

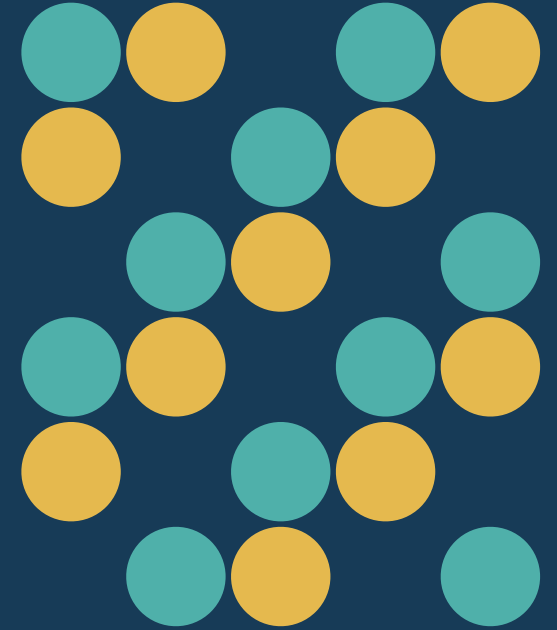
SCALE DRAWINGS

Scale Drawings, Maps & Units

Review for Math 7 • Unit 1 • Lessons 7–12

Goal: interpret, create, and compare scale drawings—including maps, unitless scales, and equivalent units.

Access IDEAS presents a customized session for OUSD Math 7.



ACCESS IDEAS
INSPIRE. DEVELOP. EXCEL. ACHIEVE. SUCCEED.

What are we trying to understand?

Six lessons connect through three big ideas.



INTERPRET

A scale connects each drawing length to an actual length.



CREATE

Choose a scale, convert units, and calculate drawing lengths.



COMPARE

Equivalent scales express the same relationship in different ways.

Big idea: direction and units determine whether to multiply or divide.

Lessons 7–9: interpret and create

These lessons connect scale drawings to real measurements.

1

LESSON 7

Interpret scales and calculate drawing or actual distances.

2

LESSON 8

Use maps to estimate distance, travel time, and speed.

3

LESSON 9

Create a scale drawing from actual measurements.

Keep drawing units and actual units clearly labeled.

Lessons 10–12: change and compare

These lessons connect changing scales, units, and area.

1

LESSON 10

Reproduce one object at a new scale and compare drawing areas.

2

LESSON 11

Interpret unitless scales such as 1 : 1,000.

3

LESSON 12

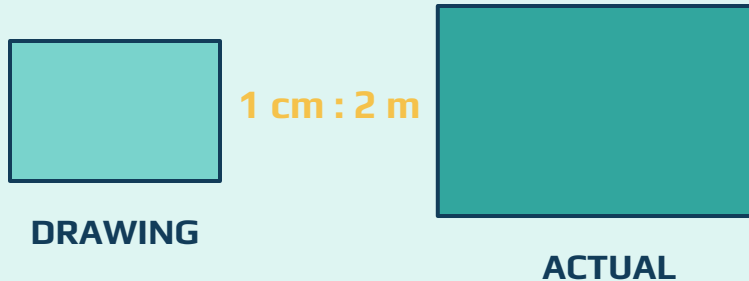
Convert units and identify equivalent scales.

Equivalent scales must describe one consistent relationship.

A scale drawing uses one relationship

A scale connects every drawing length to an actual length.

THE SCALE



READ IT IN ORDER

- 1 Identify the drawing unit.
- 2 Identify the actual unit.
- 3 Apply it to every distance.

DRAWING ↔ ACTUAL

multiply
divide
label units

**Write units every time to
keep the direction clear.**

Maps turn lines into actual distances

Measure the route, apply the scale, then use rate reasoning.

READ A MAP



MAP

ACTUAL

map route ↔ actual route

measure the path; use the scale

DISTANCE • RATE • TIME

1

distance = rate × time

2

time = distance ÷ rate

3

rate = distance ÷ time

**APPROXIMATE
CAREFULLY**

curved
paths

scale bar

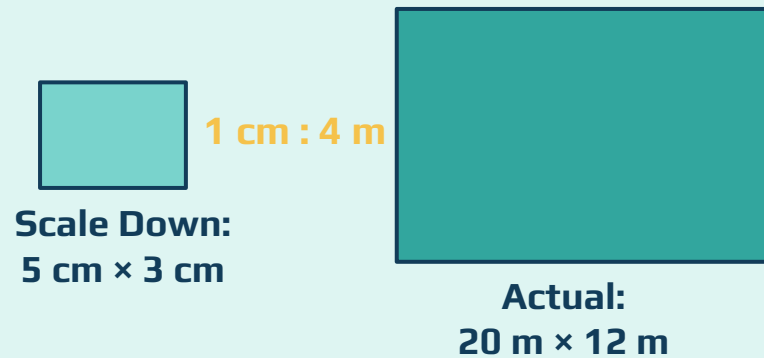
sensible
precision

**A map estimate is only as
precise as the drawing.**

To create a drawing, convert every length

The same scale must be used for every actual measurement.

MAKE A DRAWING



USE THIS PROCESS

- 1 List the actual dimensions.
- 2 Divide by the actual length per drawing unit.
- 3 Draw and label the scaled dimensions.

**Use one scale everywhere.
Mixed scales distort the drawing.**

Changing the scale changes the drawing

The actual object stays fixed while its drawing dimensions change.

COMPARE SCALES



Scale A:
1 cm : 4 m

drawing
lengths
×2



Scale B:
1 cm : 2 m

same actual object

Changing scale results in
new drawing size

CHANGE SCALES

- 1 Keep actual lengths fixed.
- 2 Calculate with the new scale.
- 3 Compare the two drawings.

**Changing 1 cm : 4 m
to 1 cm : 2 m
doubles every drawing length.**

A unitless scale compares the same units

A scale of 1 : 1,000 means actual lengths are 1,000 times drawing lengths.

SCALE 1 : n

**Convert to same units first;
then remove the units.**

Example:
1 in : 20 ft
1 in : 240 in
1 : 240

Note: 1 foot = 12 inches

USE THE RATIO

- 1 drawing $\times$ n = actual
- 2 actual $\div$ n = drawing
- 3 use the same unit on both sides

Equivalent scales tell the same story

Convert to the same units, then simplify the ratio.

$$\begin{aligned} &1 \text{ in} : 2 \text{ ft} \\ &1 \text{ in} : 24 \text{ in} \end{aligned}$$

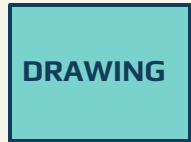
$$\text{Length} \Rightarrow 1 : 24$$

$$\begin{aligned} \text{Area} &\Rightarrow 1 : (24 \times 24) \\ &1 : 576 \end{aligned}$$

**For area, square the length relationship:
 $1 : n$ becomes $1 : n^2$.**

Example 1 — Try it first

A court drawing uses a scale of 1 cm to 2 m. A sideline measures 7.5 cm on the drawing. What is the actual length?



7.5 cm



? m

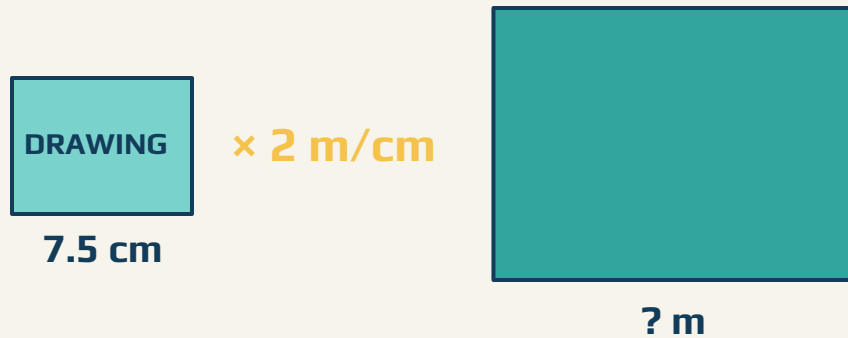
YOUR TURN

**Find the actual length.
Be ready to explain your
operation.**

Start by reading the scale in order.

Example 1 — Step 1: Read the scale

A court drawing uses a scale of 1 cm to 2 m. A sideline measures 7.5 cm on the drawing. What is the actual length?



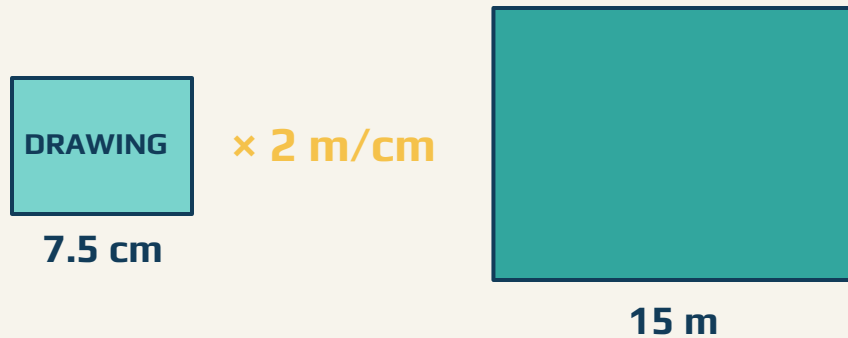
STEP 1: READ THE SCALE

**1 cm on the drawing
represents 2 m actual.**

Next: multiply 7.5 by 2.

Example 1 — Step 2: Calculate

A court drawing uses a scale of 1 cm to 2 m. A sideline measures 7.5 cm on the drawing. What is the actual length?



STEP 2: MULTIPLY

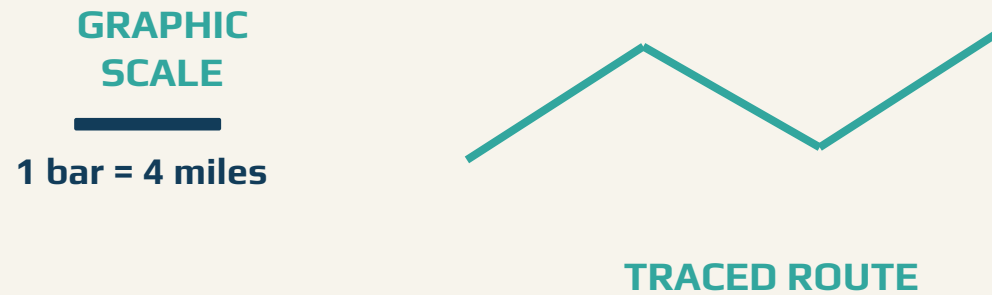
$$7.5 \text{ cm} \times 2 \text{ m/cm} = 15 \text{ m}$$

The centimeters cancel.

Actual length = 15 m.

Example 2 — Try it first

A map's scale bar represents 4 miles. A bike route spans about 12.5 scale-bar lengths. At 15 mph, about how long will the trip take?



YOUR TURN

Estimate the route distance first.

**Then use
time = distance ÷ rate.**

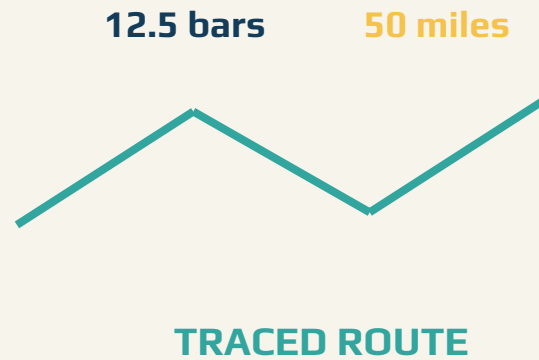
Use sensible precision for a map estimate.

Example 2 — Step 1: Find distance

A map's scale bar represents 4 miles. A bike route spans about 12.5 scale-bar lengths. At 15 mph, about how long will the trip take?

**GRAPHIC
SCALE**

1 bar = 4 miles



STEP 1: FIND DISTANCE

$$12.5 \times 4 = 50 \text{ miles}$$

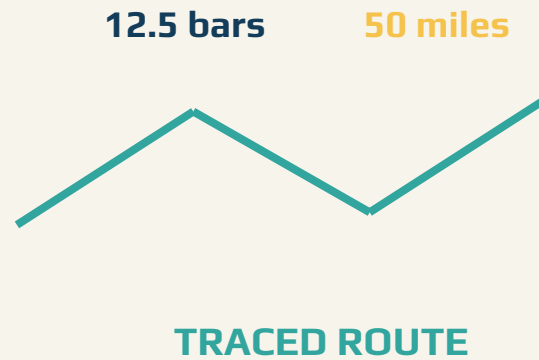
Next: divide 50 miles by 15 mph.

Example 2 — Step 2: Find time

A map's scale bar represents 4 miles. A bike route spans about 12.5 scale-bar lengths. At 15 mph, about how long will the trip take?

**GRAPHIC
SCALE**

1 bar = 4 miles



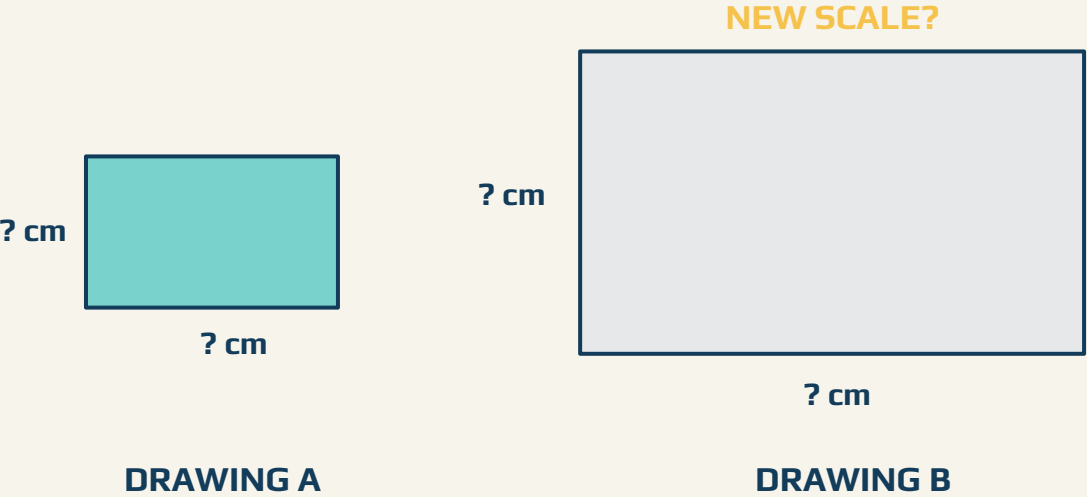
STEP 2: DIVIDE

$$\text{time} = 50 \div 15 = 3\frac{1}{3} \text{ hours}$$

$$3\frac{1}{3} \text{ hours} = 3 \text{ hours } 20 \text{ minutes.}$$

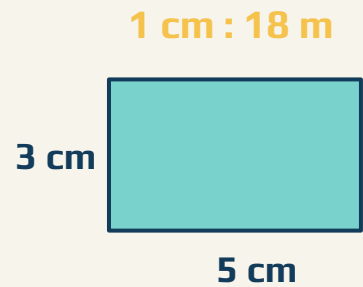
Example 3 — Try it first

A 90 m by 54 m park is drawn at 1 cm to 18 m. Make a second drawing at 1 cm to 9 m. Compare the drawing sizes.



Example 3 — Step 1: Drawing A

A 90 m by 54 m park is drawn at 1 cm to 18 m. Make a second drawing at 1 cm to 9 m. Compare the drawing sizes.



DRAWING A



DRAWING B

STEP 1:
USE 1 cm : 18 m

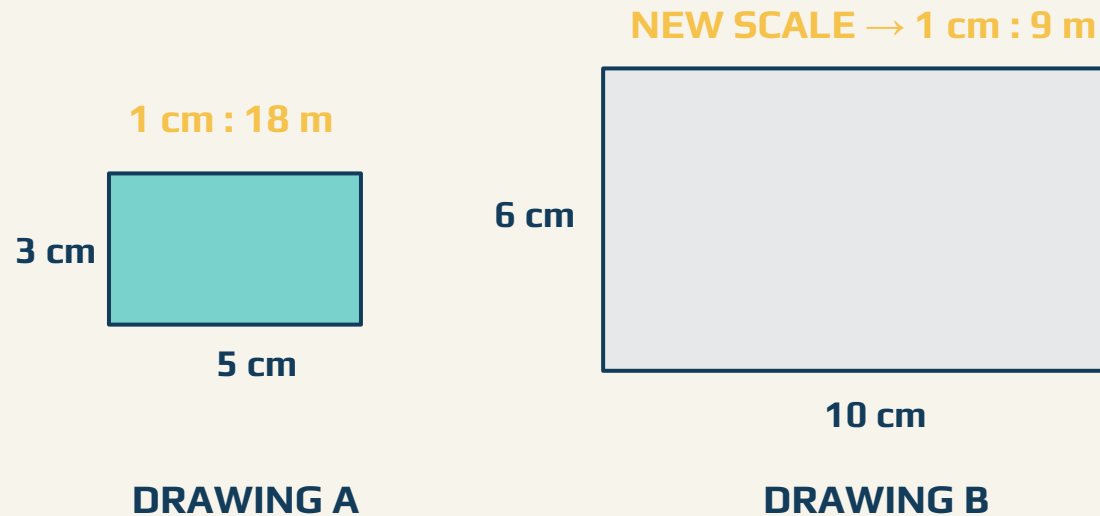
$$90 \div 18 = 5 \text{ cm}$$

$$54 \div 18 = 3 \text{ cm}$$

Next: use the new scale, 1 cm : 9 m.

Example 3 — Step 2: Drawing B

A 90 m by 54 m park is drawn at 1 cm to 18 m. Make a second drawing at 1 cm to 9 m. Compare the drawing sizes.



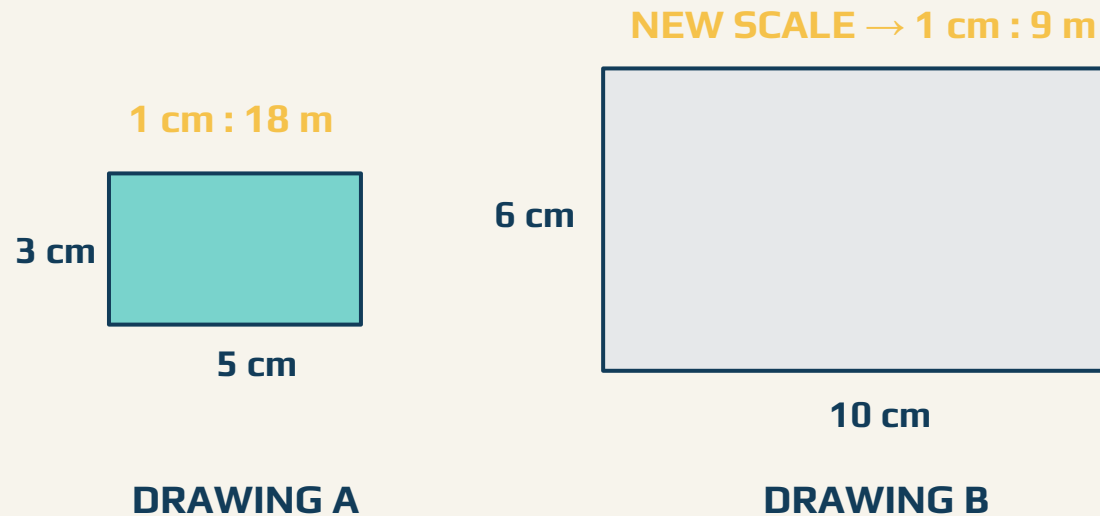
STEP 2:
USE 1 cm : 9 m

$$90 \div 9 = 10 \text{ cm}$$
$$54 \div 9 = 6 \text{ cm}$$

**Drawing B is twice as long
and twice as wide.**

Example 3 — Solution

A 90 m by 54 m park is drawn at 1 cm to 18 m. Make a second drawing at 1 cm to 9 m. Compare the drawing sizes.



SOLUTION

Drawing A: 5 cm by 3 cm.
Drawing B: 10 cm by 6 cm.

Length factor = 2;
drawing-area factor = 4.

Example 4 — Try it first

A blueprint uses 1 inch to 200 feet. Write an equivalent unitless scale.
Then find the actual distance represented by 3.5 inches.

1 in : 200 ft

3.5 in → ? ft

YOUR TURN

**Convert 200 feet to inches.
Then use the unitless scale.**

Both sides of a unitless scale use the
same unit.

Example 4 — Step 1: Convert units

A blueprint uses 1 inch to 200 feet. Write an equivalent unitless scale. Then find the actual distance represented by 3.5 inches.

How many inches in 200 ft?

$$200 \text{ ft} \times 12 \text{ in/ft} = 2400 \text{ in}$$

STEP 1: SAME UNITS

1 in : 200 ft

1 in : 2400 in

**Next: remove the matching
inch units.**

Example 4 — Step 2: Use the ratio

A blueprint uses 1 inch to 200 feet. Write an equivalent unitless scale.
Then find the actual distance represented by 3.5 inches.

STEP 2: UNITLESS SCALE

$$\begin{array}{l} 1 \text{ in} : 2400 \text{ in} \\ 1 : 2400 \end{array}$$

Example 4 — Solution

A blueprint uses 1 inch to 200 feet. Write an equivalent unitless scale.
Then find the actual distance represented by 3.5 inches.

3.5 inches represent what?
Use the equivalent scale to find out.

$$\begin{aligned} 3.5 \text{ in} \times 2400 &= 8400 \text{ in} \\ 8400 \text{ in} \times 1\text{ft}/12\text{in} &= 700 \text{ ft} \end{aligned}$$

SOLUTION

Equivalent scale
1 : 2400

3.5 inches represents
700 feet.

Common mistakes to avoid

Track direction and units before calculating.

A

Multiply when the problem requires division.

From actual to drawing, divide by the actual length represented by one drawing unit.

drawing

actual

write units

B

Compare scales before converting units.

A unitless ratio requires the same unit on both sides.

Convert to the same units, then simplify.

For area, square the length relationship: n^2 , not n .

Takeaway + exit ticket

A scale connects drawing and actual lengths; units determine the calculation.

1 Interpret

Read drawing units, actual units, and direction.

2 Create

Convert each actual length using one consistent scale.

3 Compare

Convert units to identify equivalent scales.

EXIT TICKET

**A 24 m by 15 m garden is drawn at 1 cm : 3 m.
Find the drawing dimensions and write an equivalent unitless scale.**

Bonus: predict the new dimensions at 1 cm : 1.5 m.



THANK YOU

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