DIG INTO PROPORTIONAL REPRESENTATIONS: FLOOR PLANS

Presented by MathLinks Authors
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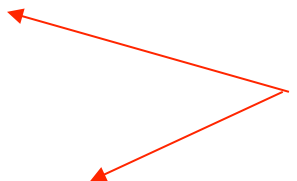
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In this session, we will:

- Explore how to use ratio strips to help students understand scale drawings.

- Connect ratio strips to representations such as double number lines and equations.

- Use proportional reasoning representations in different contexts.

Proportional Reasoning vs. Proportions

Proportional reasoning is the ability to compare quantities multiplicatively.

A proportion is an equation stating that the values of two ratios are equal.

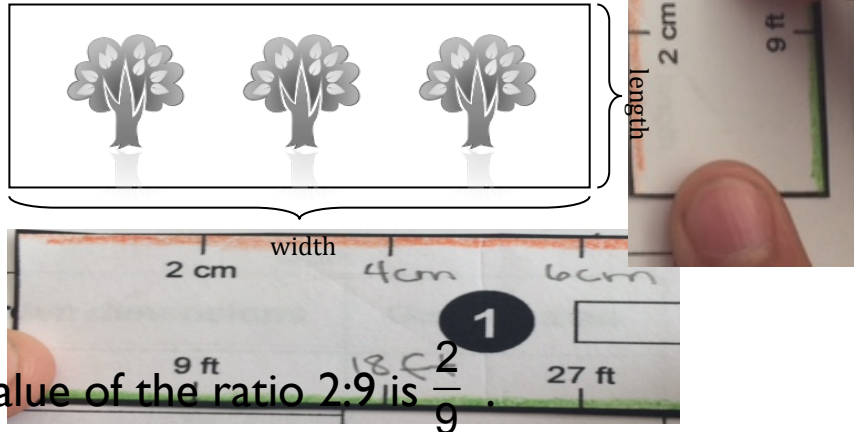Some proportional reasoning tools and representations include:

- Equivalent ratios
- Tables
- Tape diagrams
- Double number lines
- Equations (proportions)

"ratio strips"

Ratio Strips

A <u>ratio strip</u> is a double number line where equivalent ratios can be easily identified.

2 cm	4 cm	6 cm	8 cm	10 cm	12 cm	14 cm
9 ft	18 ft	27 ft	36 ft	45 ft	54 ft	63 ft
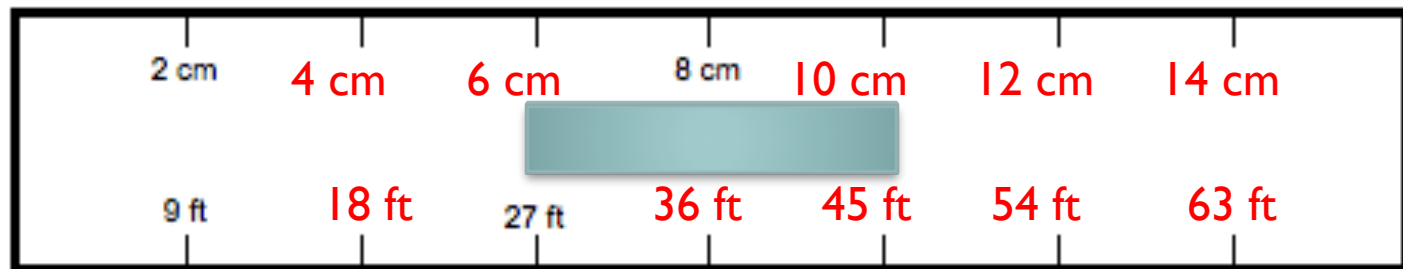
Measuring with a ratio strip

The value of the ratio 2:9 is $\frac{2}{9}$.

The value of the ratio 6:27 is $\frac{6}{27} = \frac{2}{9}$.

	Drawing dimensions	Drawing area	Garden dimensions	Garden area
Length	2 cm		9 ft	
		12 cm²		243 cm²
Width	6 cm		27ft	

Handout

USING A RATIO STRIP

In a scale drawing, all lengths are multiplied by the same scale factor. If the scale factor is greater than 1, the figure is expanded, and if the scale factor is between 0 and 1, the figure is reduced in size.

Sometimes the scale in a drawing is described using a ratio. A ratio strip is a double number line where equivalent ratios can be easily identified. You will use the ratio strip to interpret drawings using a scale of 2 cm : 9 ft.

1. Here is a drawing of a garden that was created using the scale 2 cm : 9 ft. Use the ratio strip to determine the actual dimensions and area of the garden.

length

width

	Drawing dimensions	Drawing area	Garden dimensions	Garden area
Length				
Width				

Use the data from the table above to complete the table below.

		Ratios of measurements drawing : garden	Value of the ratio
2.	Length		
3.	Width		
4.	Area		

5. Consider the ratio used to create the scale drawing (2 cm : 9 ft), and the ratios found in problems 3 and 4 above. How do the values of these ratios compare?

6. Consider the ratio used to create the scale drawing and the ratio of the areas found in problem 5 above. How do the values of these ratios compare?

2 cm   8 cm

2 cm : 9 ft

9 ft   27 ft
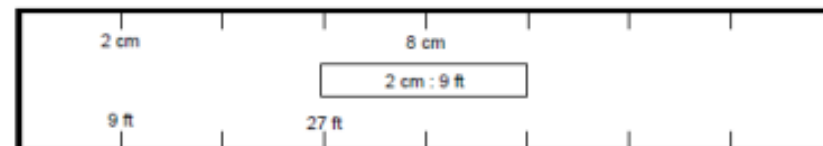
Floor Plans

2 cm : 9 ft
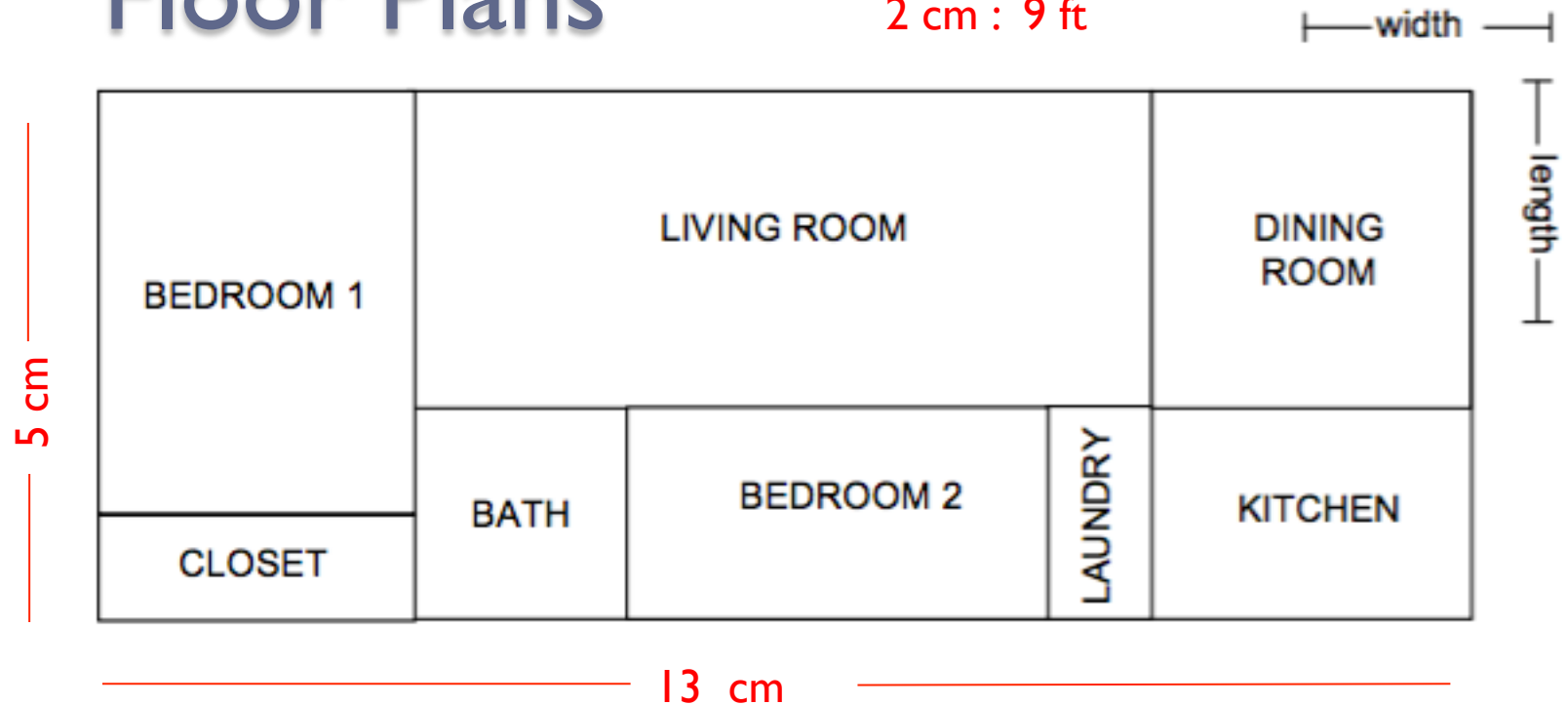
What questions could we ask about this floor plan?

Handout

Extension:
Consider having students make their own scale drawing and a ratio strip for
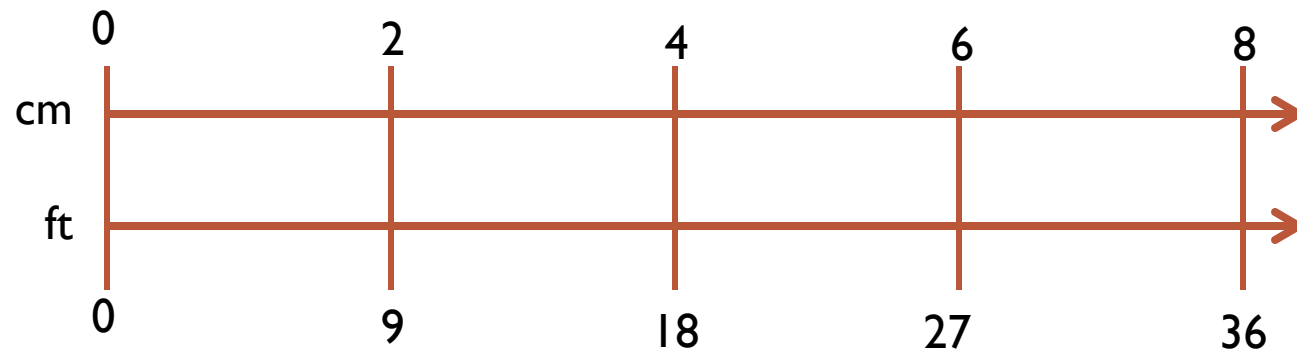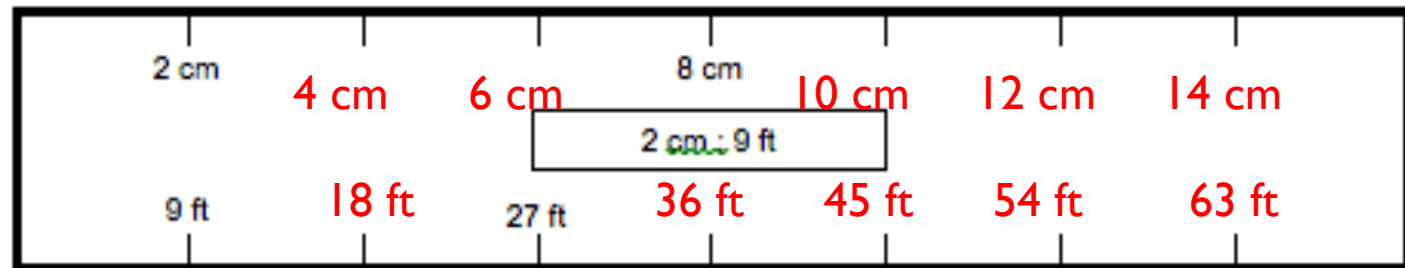
measuring it.

A FLOOR PLAN

Architects often use scale drawings to represent actual building floor plans. Use the Ratio Strip to measure some scale drawings of rooms and determine their actual dimensions.

BEDROOM 1
LIVING ROOM
DINING ROOM
CLOSET
BATH
BEDROOM 2
LAUNDRY
KITCHEN

Scale: 2 cm : 9 ft
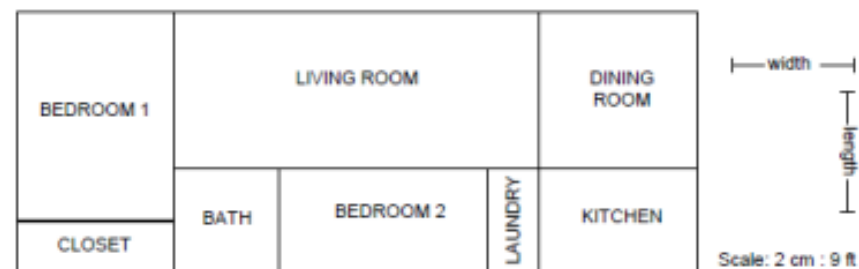
|	Room	Drawing length	Drawing width	Actual length	Actual width
1.	Bath	_____ cm	_____ cm	_____ ft	_____ ft
2.	Bedroom 2				
3.	Laundry				
4.	Dining Room	3 cm			
5.	Bedroom 1			18 ft	
6.	Living Room				

7. If the length and width of the dining room in the scale drawing were increased by 2 cm each, what would be the new actual dimensions of the dining room?

Transition to Double Number Lines

2 cm   4 cm   6 cm   8 cm   10 cm   12 cm   14 cm

2 cm : 9 ft

9 ft   18 ft   27 ft   36 ft   45 ft   54 ft   63 ft

cm: 0   2   4   6   8

ft: 0   9   18   27   36

Sally's scale drawings

- Sally is making and interpreting scale drawings.

- She uses   2 cm : 9 ft   as the scale.

2 cm	4 cm	6 cm	8 cm	10 cm	12 cm	14 cm
			2 cm : 9 ft			
9 ft	18 ft	27 ft	36 ft	45 ft	54 ft	63 ft
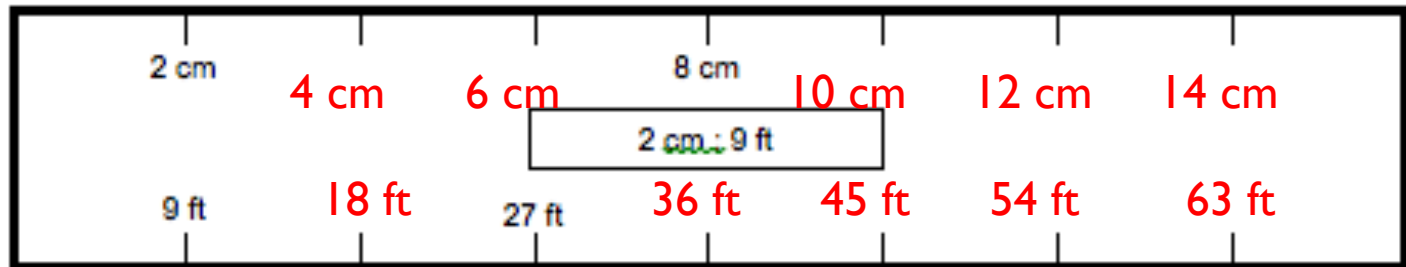
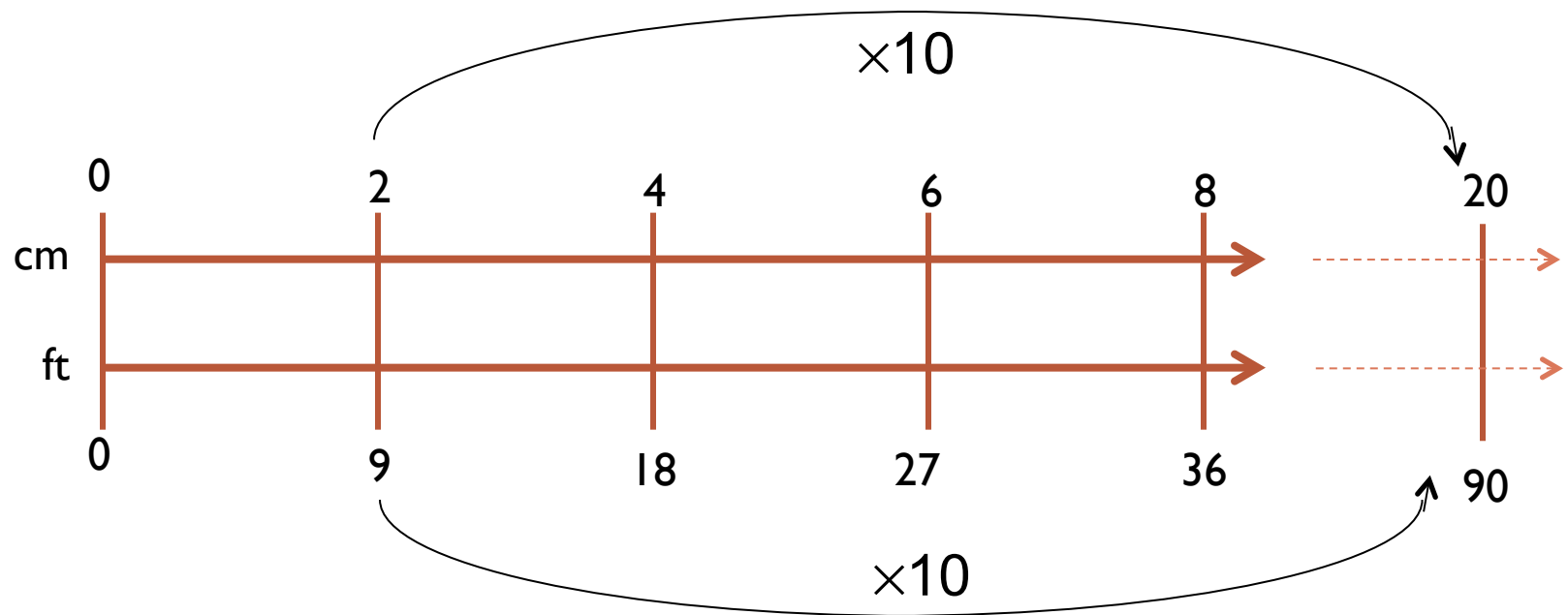1. On Sally's scale drawing, a room is 5 cm long. How could she use a double number line to find the actual length of the room?

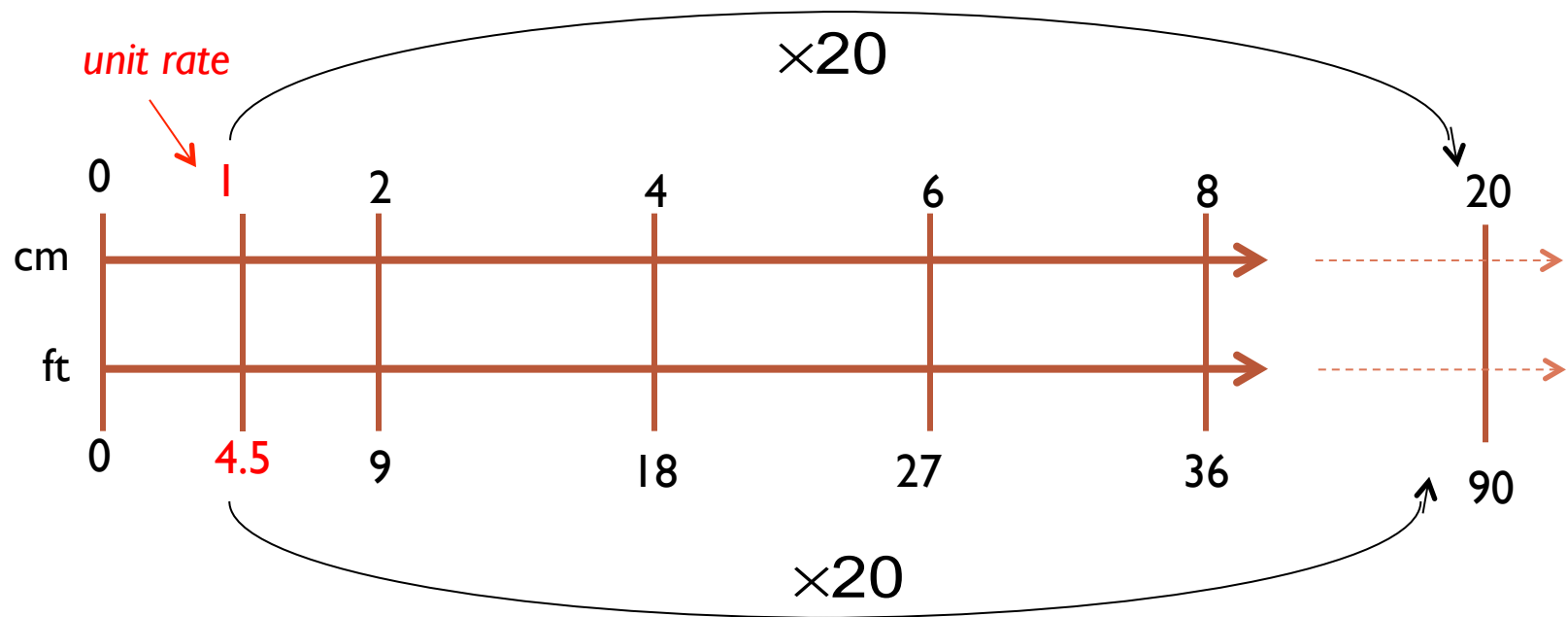|	0	2	4	5	6	8
cm						
ft						
	0	9	18	22.5	27	36
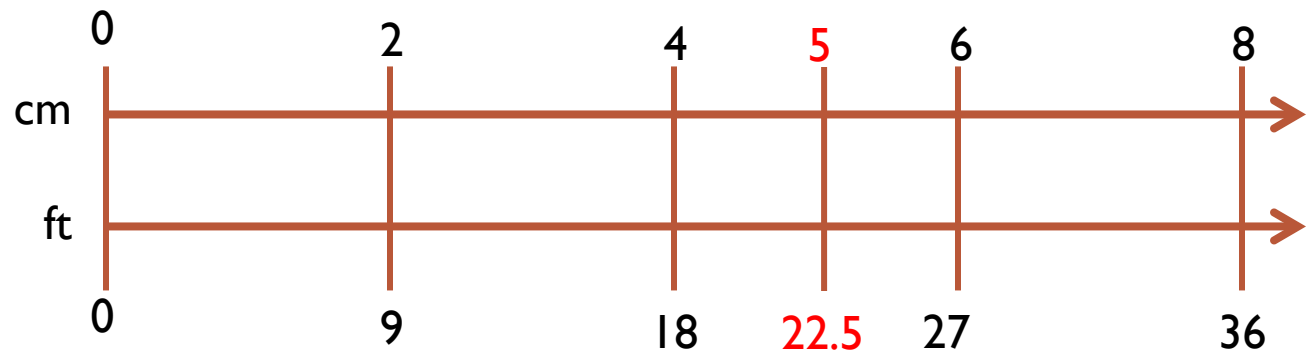
The room is actually 22.5 ft long.

2. On Sally's scale drawing, a fence is 20 cm long. How could she use a double number line to find the actual length of the fence?
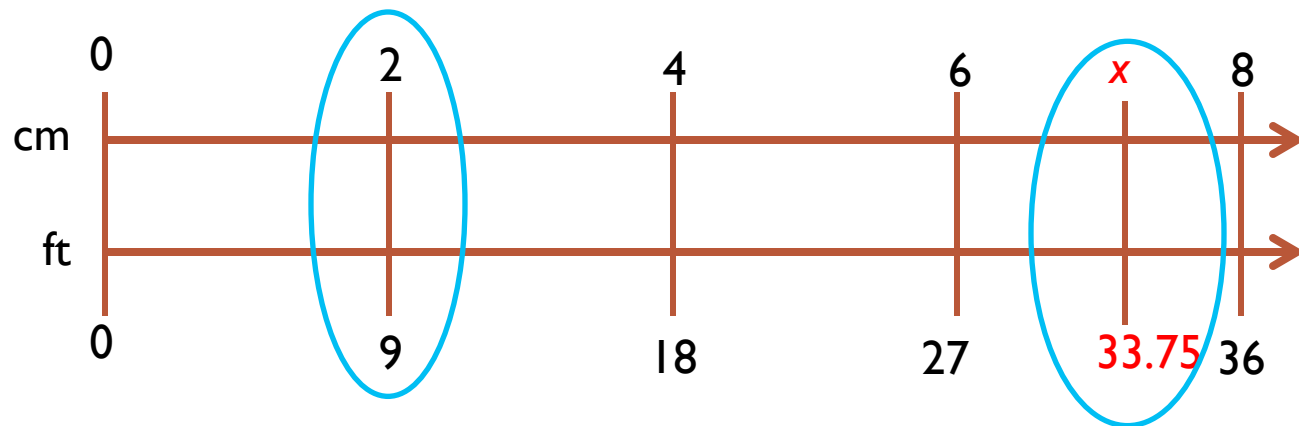

The fence is actually 90 ft long.

2. On Sally's scale drawing, a fence is 20 cm long. How could she use a double number line to find the actual length of the fence?

The fence is 90 actually ft long.

3. Sally measures the classroom. It's actual length is 33' 9" (33.75 ft). How could she use an equation (proportion) to find the scale drawing length?

$$\frac{2}{9} = \frac{x}{33.75}$$

$$9x = 67.5$$

$$x = 7.5 \text{ cm}$$

The length of the classroom on the scale drawing should be 7.5 cm.

Freddy's floor plans

- Freddy created a scale drawing for a house floor plan.

- On his scale drawing, the length of the side of the house is 30 cm.

Percent of a number
Double number line

4. Freddy wants the living room length to be 60% of the length of the house. How long should the living room be?

The living room should be 18 cm.

cm   %

0 ———————————— 0

3 ———————————— 10

15 ———————————— 50

18 ———————————— 60

30 ———————————— 100
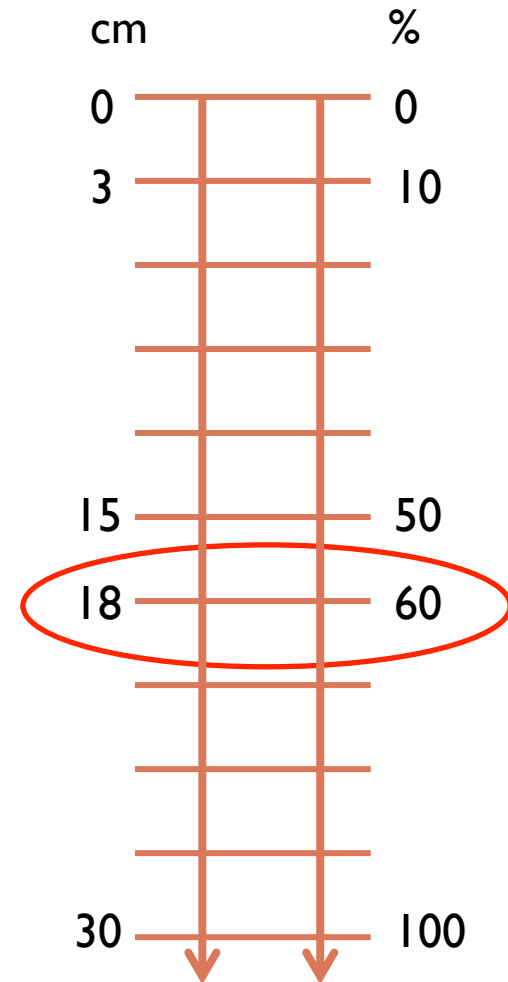
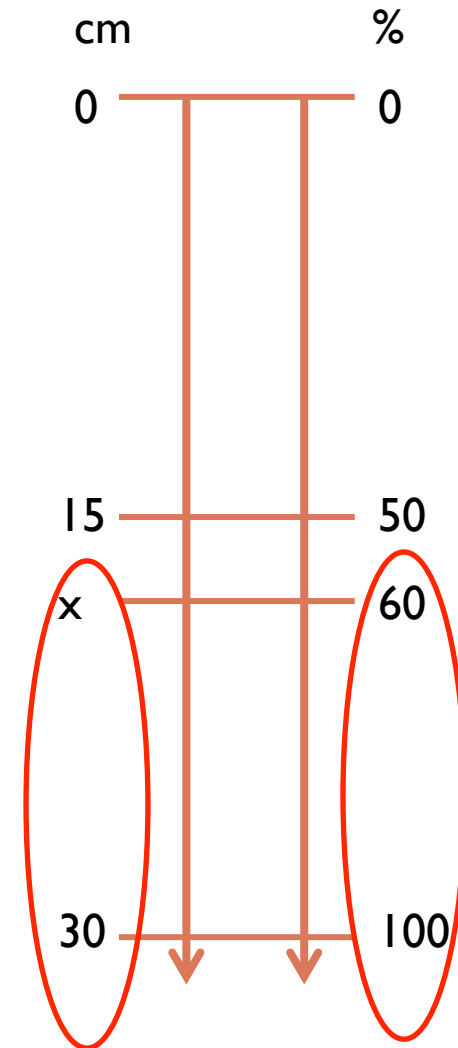# Percent of a number
Equation (proportion)

4. Freddy wants the living room length to be 60% of the length of the house. How long should the living room be?

$$\frac{x}{30} = \frac{60}{100}$$

$$100x = 1800$$
$$x = 18 \text{ cm}$$
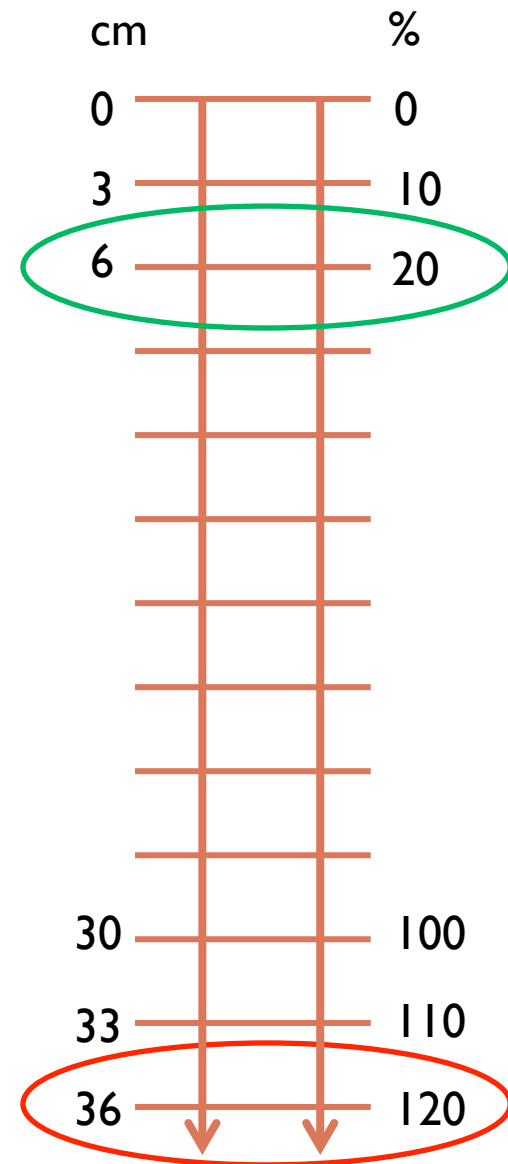
The living room should be 18 cm long.

cm   %

| 0 | 0 |

| 15 | 50 |

| x | 60 |

| 30 | 100 |

Percent increase
Double number line

5. Freddy wants to increase lengths on his floor plan drawing by 20%. How long should the new length of the house be?

The new length should be 6 cm more than the old length or 36 cm.

The new length should be 36 cm.

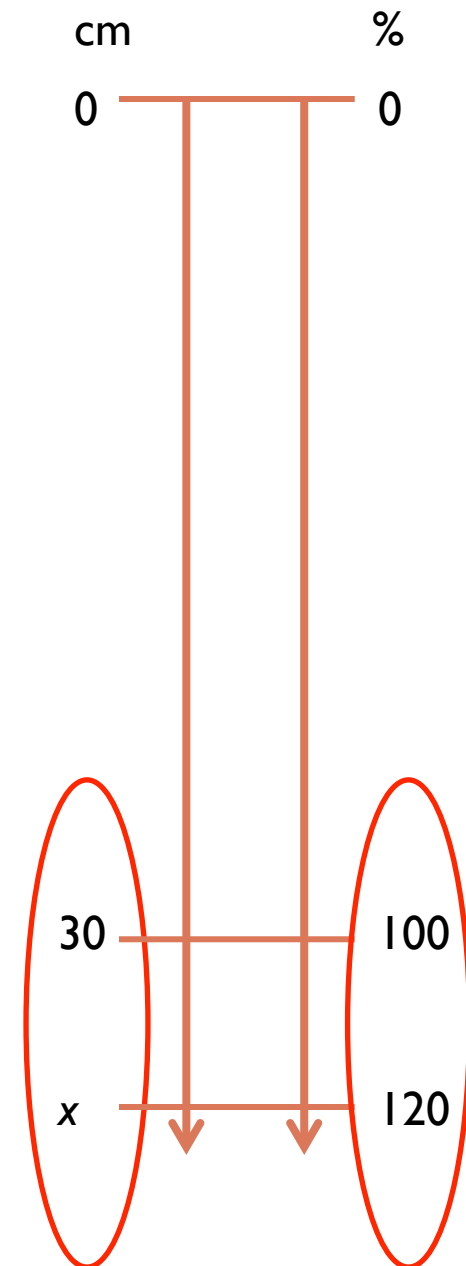| cm	%
0	0
3	10
6	20
30	100
33	110
36	120

Percent increase
Equation (proportion)

5. Freddy wants to increase his floor plan drawing by 20%. How long should the new length of the house be?

$$\frac{30}{x} = \frac{100}{120}$$

$100x = 3600$

$x = 36$ cm

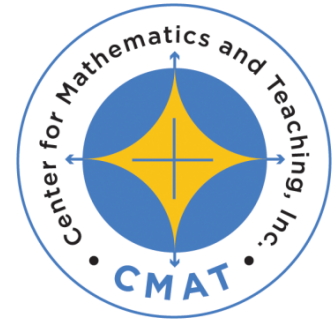The new length should be 36 cm.

cm   %

0   0

30   100

x   120

In this session, we:

- Used ratio strips to interpret scale drawings.

- Connected ratio strips to double number lines.

- Connected double numbers line to proportions.

- Used proportional reasoning tools to solve scale problems and percent problems.

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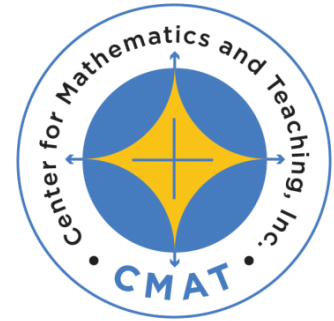
THANK YOU!

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