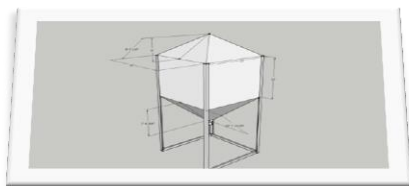


## Performance Assessment Task

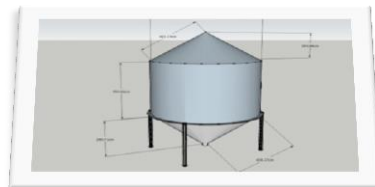
### Grain Bins

The farming supply stores in rural towns sell hopper bins for storing grain to farmers. They have two different style bins. The classic model bin that they have in stock is in the shape of a rectangular prism with a pyramid on top and bottom. A customizable bin that farmers can order is a cylinder with a conical top and bottom. (*See the full size versions included.*)

*Classic Model:*



*Customizable Model:*



As a farmer, you want to purchase the correct number and type of bin (has to be a combination of the two) to store your grain. You must be cost effective for your farm budget; do not pay for excessive storage space that you will not use, but don't leave your grain uncovered to go to waste. The store has 5 rectangular bins available for purchase but the remainder of the bins you will need to customize based on your farming needs. Each bins' interior must also be coated with an anti-mold coating to increase the grains shelf life in storage.

#### Conversion Legend

160 acres =  $\frac{1}{4}$  section

1 section = 4 quarter sections

Crop Yield

1 acre = 35 bushels

1 bushel = 1.24 ft.<sup>3</sup>

Measurement Conversions

1 in. = 2.54 cm

1 ft.<sup>3</sup> = 0.028 m<sup>3</sup>

### Your Task:

#### How big is your farm?

**1.** *Determine the size of your farm:*

Since you currently do not own your own farm, calculate the number of acres for your hypothetical farm by multiplying your height in centimeters by your birth month.

Example: Mike is 173 cm tall and was born in November.

To estimate the number of the acres on Mike's farm =>  $(173)(11) = 1903$  acres

## Performance Assessment Task

### Grain Bins (Continued)

How much grain will you harvest?

*2. Determine your yield of grain:*

**Use proportional reasoning** to calculate the volume of grain that, once harvested, will need to be stored. For your purposes, it is to be assumed that the harvest will yield 35 bushels per acre.

**Note for Step 3 and 4:**

The grain will be filled to the top of each prism but will not fill the top rectangular pyramid or cone.

How many rectangular prism bins will you purchase?

*3. Determine the amount of grain that can be stored in the classic rectangular bin:*

The bin is a composite 3-d shape. **Find the volume** of the rectangular bin to calculate the amount of grain it can hold.

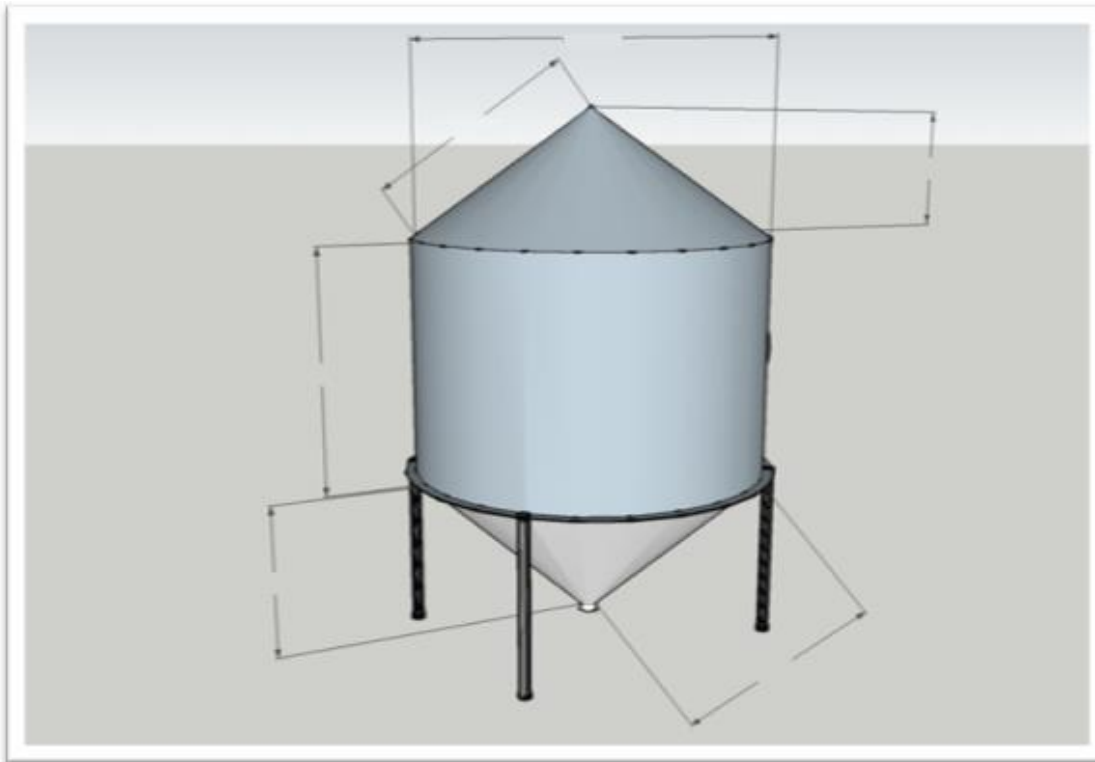
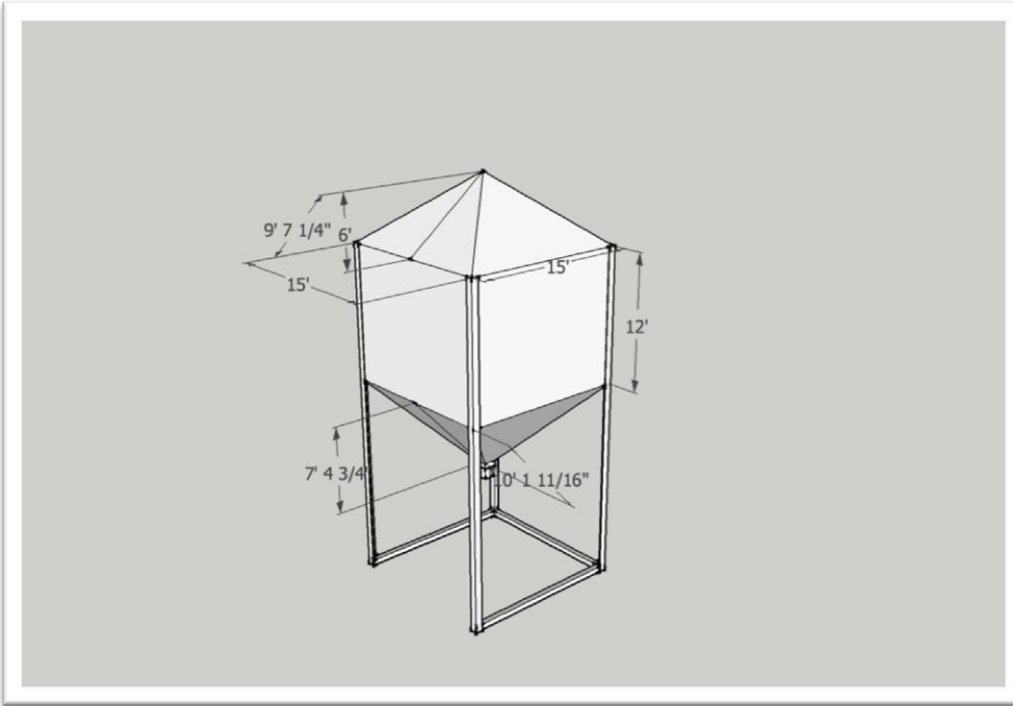
How many cylindrical prism bins will you purchase?

*4. Customize the dimensions of the cylindrical bin that will hold the remaining grain:*

**Convert between the imperial and metric systems** of measure to **calculate the volume** of the grain left to be stored in the customizable bin(s) measured in cubic meters. Determine the appropriate dimensions (radius, height of cylinder and height of cone) to **find the volume** of the cylindrical bin that would store the remaining grain. Ensure each of your dimensions have reasonable measurements. The maximum volume the cylindrical bin can be built to hold is  $300 \text{ m}^3$ .

Clearly communicate your answer and explain any assumptions you may have made.

## Models: Grain Bins



CLASSIC

CUSTOMIZABLE

## Rubric: Grain Bins

Student \_\_\_\_\_ Date \_\_\_\_\_

Level Criteria	Excellent	Proficient	Adequate	Limited *	Insufficient/ Blank *
<b>Determine volume of 3-D composite objects</b> (Measurement 3.) [CN, PS, R, V]	Selects appropriate formulae and applies them <b>correctly</b> to determine the volume of the given composite object.	Selects appropriate formulae and applies them in a <b>substantially correct</b> manner to determine the volume of the given composite object.	Selects appropriate formulae and applies them in a <b>partially correct</b> manner to determine the volume of the given composite object.	<b>Unable</b> to select correct formulae and/or <b>unable</b> to apply them to solve the problem.	No score is awarded because there is insufficient evidence of student performance based on the requirements of the assessment task.
<b>Determine dimensions of 3-D composite objects to achieve a given volume</b> (Measurement 1., 3.) [C, ME, PS]	Makes a <b>perceptive</b> choice of dimensions and applies formulae <b>correctly</b> to determine a volume within given parameters.	Makes a <b>logical</b> choice of dimensions and applies formulae in a <b>substantially correct</b> manner to determine a volume within given parameters.	Makes an <b>appropriate</b> choice of dimensions and applies formulae in a <b>partially correct</b> manner to determine a volume within given parameters.	Makes a <b>questionable</b> choice of dimensions and <b>unable to apply</b> formulae to determine a volume within given parameters.	

\* When work is judged to be limited or insufficient, the teacher makes decisions about appropriate intervention to help the student improve.

Criteria	Specific Requirements	Yes	Not Yet	Teacher Comment
<b>Convert between SI units and imperial units</b> (Measurement 1, 2, 3) [C, CN, ME, PS, V]	<ul style="list-style-type: none"> <li>the student has correctly converted from Imperial to metric.</li> </ul>			