Lesson: **4.1.2 – Supplement**
Scale Drawings

CC Standards

7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Calculator

Yes

Objective

The students will use proportions to solve problems involving scale. Students will also use scale factors to find the area of geometric shapes.

Mathematical Practices

#1 Make sense of problems and preserve in solving them.
#5 Use appropriate tools strategically.

Teacher Input

Bellwork: Review bellwork.
Homework: Review important problems assigned the previous night.
Introduction: Explain what scale drawings are by showing images of how scales are used with blueprints, maps, and models. Blueprints: Talk about Mississippi State School of Architecture and how scales are used. Maps: Display map of Mississippi and explain how scales are used with maps. Models: Display example of scale model of the White House used in the movie "Independence Day". Show the image of the scale model of the twin towers.

Practice

Classwork: Scale Drawings Worksheet
Homework: Scale Drawing Worksheet (4 problems)
Extra Practice: Teacher selected

Closure

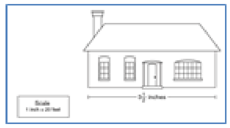
1. A scale drawing is a reduced or enlarged drawing of a actual object.
   What are some examples of scale drawings? **Maps, blueprints, models**
2. How do you solve problems involving scales? **Set up a proportion.**
3. The first ratio is always your _____? **scale**
4. The second ratio is set up from the _______? **The other information provided.**
5. What is important to remember about setting up a proportion?
   Same units must be across from each other

Lesson 4.1.2 – Scale Drawings

Section 1: What is a Scale Drawing?

Scale Drawings

Enlarged or reduced drawing of an actual object.



Where used:
Blue Prints
Maps

Scale models

To solve:
Use Proportions

$$\frac{1\ in}{20\ ft} = \frac{3.5\ in}{x\ ft}$$

Section 2: Using proportions to find unknown quantities involving scales drawings.

Note… When setting up a proportion, you always want to put the "like things" across from each other.

Example: The scale of a map is **2 inches = 25 miles**.
Find the actual distance if the map distance is 3 inches.

STEP 1:

Take the scale and make that the 1st ratio.

$$\frac{drawing\ length}{actual\ length}$$

STEP 2:

Take the other information provided and make that your 2nd ratio.

STEP 3:

Cross Multiply

STEP 4:

Solve the equation!

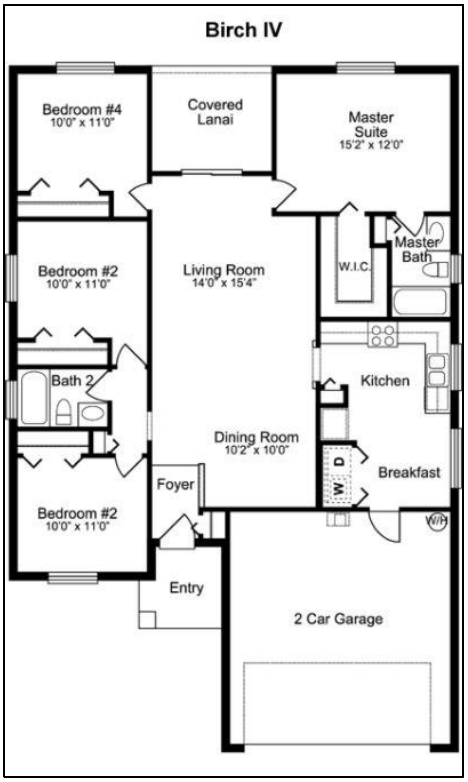
$$\frac{2\ \ in}{25\ mi} = \frac{3\ \ in}{x}$$

$$2x = 75$$

$$x = 37.5\ mi$$

You are given the 3 inches. It goes on the top because the "like things" go across from each other. That means our unknown (x) goes on the bottom.

Guided Practice: On an architect's drawing of a house, 1 inch represents 1.5 feet. If the actual bedroom window is 3 feet, how many inches will it be on the drawing?



STEP 1: Take the scale and make that the 1st ratio.

$$\frac{drawing\ length}{actual\ length}$$

→ **STEP 2:** Take the other information provided and make that your 2nd ratio.

→ **STEP 3:** Cross Multiply

→ **STEP 4:** Solve the equation!

You Try

The scale on a map shows that 5 centimeters = 2 kilometers.

Part A: What number of centimeters on the map represents an actual distance of 5 kilometers?

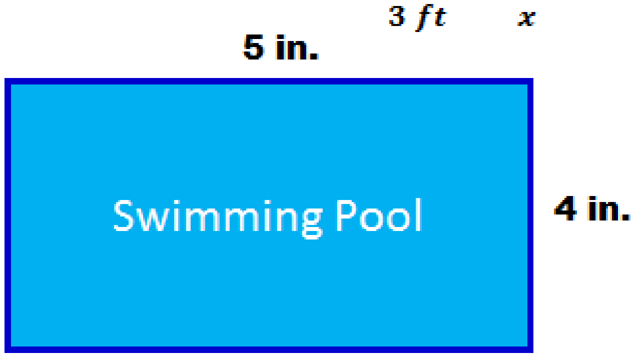
Part B: What is the actual number of kilometers that is represented by 2 centimeters on the map?

Section 3: Reproducing a figure using a scale.

Example: An architect made this drawing to represent a swimming pool.
If the scale is 1 inch = 3 feet, what are the dimensions of the actual swimming pool?

To find the actual dimensions of the pool, set up and solve a proportion using the scale for each side as shown below.

$$\frac{1\ in}{3\ ft} = \frac{5\ in}{x} \qquad x = 15\ ft$$

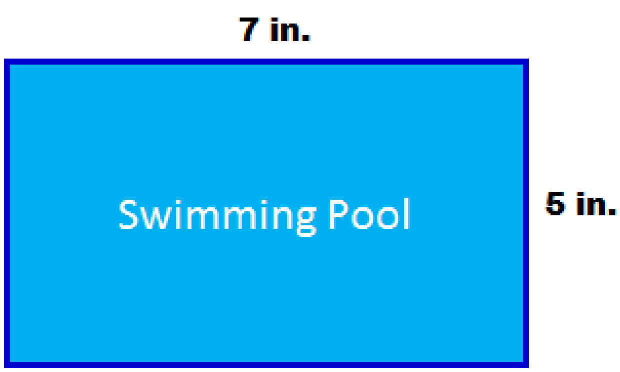


$$\frac{1\ in}{3\ ft} = \frac{4\ in}{x} \qquad x = 12\ ft$$

Answer: The dimensions of the actual swimming pool are **12 ft. by 15 ft**.

Section 4: Finding area and perimeter of shapes involving scale.

Guided Practice: An architect made this drawing to represent a swimming pool.
If the scale is 1 inch = 3 feet, what is the <u>perimeter</u> and <u>area</u> of the <u>actual</u> swimming pool?



<u>You Try</u>
Julie is constructing a scale model of her room. The rectangular room is 10.5 inches by 8 inches. If 1 inch represents 2 feet of the actual room, what is the perimeter and area of Julie's room?

Lesson 4.1.2 – Scale Drawings

Classwork

1) A scale drawing has a scale of 1 in = 11 ft.
Find the actual length for each drawing length.

Drawing Length	Proportion	Solve for the Variable
a) 21 in		
b) 15 in		
c) 6 in		
d) 45 in		
e) 13.5 in		

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2) The scale on a map is 2 cm: 21 km.
Find each <u>drawing length</u> for the actual map distances given below.

Actual Length	Proportion	Solve for the Variable
a) 94.5 km		
b) 131.25 km		
c) 47.25 km		

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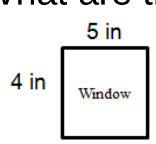
3) On an architect's drawing of a house, 1 inch represents 1.5 feet.
If the bedroom window is 5 inches long on the drawing and 4 inches wide…

Part A: What are the actual dimensions of the window on the real house?



Part B: What is the perimeter and area of the window in real life?

Homework

Name:______________________________ Date:_____________ Period:_______

Solve problems 1-4 using proportions. Must show your work for credit!

1. On an architect's drawing of a house, 1 inch represents 7 feet.
   If the bedroom window is 5 inches long on the drawing, how long will it be on the actual house?

2. Scale: 4 inches = 12 miles
   If the drawing length is 13 inches, what is the actual length?

3. Scale: .25 inches = 6 feet
   If the <u>actual length</u> is 18 feet, what is the drawing length?

4. On a blueprint for a new building 3 inches equals 8 feet in real life. The height of the building on the blueprint is 9 inches. What is the actual height of the building?

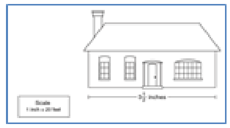
ANSWER KEYS

Section 1: What is a Scale Drawing?

Answer Key

Scale Drawings

Enlarged or reduced drawing of an actual object.



Where used:
Blue Prints
Maps
Scale models

To solve:
Use Proportions

$$\frac{1\ in}{20\ ft} = \frac{3.5\ in}{x\ ft}$$

Section 2: Using proportions to find unknown quantities involving scales drawings.

Note… When setting up a proportion, you always want to put the "like things" across from each other.

Example: The scale of a map is **2 inches = 25 miles**.
Find the actual distance if the map distance is 3 inches.

STEP 1:

Take the scale and make that the 1st ratio.

$$\frac{drawing\ length}{actual\ length}$$

→ **STEP 2:**

Take the other information provided and make that your 2nd ratio.

→ **STEP 3:**

Cross Multiply

→ **STEP 4:**

Solve the equation!

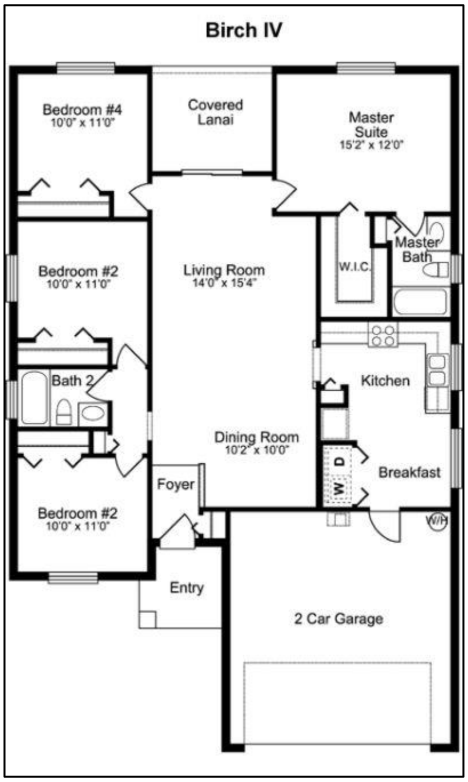
$$\frac{2\ in}{25\ mi} = \frac{3\ in}{x}$$

$$2x = 75$$

$$x = 37.5\ mi$$

You are given the 3 inches. It goes on the top because the "like things" go across from each other. That means our unknown (x) goes on the bottom.

Guided Practice: On an architect's drawing of a house, 1 inch represents 1.5 feet. If the actual bedroom window is 3 feet, how many inches will it be on the drawing?



STEP 1: Take the scale and make the 1st ratio. $\frac{\textit{drawing length}}{\textit{actual length}}$ → **STEP 2:** Take the other information provided and make that your 2nd ratio. → **STEP 3:** Cross Multiply → **STEP 4:** Solve the equation!

$$\frac{1\ in}{1.5\ ft} = \frac{x}{3\ ft}$$

$1.5x = 3$

$x = 2$ in

You Try

The scale on a map shows that 5 centimeters = 2 kilometers.

Part A: What number of centimeters on the map represents an actual distance of 5 kilometers?

$$\frac{5\ cm}{2\ km} = \frac{x}{5\ km}$$

$2x = 25$ $\quad$ $x = 12.5$ cm

Part B: What is the actual number of kilometers that is represented by 2 centimeters on the map?

$$\frac{5\ cm}{2\ km} = \frac{2\ cm}{x}$$

$5x = 4$ $\quad$ $x = 0.8$ km

Section 3: Reproducing a figure using a scale.

Example: An architect made this drawing to represent a swimming pool.
If the scale is **1 inch = 3 feet**, what are the dimensions of the actual swimming pool?

To find the actual dimensions of the pool, set up and solve a proportion using the scale for each side as shown below.

$$\frac{1\ in}{3\ ft} = \frac{5\ in}{x} \qquad x = 15\ ft$$

5 in.

4 in.

$$\frac{1\ in}{3\ ft} = \frac{4\ in}{x} \qquad x = 12\ ft$$

Answer: The dimensions of the actual swimming pool are **12 ft. by 15 ft**.

Section 4: Finding area and perimeter of shapes involving scale.

Guided Practice: An architect made this drawing to represent a swimming pool.
If the scale is 1 inch = 3 feet, what is the <u>perimeter</u> and <u>area</u> of the <u>actual</u> swimming pool?

$$\frac{1\ in}{3\ ft} = \frac{7\ in}{x} \qquad x = 21\ ft$$

7 in.

5 in.

$$\frac{1\ in}{3\ ft} = \frac{5\ in}{x} \qquad x = 15\ ft$$

P = 21 + 21 + 15 + 15 = **72 ft**
A = b • h = 21 • 15 = **315 ft^2**

<u>You Try</u>
Julie is constructing a scale model of her room. The rectangular room is 10.5 inches by 8 inches. If 1 inch represents 2 feet of the actual room, what is the perimeter and area of Julie's room?

Find the actual length of each side by setting up and solving a proportion.

$$\frac{1\ in}{2ft} = \frac{10.5\ in}{x} \qquad x = 21\ ft \qquad \frac{1\ in}{2ft} = \frac{8\ in}{x} \qquad x = 16\ ft$$

P = 21 + 21 + 16 + 16 = 74 ft.
A = b x h = 21 x 16 = 336 ft^2

Lesson 4.1.2 – Scale Drawings

Classwork

1) A scale drawing has a scale of 1 in = 11 ft.
Find the actual length for each drawing length below.

Drawing Length	Proportion	Solve for the Variable
a) 21 in	$\frac{1\ in}{11\ ft} = \frac{21\ in}{x\ ft}$	x = 231 ft
b) 15 in	$\frac{1\ in}{11\ ft} = \frac{15\ in}{x\ ft}$	x = 165 ft
c) 6 in	$\frac{1\ in}{11\ ft} = \frac{6\ in}{x\ ft}$	x = 66 ft
d) 45 in	$\frac{1\ in}{11\ ft} = \frac{45\ in}{x\ ft}$	x = 495 ft
e) 13.5 in	$\frac{1\ in}{11\ ft} = \frac{13.5\ in}{x\ ft}$	x = 148.5 ft

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2) The scale on a map is 2 cm: 21 km.
Find each drawing length for the actual map distances given below.

Actual Length	Proportion	Solve for the Variable	
a) 94.5 km	$\frac{2\ cm}{21\ km} = \frac{x\ cm}{94.5\ km}$	21x = 189	x = 9 cm
b) 131.25 km	$\frac{2\ cm}{21\ km} = \frac{x\ cm}{131.25\ km}$	21x = 262.5	x = 12.5 cm
c) 47.25 km	$\frac{2\ cm}{21\ km} = \frac{x\ cm}{47.25\ km}$	21x = 94.5	x = 4.5 cm

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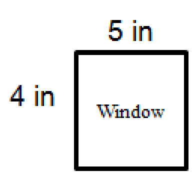
3) On an architect's drawing of a house, 1 inch represents 1.5 feet.
If the bedroom window is 5 inches long on the drawing and 4 inches wide…

Part A: What are the actual dimensions of the window on the real house?



$\frac{1\ in}{1.5\ ft} = \frac{5\ in}{x}$ x = 7.5 ft

$\frac{1\ in}{1.5\ ft} = \frac{4\ in}{x}$ x = 6 ft

Actual dimensions: **7.5 ft. by 6 ft.**

Part B: What is the perimeter and area of the window in real life?

P = 7.5 + 7.5 + 6 + 6 = 27 ft

Area = b x h = 7.5 x 6 = 45 ft^2

Homework

Name:_______________________________ Date:_____________ Period:_______

Solve problems 1-4 using proportions. Must show your work for credit!

1. On an architect's drawing of a house, 1 inch represents 7 feet.
   If the bedroom window is 5 inches long on the drawing, how long will it be on the actual house?

   Scale

   $\frac{1\,in}{7\,ft} = \frac{5\,in}{x\,ft}$ $\quad x = 35\ ft$

2. Scale: 4 inches = 12 miles
   If the drawing length is 13 inches, what is the actual length?

   Scale

   $\frac{4\,in}{12\,mi} = \frac{13\,in}{x\,mi}$ $\quad \frac{4x}{4} = \frac{156}{4}$ $\quad x = 39\ mi$

3. Scale: .25 inches = 6 feet
   If the <u>actual length</u> is 18 feet, what is the drawing length?

   Scale

   $\frac{.25\,in}{6\,ft} = \frac{x\,in}{18\,ft}$ $\quad \frac{6x}{6} = \frac{4.5}{6}$ $\quad x = .75\ in$

4. On a blueprint for a new building 3 inches equals 8 feet in real life. The height of the building on the blueprint is 9 inches. What is the actual height of the building?

   Scale

   $\frac{3\,in}{8\,ft} = \frac{9\,in}{x\,ft}$ $\quad \frac{3x}{3} = \frac{72}{3}$ $\quad x = 24\ ft$