Scale Drawings

Objectives:

…to interpret and/or apply scales shown on maps, blueprints, models, etc.
…to determine and/or apply an appropriate scale for reduction or enlargement

Assessment Anchor:

7.B.2.2 – Construct, interpret and/or use scale drawings to solve real-world problems

Vocabulary alert!!

SCALE DRAWING – an enlarged or reduced drawing that is similar to an actual object or place

SCALE – the ratio of the model size to the actual size

NOTES and EXAMPLES

There are many situations where something has been represented with a model…and the size needs to be "scaled." Model cars, sports figurines, statues of famous people, blueprints to houses…the list goes on and on.

***To calculate a measurement using a scale:**

1. **Write a proportion using the given scale as your first ratio**
2. **Solve the proportion and label your answer properly.**

***To determine a scale for enlargement or reduction:**

1. **Write the given measurements as a ratio**
   a. **You may simplify the ratio (keeping whole number pieces)**
   b. **You may divide in order to make the leading component "one"**

Scale Drawings

1) A map's scale is 1 inch : 30 miles. The distance between two cities is 45 miles. What is the distance between the cities on the map?

2) A scale drawing has a scale of 2 cm : 15 m. If the length of something on the drawing is 12 cm, what is the actual length?

$$\frac{1inch}{30miles} = \frac{x}{45miles} \quad \leftarrow \text{write proportion} \rightarrow$$

$$\frac{30x}{30} = \frac{45}{30} \quad \leftarrow \text{solve proportion} \rightarrow$$

$$x = 1.5$$

1.5 inches $\leftarrow$ answer question $\rightarrow$

3) The scale on a blueprint of a home is 1 in : 4 ft. The actual length of the family room is 26 feet. What is the blueprint length?

4) The scale on a drawing is given as ½ in : 6 ft. A distance on the drawing measures 1 ½ inches. What is the real distance?

5) Two cities are 1,750 miles apart. On a map, the cities are 5 inches apart. What is the scale on the map?

6) A 75-ft statue of Mr. Seidel stands outside. A miniature replica is just 10 inches tall. What is the scale being used?

$$\frac{model}{actual} = \frac{5inches}{1{,}750miles} \rightarrow \frac{1inch}{350miles}$$

Scale ---> (1 inch : 350 miles)

***Discuss the possibility of always making the model size "one"...

Integrated Algebra Name:

1.2 Proportions as Models

EXAMPLE 1

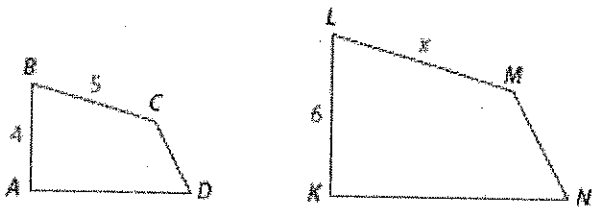
According to the American Automobile Association (AAA), the overall cost of owning and operating a passenger vehicle averages $7,834 based on 15,000 miles of driving. If the cost per mile is constant, about what would it cost to drive 12,000 miles?

EXAMPLE 2

A typical scale for a house plan is $\frac{1}{4}$ inch to 1 foot. If the width of a room on such a plan measures $3\frac{1}{2}$ inches, what is the actual width of the room?

EXAMPLE 3

Given: $ABCD \sim KLMN$



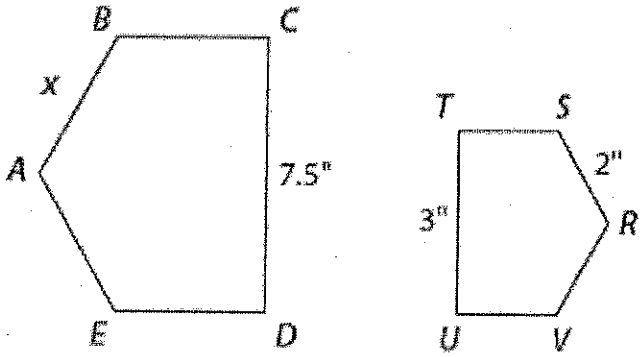
a. What is the scale factor of $ABCD$ to $KLMN$?

b. Find the value of x.

4. Walking at a fast pace burns 5.6 calories per minute. How many minutes of walking at a fast pace are needed to burn the 500 calories consumed by eating a dish of ice cream?

5. A plan for an office building uses a scale of $\frac{1}{16}$ inch to 1 foot. How long would a 35 foot wall appear on the plan?

6. Given: $ABCDE \sim RSTUV$. Find the value of x.



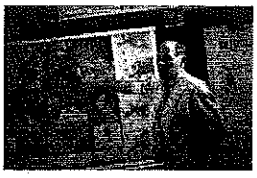
7.

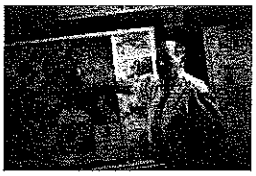
The ratio of the corresponding sides of two similar rectangles is 4 : 9. The length of the smaller rectangle is 16 cm and its width is 12 cm. What is the perimeter of the larger rectangle?

8.

Suppose that a, b, c, and d represent four numbers that form the proportion $\frac{a}{b} = \frac{c}{d}$. If a is doubled while b remains the same, how would c or d have to change for the proportion to stay true?

Scale Drawings – Worksheet #1





For problems #1 – 2, use the following scale... 2 in : 35 miles

1) The distance between Troy City and Ben City is 315 miles. How far apart are they on the map?

2) Marking City is 5 inches away from Jamming City on the map. What is the actual distance between the two cities?

3) A blueprint of a house has a scale of 1 in : 6 ft. The living room has dimensions of 18 ft by 24 feet. What are the dimensions on the blueprint of the living room? (HINT: Use two different proportions!)

4) A model of a car has a scale of 3 cm : 2 m. The length of the actual hood of the car is 1 m. What is the length of the hood of the model?

5) A 120-ft long playground is just 15 in. on the scale drawing. What is the scale on the scale drawing?

Scale Drawings – Worksheet #1

6) The scale on a map is ¼ in : 18 mi. The state capital is 252 miles from the border. How far is the state capital from the border on the map?

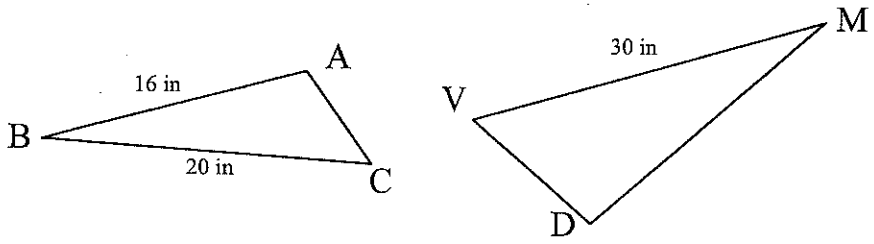
7) A model length of 12 cm. represents an actual length of 102 ft. What is the scale for the model?

Other proportion review:

8) Jenny can type 1,200 words in just 15 minutes. How many words can she type in an hour?

9) A tree casts a shadow that is 24 ft long. A 4-ft tall young boy casts a shadow that is 3 ft long. The two triangles created are similar. How tall is the tree? (HINT: Draw a picture first!)

10) Given: $\Delta ABC \sim \Delta DMV$; DM = _____



Scale Drawings – Worksheet #2

For problems #1 – 2, use the following scale... 5 cm : 2 miles

1) The distance on the map between Yappy City and Quiet City is 23 cm. What is the actual distance between the cities?

2) The famous "math" water fountain is just 5 miles away from the high school. How far is the fountain away from the school on the map?

3) A tower that is 3,500 meters tall is represented on a scale drawing and is 14 inches tall. What is the scale on the scale drawing?

4) A blueprint shows the master bedroom to be 5 inches long and 3 inches wide. The scale on the blueprint is 2 in : 11 ft. What are the actual length and width of the master bedroom? (HINT: Use two different proportions!)

5) A baseball player is 6 ft tall. His collectible figurine is just 4 inches tall. What is the scale of the collectible figurine?

Scale Drawings – Worksheet #2

6) The scale on a map is 4 cm : 125 Km. The distance from the Scale Drawing Junior High School to the shore is 350 Km. What is the map distance from the JHS to the shore?

7) The scale on a blueprint is ½ in : 6 ft. The height of the living room ceiling is shown as 1 ½ in. on the blueprint. How high should the living room ceiling really be?

Other proportion review:

8) Eight boxes of baseballs cost $27.60. How much will it cost Mickey to buy three boxes of baseballs?

9) If 5 cans of MathJuice contain 120 grams of sugar, how many grams of sugar are in a case (24 cans) of MathJuice?

10) A flagpole casts a shadow that is 12 ft long. A 6-ft tall man casts a shadow that is 8 ft long. The two triangles created are similar. How tall is the flagpole? (HINT: Draw a picture first!)

Integrated Algebra Name:

1.2 Homework No Work = No Credit

For Exercises 1–3, choose the correct answer.

1. Which proportion *cannot* be used to solve the following problem?

   How many milligrams (mg) of medication should you give to a 120-pound person if you should give 50 mg for every 10 pounds?

   A. $\frac{50 \text{ mg}}{10 \text{ lb}} = \frac{x}{120 \text{ lb}}$

   B. $\frac{10 \text{ lb}}{50 \text{ mg}} = \frac{120 \text{ lb}}{x}$

   C. $\frac{50 \text{ mg}}{x} = \frac{120 \text{ lb}}{10 \text{ lb}}$

   D. $\frac{10 \text{ lb}}{120 \text{ lb}} = \frac{50 \text{ mg}}{x}$

2. Triangles ABC and XYZ are similar. Which statement is *not* true?

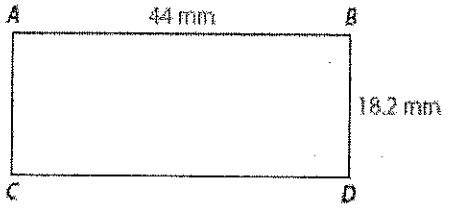
   A. $\frac{AB}{XY} = \frac{BC}{YZ}$

   B. $\frac{XZ}{AC} = \frac{YZ}{BC}$

   C. $\frac{CB}{ZY} = \frac{AC}{XZ}$

   D. $\frac{XY}{AB} = \frac{ZY}{CA}$

3. $ABCD$ is a rectangle.



   Which set of dimensions produces a rectangle that is similar to rectangle $ABCD$?

   A. 36.4 mm, 11 mm

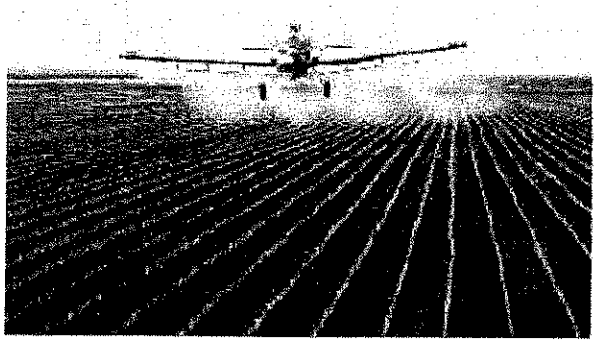
   B. 44 mm, 9.1 mm

   C. 176 mm, 72.8 mm

   D. 91 mm, 66 mm

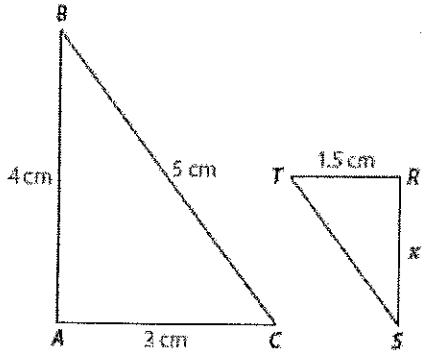
4. If your new car goes 320 miles on 10 gallons of gas, how far will it go on 6 gallons of gas?

5. The Tannery Mall in Massachusetts is partially powered by an array of 375 solar panels. They produce 60 kilowatts of electrical power. How many panels would be needed to produce 84 kilowatts of power?



6. An airplane sprays 16 gallons of liquid fertilizer on 5 acres of crops. If the plane's tank can hold 280 gallons, how many acres of crops can be sprayed?
7. Most conventional TV screens have a width : height ratio of 4 : 3. If a screen has a width of 42 inches, what is its height?
8. The scale on a map is 1 inch : 6 miles. Find the actual length of a road if it is 3 inches long on the map.
9. A drawing's scale is 0.5 inch : 20 feet. If a banquet room's length is 50 feet, what is the length of the room in the drawing?

10. Given: $\triangle ABC \sim \triangle RST$



a. What is the scale factor of triangle ABC to triangle RST?
b. Find the value of x.

11. Trapezoid $PQRS$ is similar to trapezoid $KLMN$. Find the value of x.