

6.4 Scale Models
6.5 Solve Problems with Given Constraints

A Scale Models

- ✓ a physical representation of an object that maintains accurate relationships between all important aspects of the model, although absolute values of the original properties need not be preserved
- ✓ the scale notation is the size of the model compared to the real, full-size of the prototype

B Scale

- ✓ The ratio of a distance on the map (drawing) to the corresponding distance on the real prototype.

Example. 1:10 scale. It is read as: "1 inch (or whatever measurement) on the model correspond (: means correspond) to 10 inches on the real prototype".

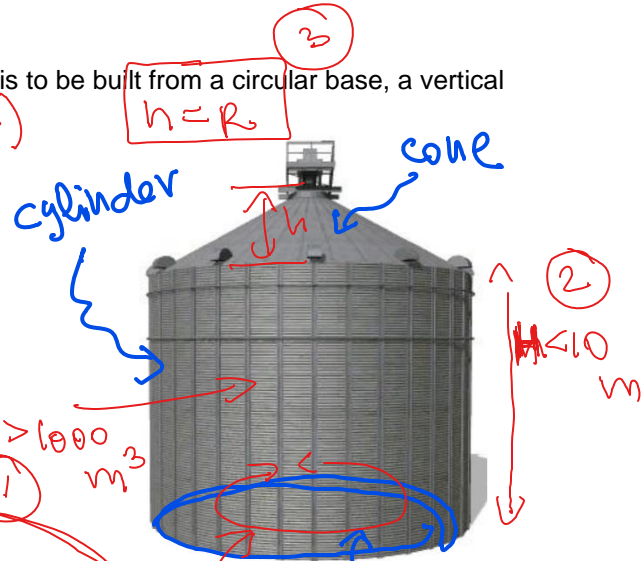
Activity 1. (Design a Silo) A silo (like the one presented in the figure below) is to be built from a circular base, a vertical cylinder and a cone on top. Here are the requirements: **(constraints)**

- ✓ The volume of the cylinder must be at least 1000 meters cube
- ✓ The height of the cylinder cannot be more than 10 meters
- ✓ The height of the cone on top is equal to the radius of the cylinder

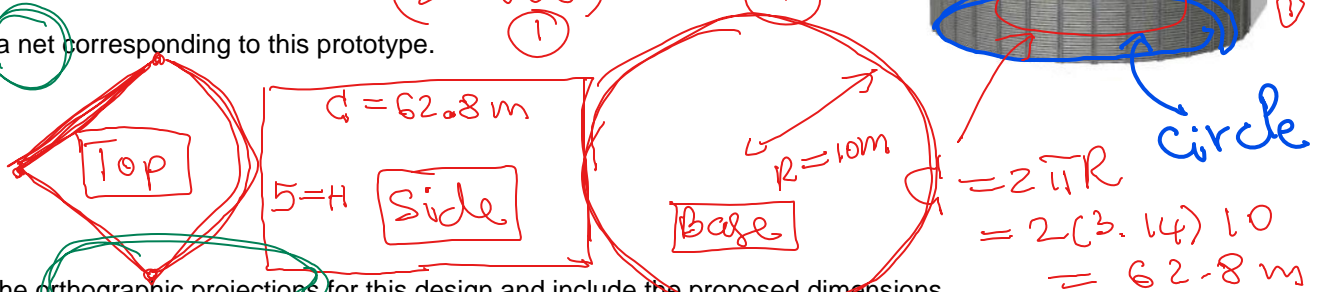
a) Propose dimensions satisfying these requirements. Explain.

Note: Volume of a cylinder is: $V = \pi R^2 H$

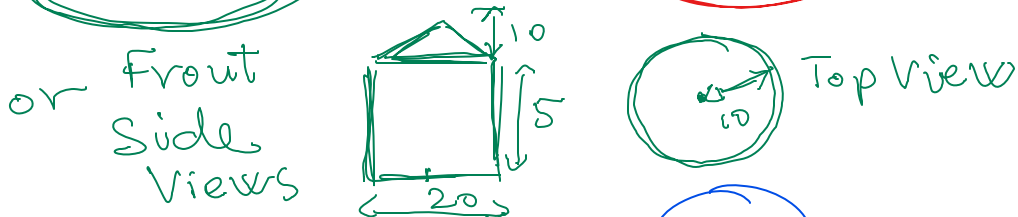
$R = 10\text{m}$ $H = 5\text{m} < 10\text{m}$ $V = 3.14 (10^2) (5) = 1570\text{m}^3$
 (> 1000)



b) Make a net corresponding to this prototype.



c) Draw the orthographic projections for this design and include the proposed dimensions.



d) If one meter square of the metal sheet used to make the cylinder costs \$10.5, estimate the cost to build this vertical side.

Note. The area of a cylinder is: $A = 2\pi RH$

$\$10.50/\text{m}^2$

$A_{\text{vertical side}} = 2\pi R H = 2(3.14)(10)(5) = 314\text{m}^2$
 $\text{Cost} = (\$10.50)(314) = \$3,297$

∴ The cost to build the silo is \$3,297

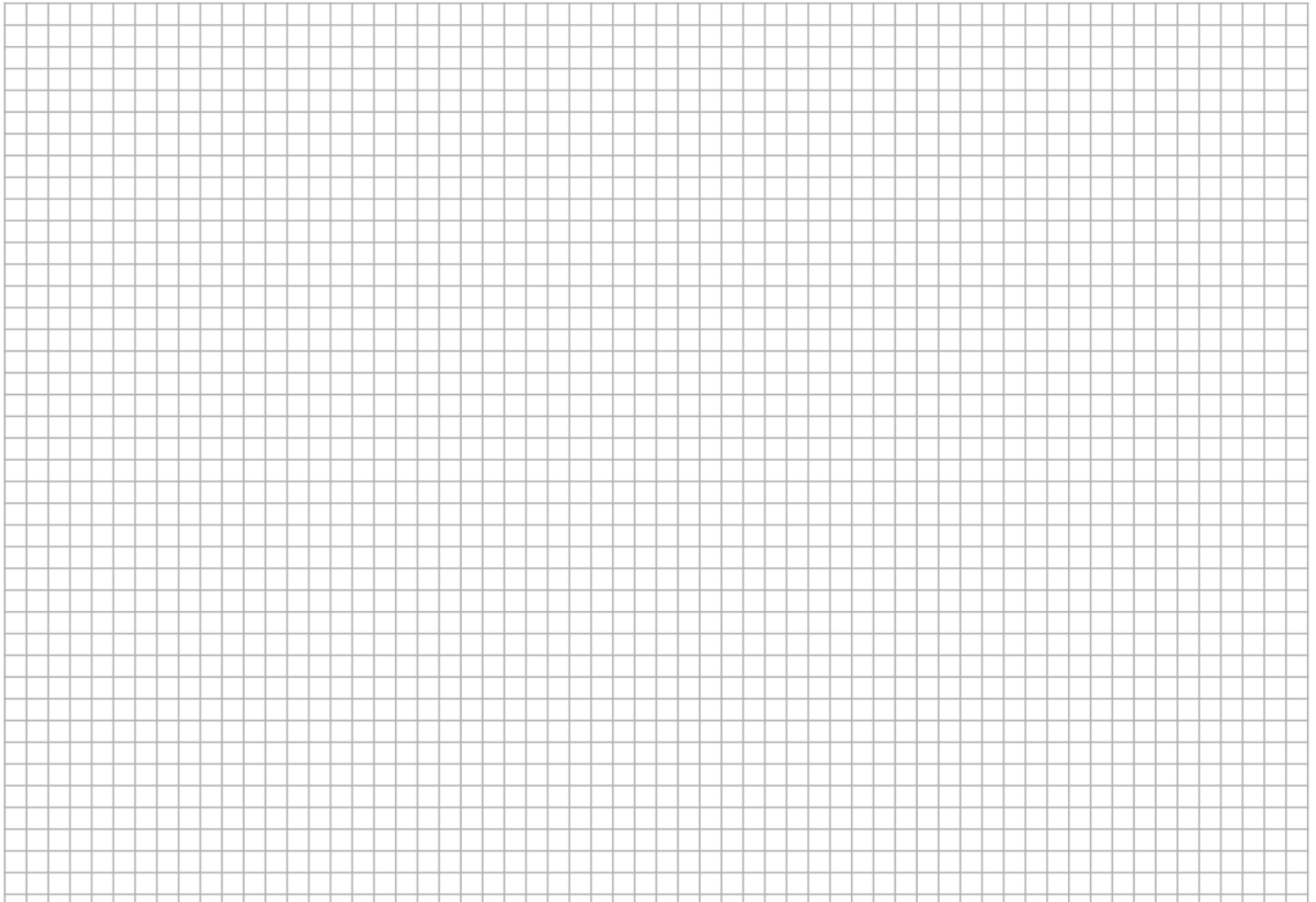
Activity 2. (Designing a backyard). In the picture below is the artist impression of a backyard. You are required to make a scale model of a backyard 40 feet (frontage) by 50 feet (deep) containing the following required rectangular elements:

1. Pool area
2. Barbeque area
3. Patio area
4. Pergola area
5. Lawn area
6. Flower bed area
7. Fireplace area
8. Walking pathways
9. Shed area
10. Anything else you would like to include



Directions:

- ✓ Draw your scale model on the following grid containing 8 lines per inch
- ✓ Use a rectangle for each element (including the whole backyard), write down the element name and its real dimensions (in feet).
- ✓ Specify the scale to your drawing.
- ✓ You may choose one cell on your model to correspond to one square foot in the real backyard.
- ✓ You may use a printout, or PowerPoint or Google Slides to work on this activity.



Reading Pages 327-331

Homework Pages 332-334 # 1, 5

Reading Pages 335-339

Homework Pages 340-343 # 5, 9