GRADE 7 · UNIT 5 · LESSON 10

Real-World Scale Drawings

MA.7.GR.1.5

I can use a map, a model or a plan to find a real distance, length or area, both directions.

Warm-Up

1. Plan area 12 in^2, scale 1 in. : 4 ft. Real area?
2. Write 1 cm : 5 m as a scale factor, plan to real.
3. Find the range: 64, 49, 88, 71, 57
4. How many centimeters are in 2.4 meters?

Warm-Up

1. Plan area 12 in², scale 1 in. : 4 ft. Real area? **192 ft²**
2. Write 1 cm : 5 m as a scale factor, plan to real. **500**
3. Find the range: 64, 49, 88, 71, 57 **39**
4. How many centimeters are in 2.4 meters? **240 cm**

Vocabulary

map scale

1 in. : 15 mi — one inch on the map stands for fifteen real miles

ratio scale

1 : 50 — no units at all, because both sides are in the same unit: 1 on the model for 50 on the real thing

Notes

I. A map is a plan of the world

1 in. : 15 mi — one inch on the map stands for fifteen miles.

Map to real: multiply the map's number by 15. Real to map: divide by 15.

A scale like 2 cm : 3 km: count the groups of 2 cm, then 3 km for each group.

Notes

II. A scale with no units at all

A scale lists the drawing (or model) first and the real thing second unless it says otherwise: 1 : 50 means 1 unit on the model for 50 of the same unit on the real thing.

$$1:50 \qquad \text{real} = 50 \cdot \text{model} \qquad \text{model} = \text{real} \div 50$$

From the model to the real thing, the scale factor is 50 — there is nothing to convert.

A real 7 m is 700 cm: $700 \div 50 = 14$, so the model is 14 cm.

Notes

III. Which rule does the question want?

One length or a perimeter — multiply by the scale, once.

An area — multiply by the scale twice.

Going to the drawing — divide, by the scale or by its square.

Example 1

A map uses the scale 1 in. : 8 mi.

Two towns are 3.5 in. apart on the map.

How far apart are they really?

Example 1

$$3.5 \cdot 8 = 28$$

Answer: 28 miles

Your Turn

A map uses 1 in. : 12 mi. Two towns are 4.25 in. apart.

How far apart are they really?

Your Turn

A map uses 1 in. : 12 mi. Two towns are 4.25 in. apart.

How far apart are they really?

1 in. on the map is 12 mi.

$4.25 \cdot 12 = 51$

Answer: 51 miles

Example 2

A model ship is built at a scale of 1 : 80.

The real ship is 24 m long.

How long is the model, in centimeters?

Example 2

$24 \text{ m} = 2{,}400 \text{ cm}$

$2{,}400 \div 80 = 30$

Answer: 30 cm

Your Turn

A model is built at 1 : 25. The real length is 5 m.

What is the model's length, in centimeters?

Your Turn

A model is built at 1 : 25. The real length is 5 m.

What is the model's length, in centimeters?

Same units first: 5 m = 500 cm

Model: $500 \div 25 = 20$

Answer: 20 cm

Whiteboards · Question 1 of 9

A map uses the scale 1 in. : 15 mi. Two towns are 6 in. apart on the map.

Find the real distance.

Answer it.

Whiteboards · Question 1 of 9

A map uses the scale 1 in. : 15 mi. Two towns are 6 in. apart on the map.

Find the real distance.

1 in. on the map is 15 mi.

$6 \cdot 15 = 90$

Answer: 90 miles

Whiteboards · Question 2 of 9

Same map, 1 in. : 15 mi. Two other towns are really 210 mi apart.

How far apart are they on the map?

Answer it.

Whiteboards · Question 2 of 9

Same map, 1 in. : 15 mi. Two other towns are really 210 mi apart.

How far apart are they on the map?

Real to map: divide.

$210 \div 15 = 14$

Answer: 14 in.

Whiteboards · Question 3 of 9

A model is built at a scale of 1 : 40.

What does that mean?

A. The model is 40 cm long.

B. The model is 40 times the real thing.

C. The real thing is 40 m long.

D. The real thing is 40 times the model.

Answer it.

Whiteboards · Question 3 of 9

A model is built at a scale of 1 : 40.

What does that mean?

The model comes first: 1 unit of model for 40 of the real thing.

Real length = 40 · model length.

Answer: D — the real thing is 40 times the model

Whiteboards · Question 4 of 9

On a map, 3 cm stands for 4 km. Two cities are 18 cm apart on the map.

Find the real distance.

Answer it.

Whiteboards · Question 4 of 9

On a map, 3 cm stands for 4 km. Two cities are 18 cm apart on the map.

Find the real distance.

$18 \div 3 = 6$ groups of 3 cm

$6 \cdot 4 = 24$, so 24 km

Answer: 24 km

Whiteboards · Question 5 of 9

A model is built at 1 : 40. The real bus is 10 m long.

Find the model's length in centimeters.

Answer it.

Whiteboards · Question 5 of 9

A model is built at 1 : 40. The real bus is 10 m long.

Find the model's length in centimeters.

Same units first: 10 m = 1,000 cm

Model: $1{,}000 \div 40 = 25$

Answer: 25 cm

Whiteboards · Question 6 of 9

A plan uses 1 in. : 6 ft. A room is 9 in^2 on the plan.

Which finds the room's real area?

A. $9 \div 6 = 1.5$, so 1.5 ft^2

B. $9 \cdot 12 = 108$, so 108 ft^2

C. $9 \cdot 36 = 324$, so 324 ft^2

D. $9 \cdot 6 = 54$, so 54 ft^2

Answer it.

Whiteboards · Question 6 of 9

A plan uses 1 in. : 6 ft. A room is 9 in² on the plan.

Which finds the room's real area?

One square inch is $6 \cdot 6 = 36$ square feet.

$9 \cdot 36 = 324$

Answer: C — 324 ft²

Whiteboards · Question 7 of 9

Over 4 drafts, a plan's perimeter came out 14 in. at the scale 1 in. : 9 ft.

Find the real perimeter.

Answer it.

Whiteboards · Question 7 of 9

Over 4 drafts, a plan's perimeter came out 14 in. at the scale 1 in. : 9 ft.

Find the real perimeter.

$$14 \cdot 9 = 126$$

Answer: 126 ft

Whiteboards · Question 8 of 9

A poster shows an ant at the scale 35 : 1, poster to real ant. On the poster the ant is 21 cm long.

How long is the real ant, in centimeters?

Answer it.

Whiteboards · Question 8 of 9

A poster shows an ant at the scale 35 : 1, poster to real ant. On the poster the ant is 21 cm long.

How long is the real ant, in centimeters?

Poster first: the poster is 35 times the real ant.

Poster to real ant, the smaller one: divide. $21 \div 35 = 0.6$

Answer: 0.6 cm

Whiteboards · Question 9 of 9

A model is built at a scale of 1 : 75, with no units anywhere.

Explain what that tells you, and why no units are needed.

Write your answer in sentences.

Whiteboards · Question 9 of 9

A model is built at a scale of 1 : 75, with no units anywhere.

Explain what that tells you, and why no units are needed.

1 : 75 compares two lengths in the same unit, the model's first.

1 cm stands for 75 cm, and 1 in. for 75 in.

Answer: Real = 75 · model, in any one unit.

Independent Practice

1. A map uses 1 in. : 20 mi. Two towns are 3 in. apart. Find the real distance.

2. On the same map, two other towns are really 180 mi apart. How far apart are they on the map?

3. A model is built at 1 : 30 and the real thing is 9 m long. Find the model's length in centimeters.

4. Across 3 drafts, a plan's perimeter is 16 in. and the scale is 1 in. : 7 ft. Find the real perimeter.

5. A plan uses 1 in. : 5 ft and a room is 14 in^2 on the plan. Find the real area.

6. A student reads 1 : 60 as “the model is 60 times the real thing”. In one sentence, say what is wrong.

Before You Go

Length once. Area twice. Towards the smaller one, divide.

One to fifty needs no units, because both sides are the same unit.

The practice test goes home today. The test is tomorrow and Friday.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. Due by the Unit 5 test.

Today's skills — all required

Scale drawings: word problems (84H)

Scale drawings: scale factor word problems (KCM)