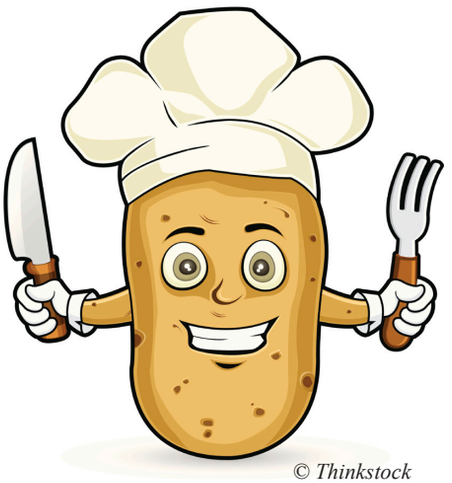
Unit 5: Proportional Reasoning Lesson 5.3

Game On!

In the 1980s, all video games started out with two-dimensional images that had limited movements. By the mid 1990s, through the use of advanced digital technology, three-dimensional characters were created. To bring back some of the older more popular games, digital animators covert the older two-dimensional characters to new three-dimensional ones. The related area and volume calculations, using scale factors, have facilitated these re-creations.

The following exercise contains questions that are recommended for entry level digital animation and design.

Show all your steps and use a ruler where necessary.



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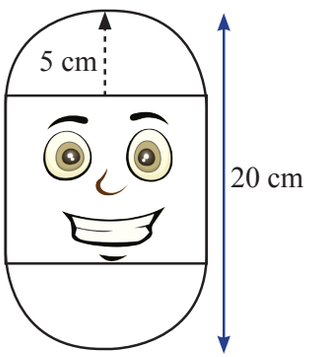

Chef Potato has the two-dimensional shape measurements shown in the image above.

(5) 1. Reduce Chef Potato by a scale factor of 0.5. Then, draw the scale diagram of the reduced Chef Potato.

2. Chef Potato needs to be converted from a two-dimensional shape to a three-dimensional object and then enlarged to 300% of his original size for an advertising campaign. The three-dimensional Chef Potato is similar in shape to a capsule made of a half-sphere at the top and a half-sphere at the bottom and a cylinder in between.

(6)

a. Determine the surface area of the enlarged three-dimensional Chef Potato.

Sphere	$SA = 4\pi r^2$
Cylinder	$SA = 2\pi r^2 + 2\pi rh$

Determine the scale factor.

(3) b. Determine the volume of the enlarged three-dimensional Chef Potato.

Sphere	$V = \frac{4}{3}\pi r^3$
Cylinder	$V = \pi r^2 h$

(3) c. What are possible dimensions of a box that could be used to deliver the enlarged model of Chef Potato to stores? Justify your answer.

(3)

3. The original volume of a three-dimensional Chef Potato was 1309.0 cm^3. What would be the volume of a three-dimensional Chef Potato model with a height that is one quarter that of the original?

4. Abed is designing an interactive three-dimensional flip calendar, like the one shown, to be used on a desktop computer or a tablet.

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(2)

a. On the screen of a computer monitor, the three-dimensional flip calendar's dimensions are such that it has a surface area of 2 100 mm^2. A scale model of this calendar has a surface area of 52 500 mm^2. Determine the scale factor.

(3)

b. Determine the scale factor if the volume of the original calendar is 6 860 mm^2 and the volume of the scale model is 28 000 mm^3.

(3)

c. The dimensions of a computer are 24 cm (vertical) by 42 cm (horizontal). How many calendar faces with a vertical height of 35 mm and a horizontal width of 28 mm would fit the screen without getting cut off if the original calendar is used as a repetitive background?

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You have completed *Lesson 5.3 Game On!* Please proceed to the *Unit 5: Proportional Reasoning Time Out*, on the next page of this *Workbook*.