Do Now 10/5/17

Unit 1, Lesson 10 : Changing Scales in Scale Drawings

10.1 : Appropriate Measurements

- 1 min think time to estimate size of their own foot in cm/in

→ task

(1) A and D only appropriate

→ marked in 1/8 inches → do not B, C, E

→ marked in 1/10 centimeter

(2) Largest is ~ 1.5 x larger

if 10 in → 15 in

FLIP TO BACK

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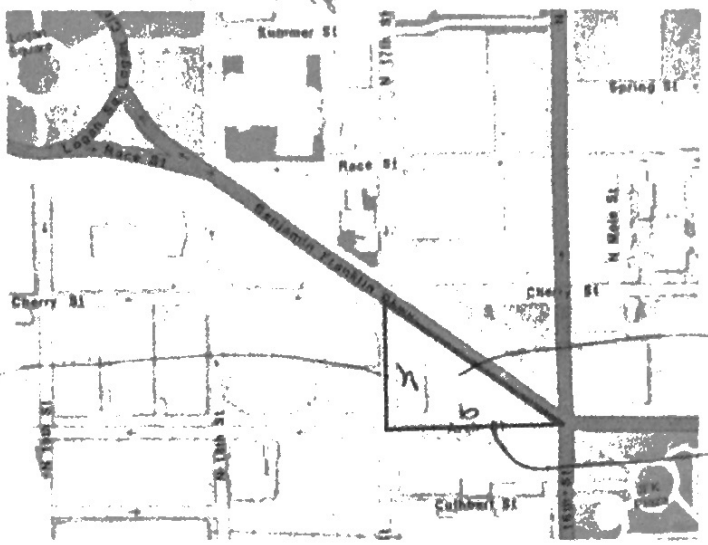
15 mins

10.2: Same Plot, Different Drawings

$A_{\triangle} = \frac{1}{2}bh$

Here is a map showing a plot of land in the shape of a right triangle.

neighborhood in Philadelphia



Going to reproduce map

Area is: 5400 sq. m.

Actual height is 90m

Actual base: 120 m

1. Your teacher will assign you a scale to use. On centimeter graph paper, make a scale drawing of the plot of land. Make sure to write your scale on your drawing.

2. What is the area of the triangle you drew? Explain or show your reasoning.

A - 216 cm^2 $\frac{1}{2} \cdot 24 \cdot 18 = 216$
B - 54 cm^2
C - 24 cm^2
D - 13.5 cm^2
E - 6 cm^2

5 mins

Independ...

3. How many square meters are represented by 1 square centimeter in your drawing?

4. After everyone in your group is finished, order the scale drawings from largest to smallest. What do you notice about the scales when your drawings are placed in this order? Whole group

5 mins

Smaller the # of m represented by one cm, the larger the scale drawing

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Are you ready for more?

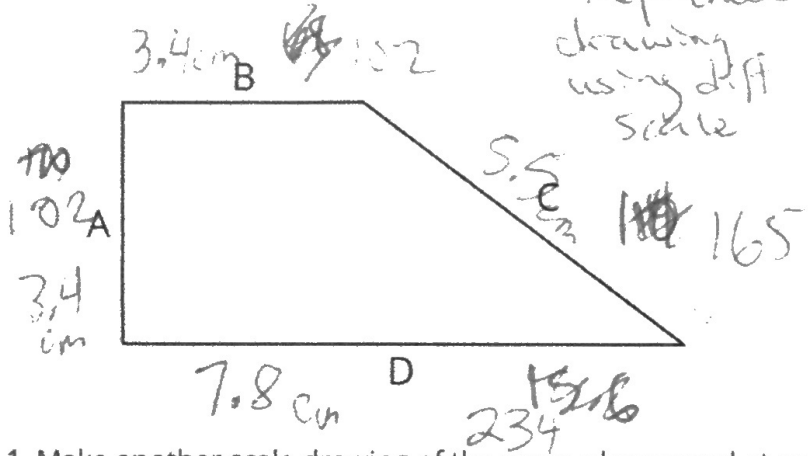
Noah and Elena each make a scale drawing of the same triangular plot of land, using the following scales. Make a prediction about the size of each drawing. How would they compare to the scale drawings made by your group?

1. Noah uses the scale 1 cm to 200 m.

2. Elena uses the scale 2 cm to 25 m.

10.3: A New Drawing of the Playground

Here is a scale drawing of a playground.



The scale is 1 centimeter to 30 meters.

1. Make another scale drawing of the same playground at a scale of 1 centimeter to 20 meters.

2. How do the two scale drawings compare?

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Unit 1, Lesson 11: Scales without Units

Let's explore a different way to express scales.

11.1: One to One Hundred

A map of a park says its scale is 1 to 100.

1. What do you think that means?

distances in park are 100 x bigger
→ than on map

2. Give an example of how this scale could tell us about measurements in the park.

1 unit on map = 100 units of distance

- if path is 6 in, 600 in

11.2: Apollo Lunar Module

How big might it be?

Your teacher will give you a drawing of the Apollo Lunar Module. It is drawn at a scale of 1 to 50.

Pass out image - use scale drawing to find out

Smirf

1. The "legs" of the spacecraft are its landing gear. Use the drawing to estimate the actual length of each leg on the sides. Write your answer to the nearest 10 centimeters. Explain or show your reasoning.

leg is ~7cm = 7.5c = 375 cm

leg is 2.75 in = 2.75 x 50 = 137.5 x 2.54
= 349.5 cm

2. Use the drawing to estimate the actual height of the Apollo Lunar Module to the nearest 10 centimeters. Explain or show your reasoning.

~7 meters tall

14 cm tall on drawing

14.50 = 700 cm = 7 m

~~~~14 cm~~~~
~~~~

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3. Neil Armstrong was 71 inches tall when he went to the surface of the moon in the Apollo Lunar Module. How tall would he be in the drawing if he were drawn with his height to scale? Show your reasoning.

1.4 in tall 71 ÷ 50 ≈ 1.4

4. Sketch a stick figure to represent yourself standing next to the Apollo Lunar Module. Make sure the height of your stick figure is to scale. Show how you determined your height on the drawing.

in space below

6'1 = 73 inches ÷ 50 = 1.46 in

Are you ready for more?

The table shows the distance between the sun and 8 planets in our solar system.

1. If you wanted to create a scale model of the solar system that could fit somewhere in your school, what scale would you use?

2. The diameter of the Earth is approximately 8,000 miles. What would the diameter of the Earth be in your scale model?

planet	average distance (millions of miles)
Mercury	35
Venus	108
Earth	150
Mars	228
Jupiter	779
Saturn	889
Uranus	1,890
Neptune	2,800

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11.3: Same Drawing, Different Scales

Is it possible to express the 1 to 15 scale as a scale without units? If so, what do we use? Cm to m

A rectangular parking lot is 120 feet long and 75 feet wide.

- Lin made a scale drawing of the parking lot at a scale of 1 inch to 15 feet. The drawing she produced is 8 inches by 5 inches.

- Diego made another scale drawing of the parking lot at a scale of 1 to 180. The drawing he produced is also 8 inches by 5 inches.

1. Explain or show how each scale would produce an 8 inch by 5 inch drawing.

Lin 1 in = 15 ft so 120 ft is 8 in 120 ÷ 15 = 8
75 ft is 5 in 75 ÷ 15 = 5

8 in x 5 in Diego 1 unit = 180 1 m = 180 m = 15 ft 180 ÷ 12 = 15

2. Make another scale drawing of the same parking lot at a scale of 1 inch to 20 feet. Be prepared to explain your reasoning.

6 in x $3\frac{3}{4}$ in. 120 ÷ 20 = 6
75 ÷ 20 = $3\frac{3}{4}$

3. Express the scale of 1 inch to 20 feet as a scale without units. Explain your reasoning.

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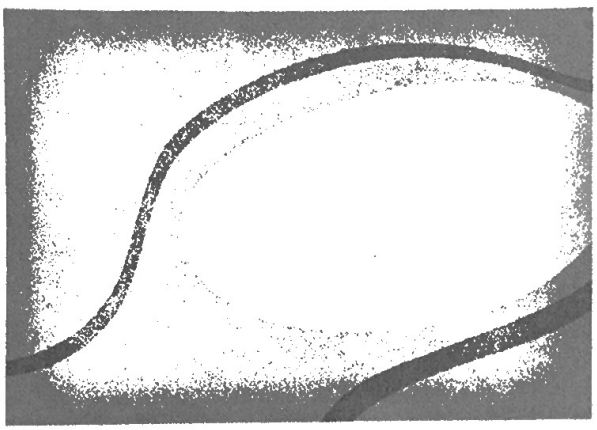
Lesson 10 Summary

Sometimes we have a scale drawing of something, and we want to create another scale drawing of it that uses a different scale. We can use the original scale drawing to find the size of the actual object. Then we can use the size of the actual object to figure out the size of our new scale drawing.

For example, here is a scale drawing of a park where the scale is 1 cm to 90 m.



The rectangle is 10 cm by 4 cm, so the actual dimensions of the park are 900 m by 360 m, because $10 \cdot 90 = 900$ and $4 \cdot 90 = 360$.

Suppose we want to make another scale drawing of the park where the scale is 1 cm to 30 meters. This new scale drawing should be 30 cm by 12 cm, because $900 \div 30 = 30$ and $360 \div 30 = 12$.

Another way to find this answer is to think about how the two different scales are related to each other. In the first scale drawing, 1 cm represented 90 m. In the new drawing, we would need 3 cm to represent 90 m. That means each length in the new scale drawing should be 3 times as long as it was in the original drawing. The new scale drawing should be 30 cm by 12 cm, because $3 \cdot 10 = 30$ and $3 \cdot 4 = 12$.

Since the length and width are 3 times as long, the area of the new scale drawing will be 9 times as large as the area of the original scale drawing, because $3^2 = 9$.

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Lesson 11 Summary

In some scale drawings, the scale specifies one unit for the distances on the drawing and a different unit for the actual distances represented. For example, a drawing could have a scale of 1 cm to 10 km.

In other scale drawings, the scale does not specify any units at all. For example, a map may simply say the scale is 1 to 1,000. In this case, the units for the scaled measurements and actual measurements can be any unit, so long as the same unit is being used for both. So if a map of a park has a scale 1 to 1,000, then 1 inch on the map represents 1,000 inches in the park, and 12 centimeters on the map represent 12,000 centimeters in the park. In other words, 1,000 is the scale factor that relates distances on the drawing to actual distances, and $\frac{1}{1000}$ is the scale factor that relates an actual distance to its corresponding distance on the drawing.

A scale with units can be expressed as a scale without units by converting one measurement in the scale into the same unit as the other (usually the unit used in the drawing). For example, these scales are equivalent:

- 1 inch to 200 feet
- 1 inch to 2,400 inches (because there are 12 inches in 1 foot, and $200 \cdot 12 = 2{,}400$)
- 1 to 2,400

This scale tells us that all actual distances are 2,400 times their corresponding distances on the drawing, and distances on the drawing are $\frac{1}{2400}$ times the actual distances they represent.