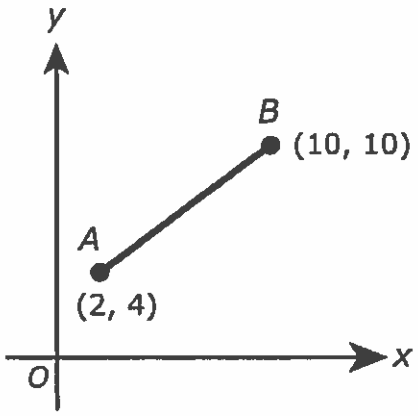
Ⓐ $\cos W = \frac{7}{\sqrt{113}}$

Ⓑ $\cos W = \frac{8}{\sqrt{113}}$

Ⓒ $\cos W = 7\sqrt{113}$

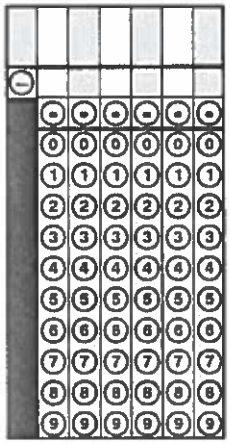
Ⓓ $\cos W = 8\sqrt{113}$

2. In the coordinate plane shown, point C (not shown) lies on $\overline{AB}$.



If the ratio of the length of $\overline{AC}$ to the length of $\overline{CB}$ is 3:1, what is the y-coordinate of point C ?

Enter your answer in the box.



3. In the coordinate plane, line p has slope 8 and y-intercept $(0,5)$. Line r is the result of dilating line p by a factor of 3 with center $(0,3)$. What is the slope and y-intercept of line r?

Ⓐ Line r has slope 5 and y-intercept $(0,2)$.

Ⓑ Line r has slope 8 and y-intercept $(0,5)$.

Ⓒ Line r has slope 8 and y-intercept $(0,9)$.

Ⓓ Line r has slope 11 and y-intercept $(0,8)$.

6. The degree measure of an angle in a right triangle is x, and $\sin x = \frac{1}{3}$.

Which of these expressions are also equal to $\frac{1}{3}$?

Select **all** that apply.

Ⓐ $\cos(x)$

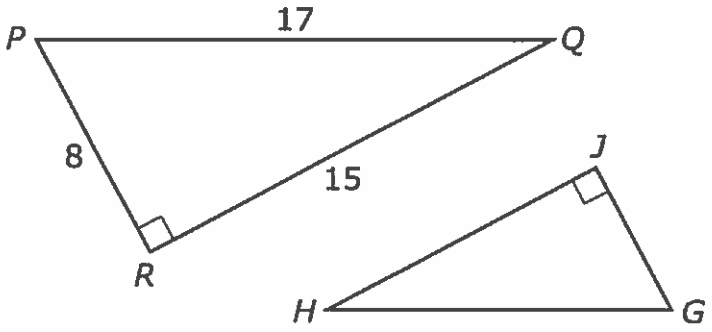
Ⓑ $\cos(x - 45°)$

Ⓒ $\cos(45° - x)$

Ⓓ $\cos(60° - x)$

Ⓔ $\cos(90° - x)$

7. In this figure, triangle *GHJ* is similar to triangle *PQR*.



Based on this information, which ratio represents tan *H*?

Ⓐ $\frac{8}{15}$

Ⓑ $\frac{8}{17}$

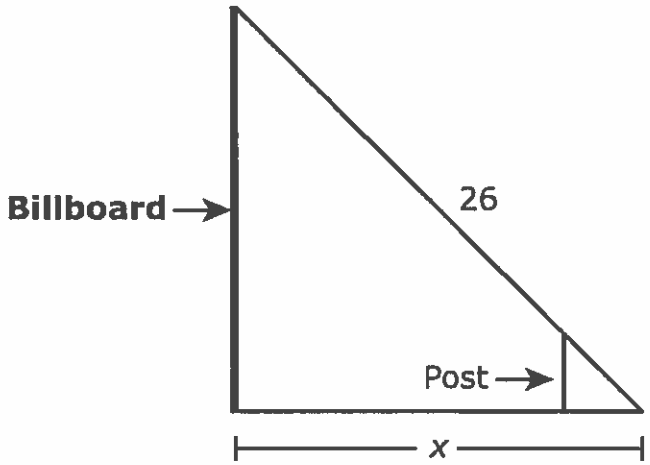
Ⓒ $\frac{15}{8}$

Ⓓ $\frac{17}{8}$

STOP

For Wednesday

10. A billboard at ground level has a support length of 26 feet that extends from the top of the billboard to the ground. A post that is 5 feet tall is attached to the support and is 4 feet from where the base of the support is attached to the ground. In the figure shown, the distance, in feet, from the base of the billboard to the base of the support is labeled x.



Create an equation that can be used to determine x. Discuss any assumptions that should be made concerning the equation. Use your equation to find the value of x. Show your work or explain your answer.

Enter your equation, assumptions, answer, and work or explanation in the space provided.

11. Line segment AB with endpoints $A(4, 16)$ and $B(20, 4)$ lies in the coordinate plane. The segment will be dilated with a scale factor of $\frac{3}{4}$ and a center at the origin to create $\overline{A'B'}$. What will be the length of $\overline{A'B'}$?

Ⓐ 15

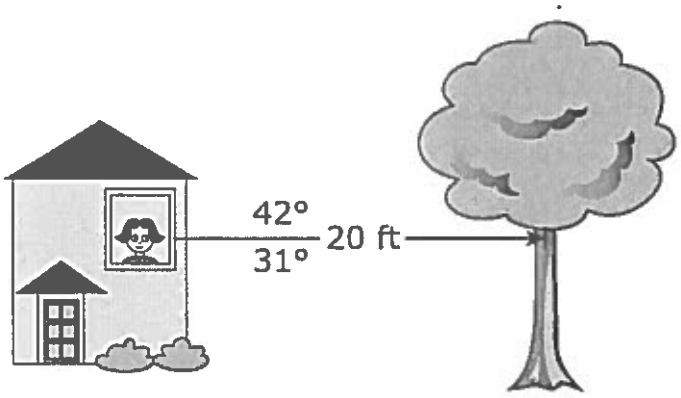
Ⓑ 12

Ⓒ 5

Ⓓ 4

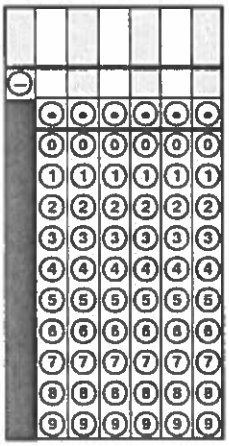
GO ON ▶

12. Mariela is standing in a building and looking out of a window at a tree. The tree is 20 feet away from Mariela. Mariela's line of sight to the top of the tree creates a 42° angle of elevation, and her line of sight to the base of the tree creates a 31° angle of depression.



What is the height, in feet, of the tree?

Enter your answer in the box.

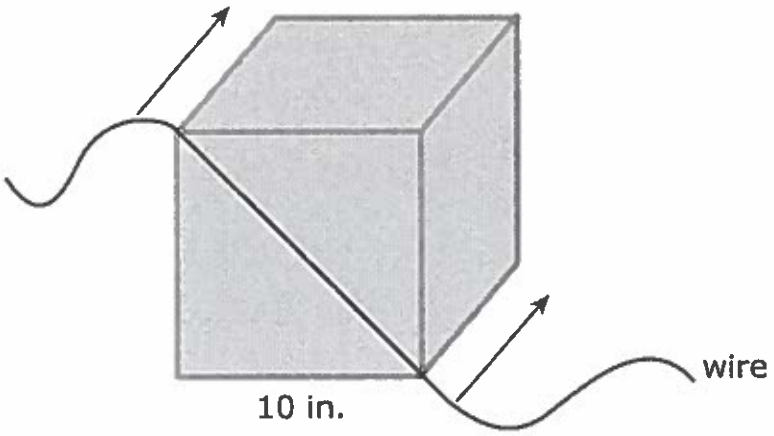


GO ON ▶

13. Part A

Daniel buys a block of clay for an art project. The block is shaped like a cube with edge lengths of 10 inches.

Daniel decides to cut the block of clay into two pieces. He places a wire across the diagonal of one face of the cube, as shown in the figure. Then he pulls the wire straight back to create two congruent chunks of clay.



Daniel wants to keep one chunk of the clay for later use. To keep that chunk from drying out, he wants to place a piece of plastic sheeting on the surface he exposed when he cut through the cube. Describe this newly exposed two-dimensional cross section, and find its area. Round your answer to the nearest whole square inch. Show your work.

Enter your answers and your work in the space provided.

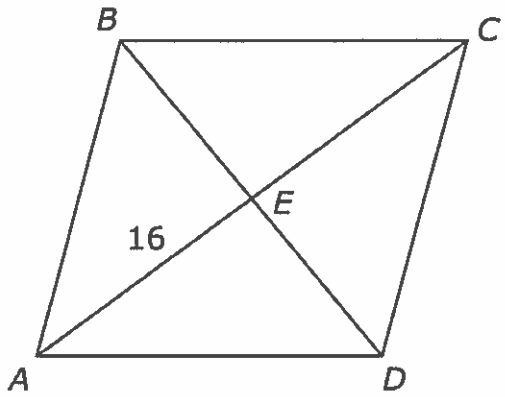
Part B

Daniel wants to reshape the other chunk of clay to make a set of clay spheres. He wants each sphere to have a diameter of 4 inches. Find the maximum number of spheres that Daniel can make from the chunk of clay. Show your work.

Enter your answer and your work in the space provided.

Use the information provided to answer Part A and Part B for question 14.

The figure shows parallelogram $ABCD$ with $AE = 16$.



not drawn to scale

14. Part A

Let $BE = x^2 - 48$ and let $DE = 2x$. What are the lengths of $\overline{BE}$ and $\overline{DE}$? Justify your answer.

Enter your answer and your justification in the space provided.

Part B

What conclusion can be made regarding the specific classification of parallelogram *ABCD*? Justify your answer.

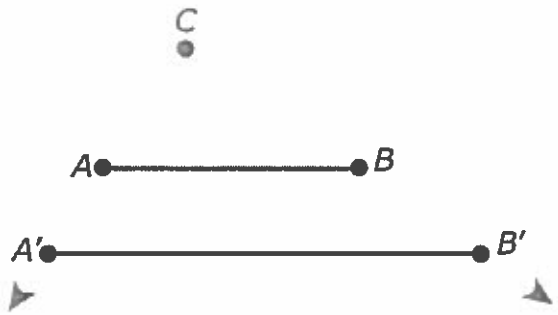
Enter your answer and your justification in the space provided.

16. A dilation centered at point C with a scale factor of k, where $k > 0$, can be defined as follows:

1. The image of point C is itself. That is, $C' = C$.
2. For any point P other than C, the point P' is on $\overrightarrow{CP}$, and $CP' = k \cdot CP$.

Use this definition and the diagram shown to prove the following theorem:

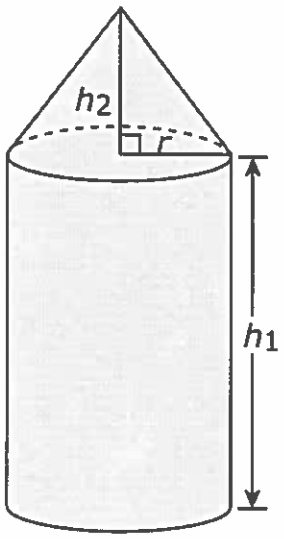
If $\overline{A'B'}$ is the image of $\overline{AB}$ after a dilation centered at point C with a scale factor of k, where $k > 0$, then $A'B' = k \cdot AB$.



Be sure to explain how you would use the diagram to prove the theorem, and show justifications for each statement in the proof.

Enter your proof, your explanation, and your justifications in the space provided.

17. The Farmer Supply is building a storage building for fertilizer that has a cylindrical base and a cone-shaped top. The county laws say that the storage building must have a maximum width of 8 feet and a maximum height of 14 feet.



Dump trucks deliver fertilizer in loads that are 4 feet tall, 6 feet wide, and 12 feet long. Farmer Supply wants to be able to store 2 dump-truck loads of fertilizer.

Determine a height of the cylinder, h_1, and a height of the cone, h_2, that Farmer Supply should use in the design. Show that your design will be able to store at least two dump-truck loads of fertilizer.

Enter your answer and your work in the space provided.

18. Points J, K, and L are distinct points, and $JK = KL$. Which of these statements must be true?

Select **all** that apply.

Ⓐ J, K, and L are coplanar.

Ⓑ J, K, and L are collinear.

Ⓒ K is the midpoint of $\overline{JL}$.

Ⓓ $\overline{JK} \cong \overline{KL}$

Ⓔ The measure of $\angle JKL$ is 90°.

STOP