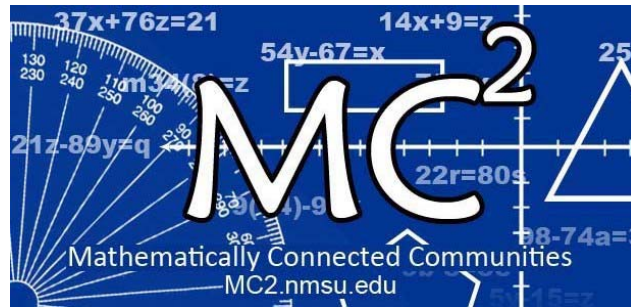


Mathematically Connected Communities



PARCC PBA Practice Test Items Geometry - Mathematics

Excerpted 1/2015 from
PARCC Online Practice Tests
www.parcconline.org

Mathematical Practice Questions for MC² Thinking Protocol

Follow the process below in working with the PARCC practice items found in this packet:

1. Choose items from this packet that relate to math concepts studied in the current or previous curriculum units during your math instruction. Each item may be used as a practice item worksheet.
2. Choose a set of **Thinking/Writing Prompts** below based on the math practice the class is working to develop.
3. Add the prompts to the practice item worksheet or display the prompts for the students to respond to.
4. Continue using the same set of prompts for an extended period of time so children develop competence and confidence in describing their mathematical thinking related to the math practice.

The questions below were intentionally not included on each MC² PARCC practice item worksheet in this packet. These are intended to help students move beyond “answer getting” to fully making sense of test item questions and their own mathematical thinking.

Thinking/Writing Prompts to Promote Mathematical Practices

Math Practice 1: Make sense of problems and persevere in solving them.

1. What do you know about the problem?
2. What questions do you have?
3. Explain your reasoning or thinking in solving the problem.

Math Practice 3: Construct viable arguments and critique the reasoning of others.

1. What are the assumptions, definitions, and previous knowledge to help in thinking about this problem?
2. What are some possible conjectures that you have about the problem?
3. Explain your mathematical argument so that somebody else can make sense of your thinking.

Math Practice 4: Model with mathematics.

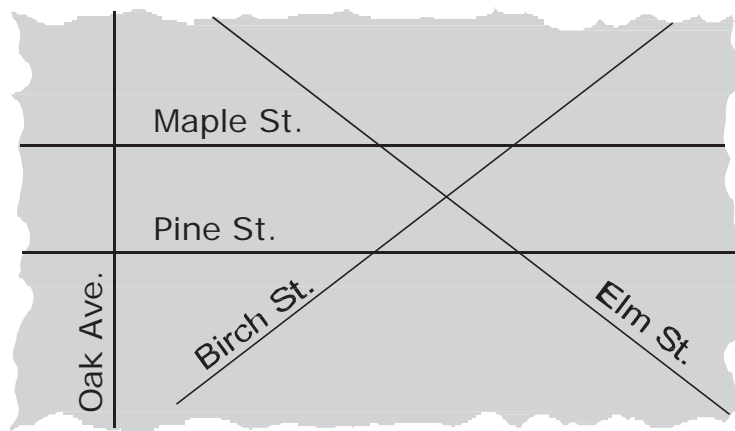
1. What are the important quantities in the problem that are needed to solve it?
2. What mathematical operation(s) or representation(s) will you use to solve the problem?
3. Explain how you know your answer makes sense in the context of the situation.

Math Practice 6: Attend to precision.

1. What are the important units in the problem? (What are we measuring or counting?)
2. What relationship between the units/quantities do you need to know in order to solve the problem?
3. Use appropriate and precise mathematical language, units, labels and computations to clearly describe your mathematical reasoning.

Geometry PARCC PBA Practice Assessment Item #1 (non-calculator): Standard G-CO.1

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.

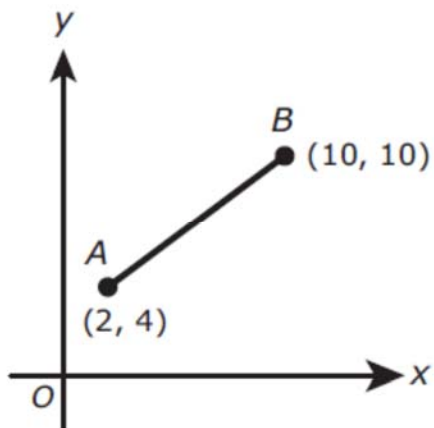


Which statements must be true, based only on the given information?

Select **all** that apply.

- A Birch Street and Elm Street intersect at right angles.
- B Maple Street and Pine Street are parallel.
- C If more of the map is shown, Elm Street and Oak Avenue will not intersect.
- D Pine Street intersects both Birch Street and Elm Street.
- E Oak Avenue and Maple Street are perpendicular.

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.

⊖					
⊙	⊙	⊙	⊙	⊙	⊙
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Geometry PARCC PBA Practice Assessment Item #3 (non-calculator): Standard G-SRT.1a

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 ?

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

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

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

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

Geometry PARCC PBA Practice Assessment Item #4 (non-calculator): Standard G-SRT.6

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

$$m\angle F = 90^\circ$$

$$DE = \sqrt{113}$$

$$DF = 7$$

$$EF = 8$$

Which expression represents $\cos W$?

A $\cos W = \frac{7}{\sqrt{113}}$

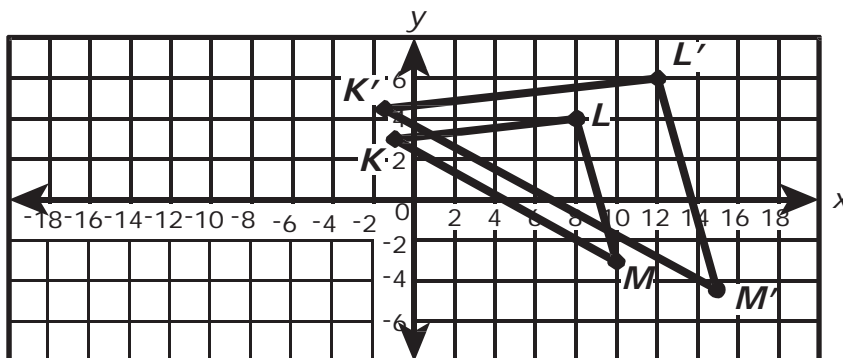
B $\cos W = \frac{8}{\sqrt{113}}$

C $\cos W = 7\sqrt{113}$

D $\cos W = 8\sqrt{113}$

Geometry PARCC PBA Practice Assessment Item #5 (non-calculator): Standard G-SRT.2

5. Triangle KLM is the pre-image of $\triangle K'L'M'$, before a transformation. Determine if these two figures are similar.



Which statements are true?

Select **all** that apply.

- A Triangle KLM is similar to $\triangle K'L'M'$.
- B Triangle KLM is not similar to $\triangle K'L'M'$.
- C There was a dilation of scale factor 0.5 centered at the origin.
- D There was a dilation of scale factor 1 centered at the origin.
- E There was a dilation of scale factor 1.5 centered at the origin.
- F There was a translation left 0.5 and up 1.5.
- G There was a translation left 1.5 and up 0.5.

Geometry PARCC PBA Practice Assessment Item #6 (non-calculator): Standard G-SRT.7-2

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.

A $\cos(x)$

B $\cos(x - 45^\circ)$

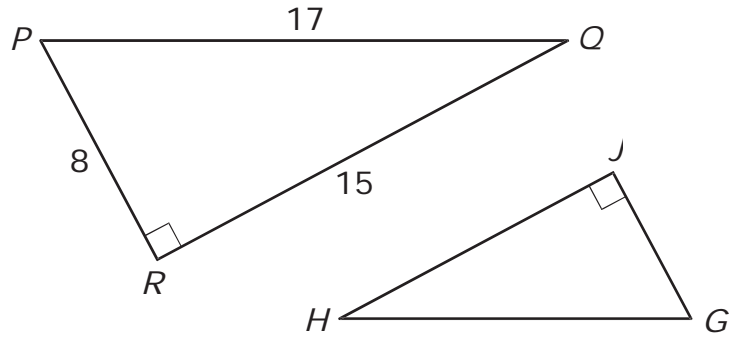
C $\cos(45^\circ - x)$

D $\cos(60^\circ - x)$

E $\cos(90^\circ - x)$

Geometry PARCC PBA Practice Assessment Item #7 (non-calculator): Standard G-SRT.6

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



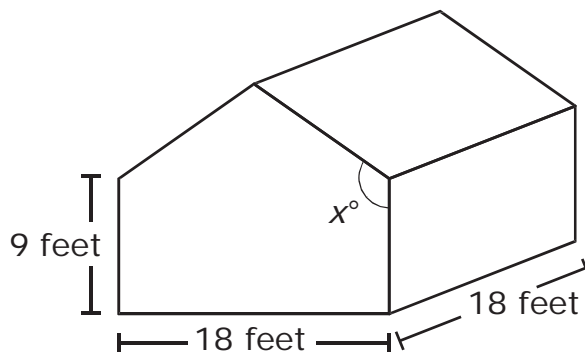
Based on this information, which ratio represents $\tan H$?

- A $\frac{8}{15}$
- B $\frac{8}{17}$
- C $\frac{15}{8}$
- D $\frac{17}{8}$



Use the information provided to answer Part A through Part C for question 8.

The figure shows the design of a shed that will be built. Use the figure to answer all parts of the task.



The base of the shed will be a square measuring 18 feet by 18 feet. The height of the rectangular sides will be 9 feet. The measure of the angle made by the roof with the side of the shed can vary and is labeled as x° . Different roof angles create different surface areas of the roof. The surface area of the roof will determine the number of roofing shingles needed in constructing the shed. To meet drainage requirements, the roof angle must be at least 117° .

8. Part A

The builder of the shed is considering using an angle that measures 125° . Determine the surface area of the roof if the 125° angle is used. Explain or show your process.

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

**8. Part B**

Without changing the measurements of the base of the shed, the builder is also considering using a roof angle that will create a roof surface area that is 10% less than the area obtained in Part A. Less surface area will require less roofing shingles. Will such an angle meet the specified drainage requirements? Explain how you came to your conclusion.

Enter your answer and your explanation in the space provided.

8. Part C

The roofing shingles cost \$27.75 for a bundle. Each bundle can cover approximately 35 square feet. Shingles must be purchased in full bundles. The builder has a budget of \$325 for shingles.

What is the greatest angle the builder can use and stay within budget? Explain or show your process.

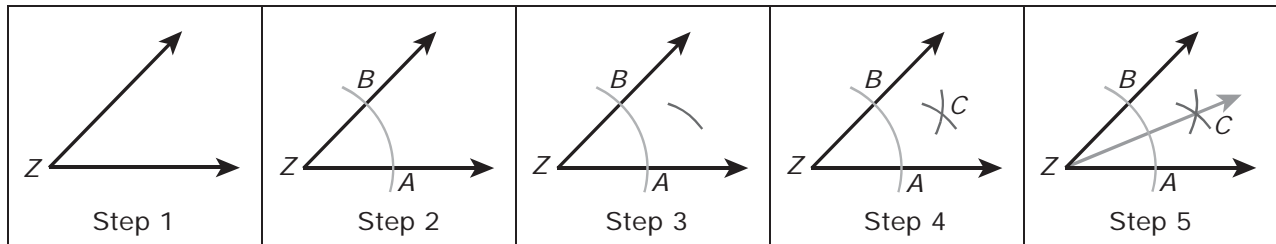
Enter your answer and your work or explanation in the space provided.



Geometry PARCC PBA Practice Assessment Item #9 (Calculator Part): Standard HS.C.14.3

Use the information provided to answer Part A and Part B for question 9.

Marcella drew each step of a construction of an angle bisector.



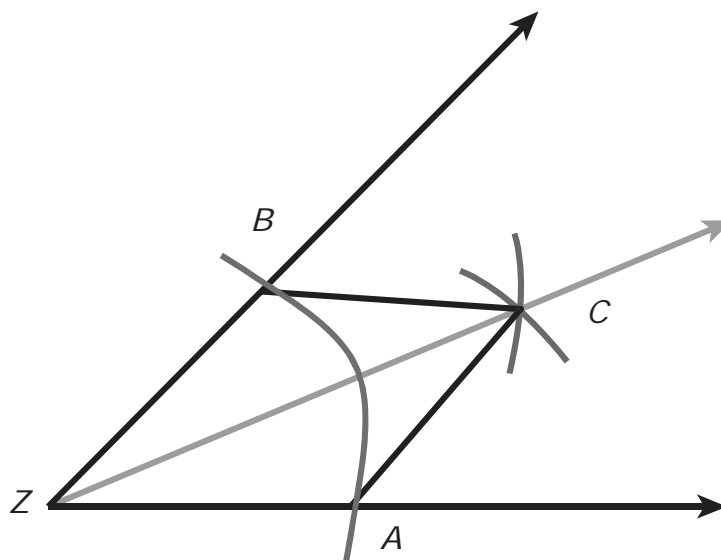
9. Part A

Angle Z is given in Step 1. Describe the instructions for Steps 2 through 5 of the construction. Enter your description in the space provided.



9. Part B

Marcella wants to explain why the construction produces an angle bisector. She makes a new step with line segments AC and BC added to the construction, as shown.

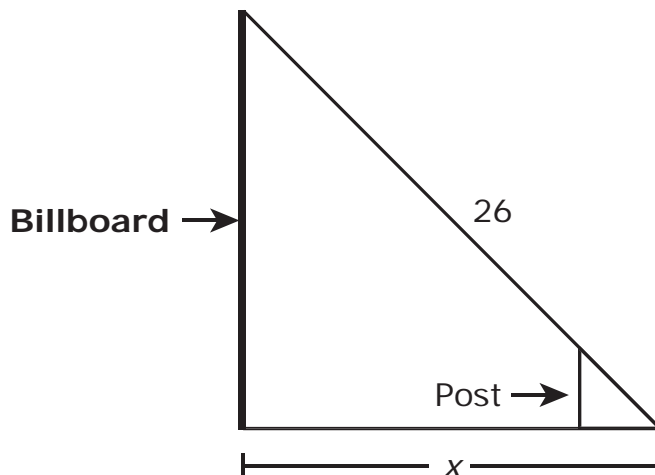


Using the figure, prove that ray ZC bisects angle AZB . Be sure to justify each statement of your proof.

Enter your proof in the space provided.



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.

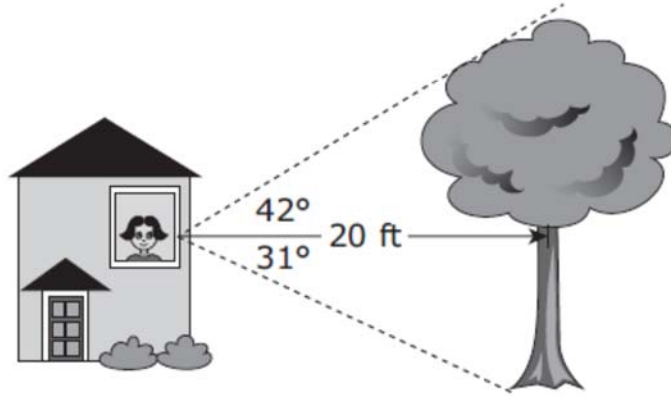


11. Line segment AB with endpoints $A(4, 16)$ and $B(20, 4)$ lies in the coordinate plane. The segment will be dilated with a scale factor of $\frac{3}{4}$ and a center at the origin to create $\overline{A'B'}$. What will be the length of $\overline{A'B'}$?

- Ⓐ 15
- Ⓑ 12
- Ⓒ 5
- Ⓓ 4



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.

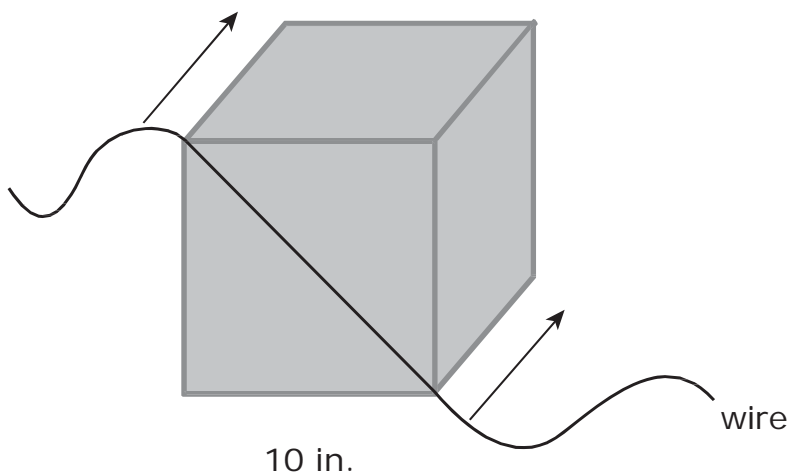
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•	•	•	•	•	•
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9



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.



13. 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.

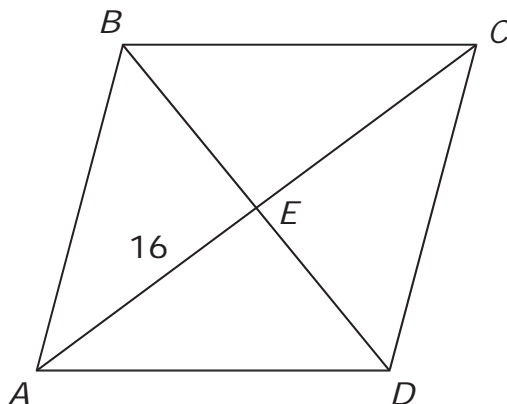
Enter your answer and your work in the space provided.



Geometry PARCC PBA Practice Assessment Item #14 (Calculator Part): Standard HS.C.18.2

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 $BE = \sqrt{x} - 48$ 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.



14. Part B

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

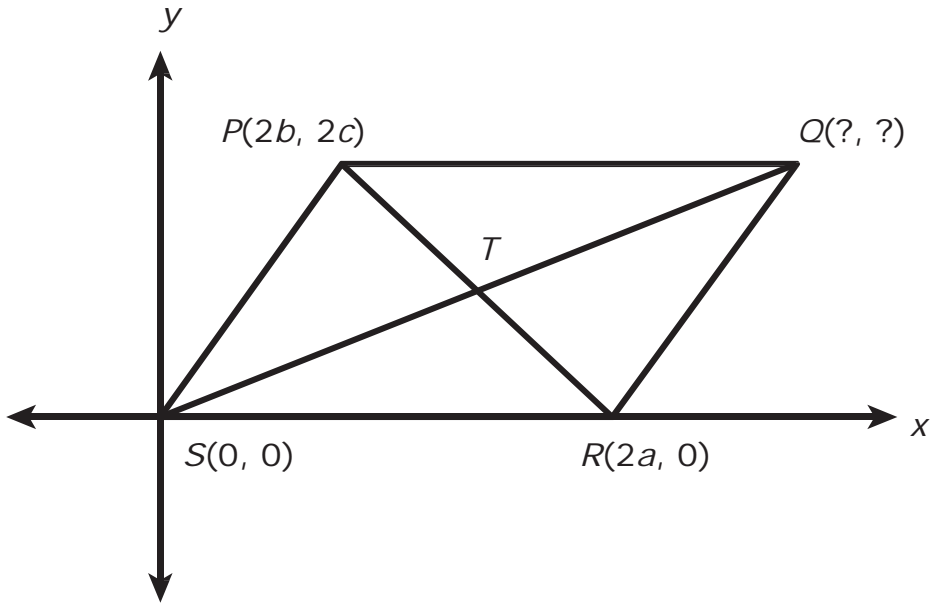
Enter your answer and your justification in the space provided.



Geometry PARCC PBA Practice Assessment Item #15 (Calculator Part): Standard HS.C.13.2

Use the information provided to answer Part A and Part B for question 15.

The figure shows parallelogram $PQRS$ on a coordinate plane. Diagonals \overline{SQ} and \overline{PR} intersect at point T .





15. Part A

Find the coordinates of point Q in terms of a , b , and c .

Enter your answer in the space provided. Enter **only** your answer.

15. Part B

Since $PQRS$ is a parallelogram, SQ and PR bisect each other. Use the coordinates to verify that SQ and PR bisect each other.

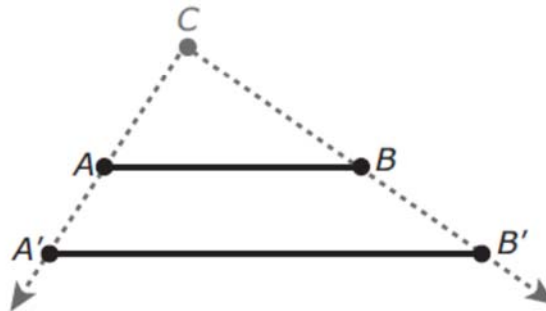


16. A dilation centered at point C with a scale factor of k , where $k > 0$, can be defined as follows:

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 $A'B' = k \cdot AB$.

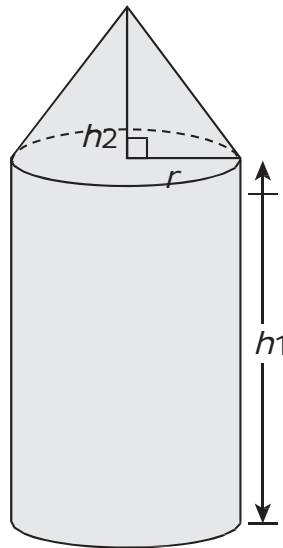


Be sure to explain how you would use the diagram to prove the theorem, and show justifications for each statement in the proof.

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.



Geometry PARCC PBA Practice Assessment Item #18 (Calculator Part): Standard G-CO.1

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

Select **all** that apply.

A J , K , and L are coplanar.

B J , K , and L are collinear.

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

D $\overline{JK} \cong \overline{KL}$

E The measure of $\angle JKL$ is 90° .

Additional Computer-Based Geometry PBA Practice Items

COMPUTER-BASED PRACTICE TEST

Geometry PARCC PBA Practice Assessment Item #2 (non-calculator): Standard G-GPE.6

2. Point Q lies on \overline{ST} , where point S is located at $(-2, -6)$ and point T is located at $(5, 8)$. If $SQ : QT = 5 : 2$, where is point Q on \overline{ST} ? Select a place on the coordinate grid to plot point Q .

