

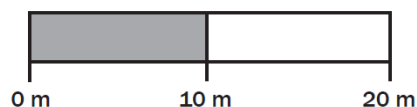


SUBJECT and GRADE	Mathematical Literacy	Grade 10
TERM 2	<i>Week 5</i>	
TOPIC	MAPS, PLANS & OTHER REPRESENTATION - SCALE	
AIMS OF LESSON	Calculate actual length and distance when map and/or measurements are known	
RESOURCES	<i>Paper based resources</i>	<i>Digital resources</i>
	Mind the GAP: Page 110 – 112 Answer Series <u>Also use:</u> Via Afrika Platinum Or any CAPS approved textbook. Look under Maps, Plans and other representation	<i>Youtube Mathematical Literacy grade 10 and go to scales</i>

INTRODUCTION

By the end of the week you need to be able to work with the following:

- Types of scales on maps, plans and other construction models
- Number scales expressed in the form 1: 500
- Bar scales expressed in the form



With an understanding of the advantages and disadvantages of each type of scale and the situation in which one type of scale is more appropriate than the other

Calculate actual length and distance when map and/or measurements are known

Previous knowledge

- Ratios
- Determine area
- Operations with whole numbers and decimal numbers and without a calculator (**Brackets Of Divide Multiply Add Subtract**)
- Rounding-off: to specific number of decimal places, to the nearest whole number, up or down

CONCEPTS AND SKILLS

Terminologies:

Scale is a ratio between two units of measure.

The two units of measure are the **distance measured on map** and the **actual distance on the ground**.

Scale is used to calculate **actual distances**.

The two types of scale: **Number scale** and **Bar Scale**.

Number Scale

- Number scale is expressed in the form 1: n, where n stands for a number
Example: 1: 50 000 meaning 1 unit on the map is equivalent 50 000 units on the ground.

So 1cm = 50 000cm

1cm = 500m

1cm = 0,5km

Advantages of Number scale:

- No units are included
- The relationship between the length on the plan and the actual length is the same.

Disadvantages of The Number Scale:

- When maps or plans are reduced or enlarged, the number scale becomes invalid.
- The correct scale can only be found if the numbers are multiplied or divided by the same factor used to reduce / enlarged the map.

ACTIVITIES/ASSESSMENT

Work Example 1:

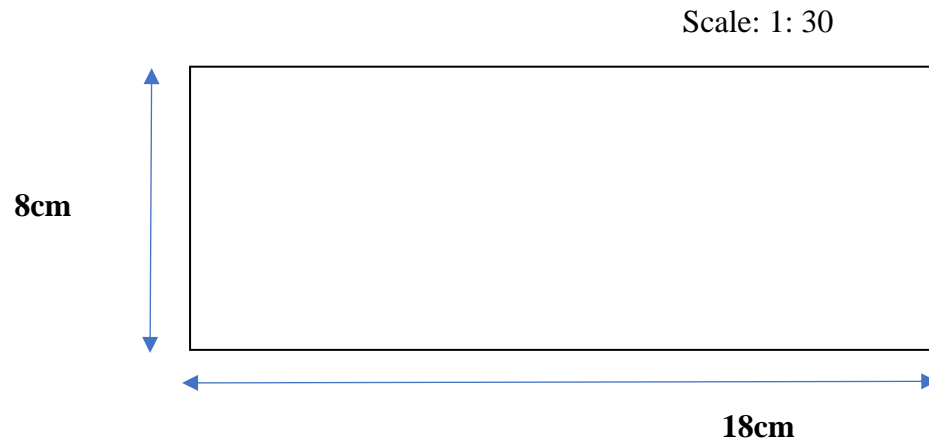
- a) A map of South Africa has a scale of 1: 50 000
- (i) Write this scale as 1cm on the map = cm on the ground.
- (ii) Write this scale as 1cm on the map = km on the ground.
- b) Simplify the following scale 3cm: 3m
- c)

Solutions: Work Example 1

- a) (i) 50 000cm
- (ii) $50\ 000 \div 100\ 000 = 0,5\ \text{km}$ reason: $100\ 000\text{cm} = 1\text{km}$
- b) 3cm: 3m Step 1: Divide both sides by 3
1cm: 1m Step 2: Change 1m to cm
1: 100 100cm = 1m

Calculations with Number Scales

Determining actual real-world length or distance when a measurement on the plan is known.



- If the scale is 1: 30 this means that:
- *The actual measurements are 30 times bigger than the measurements on the picture.*

So:

$$\begin{aligned}\text{Length on plan} &= 18\text{cm} \\ \text{Actual length} &= 18\text{cm} \times 30 \\ &= 540\text{cm}\end{aligned}$$

Height on plan = 8cm
Actual length = 8cm x 30
= 240cm

Example 2: Drawing a scaled plan

Your school is building a new classroom. The measurements of the classroom are as follows:








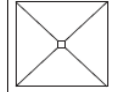



Length of each wall: 5 meters,
width of the door: 810 mm,
width and height of the windows: 1 000 mm

Use the appropriate symbols to draw a plan of the classroom using a scale of 1 : 50. (14)

Place a door, 2 windows in one of the walls and 3 windows in the opposite wall.

1. If the school wants to make blinds out of fabric for the classroom windows (1 000 mm wide), calculate the total length of material (in meters) that needs to be bought. (2)
2. If the material for the blinds costs R60 per meter, calculate the total cost of fabric for the blinds. (2)
3. The school needs to tile the floor of the classroom. Calculate the total area that must be tiled. (2)
4. If the tiles come in 4 m² boxes, how many boxes must the school buy? Explain your answer. (2)
5. If the tiles cost R150 per box, calculate how much the tiles will cost. (2)

Use the symbols below when drawing a plan of the classroom:

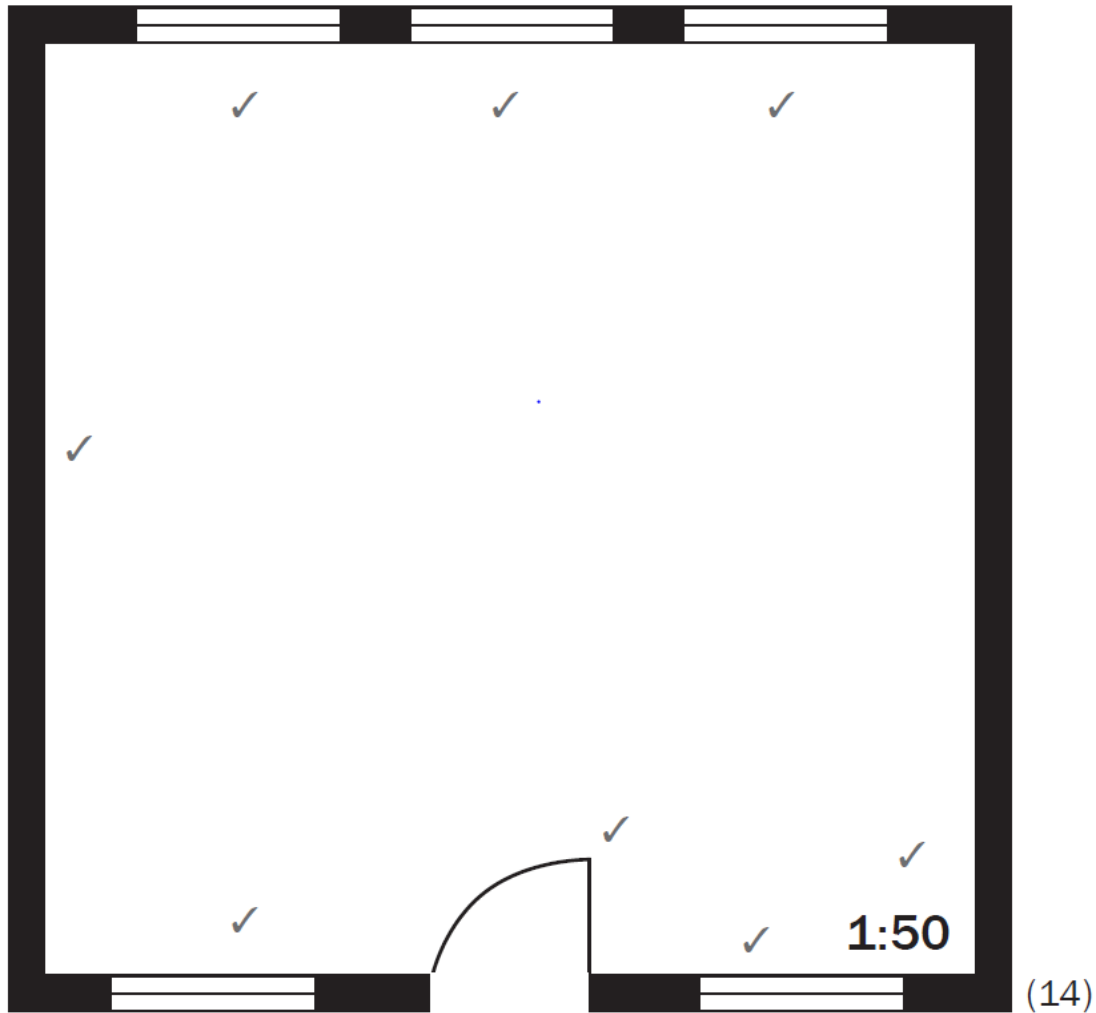
	Solid wall
	Wall that does not reach the ceiling
	Window in a wall
	Door, indicating which way it opens
	Sliding door
	Bath
	Toilet
	Shower
	Double kitchen sink
	Single bed
	Single armchair

Solutions to Example 2

Conversions: You must now convert meters and millimeters to centimeters.

	Real Life measurement	Calculations	Measurement on the plan
Length of the walls	5 meters	5 meters = 500 cm $500 \text{ cm} \div 50 = 10 \text{ cm}$ ✓	10 cm✓
Width of the door	810 mm	$810 \text{ mm} \div 50 = 16,2 \text{ mm}$ ✓	16,2 mm = 1,62 cm✓
Width of window	1 000 mm	$1\ 000 \text{ mm} \div 50 = 20 \text{ mm}$ ✓	20 mm = 2 cm✓

CONCEPTS AND SKILLS



1. There are 5 windows in total. Each window is 1 000 mm wide.

$$1\ 000\ \text{mm} \times 5 = 5\ 000\ \text{mm}$$

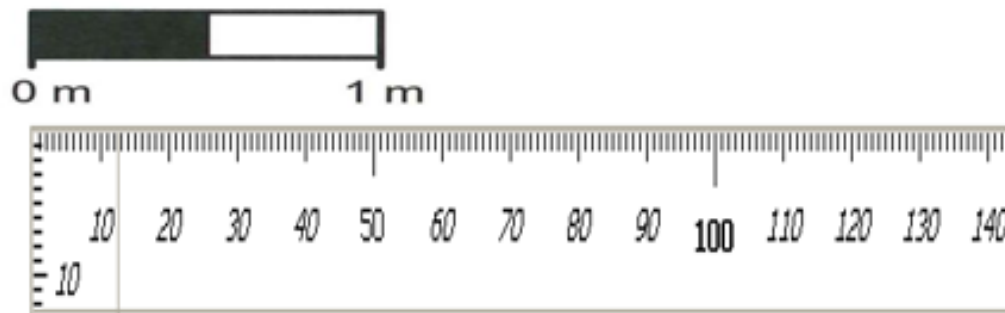
There are a 1 000mm in a meter. ✓

$$5\ 000 \div 1\ 000 = 5\ \text{m} \checkmark$$

2. R60 per meter x 5 m = R 300 ✓✓
3. Area = length x breadth ✓
 = 5m x 5m
 = 25m² ✓
4. 25m² ÷ 4 m² = 6,25 boxes ✓
 You cannot purchase 6,25 boxes of tiles. You will have to buy 7 boxes. ✓
5. 7 x R 150 = R 1 050. ✓✓

Bar Scale:

A Bar Scale in the form:



- On the Bar Scale above: 50 mm = 1 m

or 5 cm = 1 m

or 0,05 m = 1 m

- **Advantages of a Bar Scale:**

- It is easy to use
- If a map is enlarged or reduced, the bar scale on the map will change in size proportionally.
- Any unit of measure can be shown or indicated.

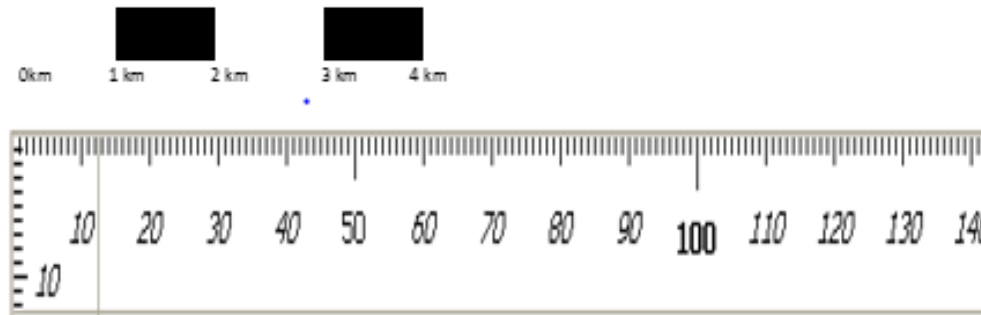
- **Disadvantages of a Bar scale**

- The ratios have different units which have to be changed to the same units.

Working Example 3:

Example 3:

Given the bar scale below. Use the ruler to determine what each bar represent (in mm).



Solutions to Example:

18 mm represent 1 km

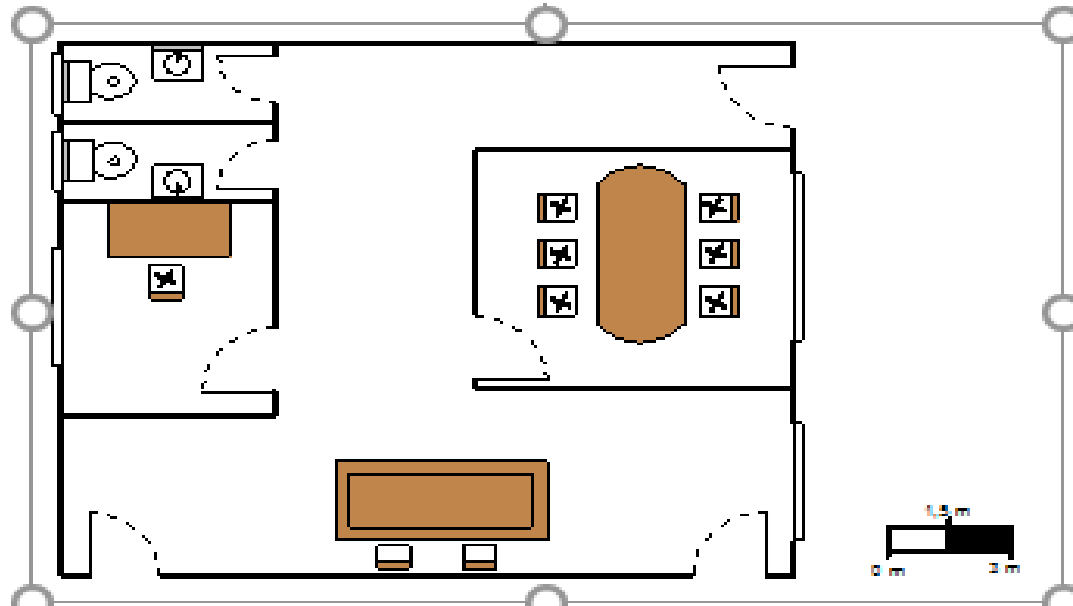
30 mm represent 2 km

48 mm represent 3 km

60 mm represent 4 km

Calculations with Bar Scale

Example 4: A floor plan of a room is given below.



- Measure the bar scale to determine the relationship between a measure on a ruler and actual distance.
On the floor plan of the office: Bar Scale: 2 cm = 3 m

- Rewrite to bar scale to work out the number of meters equal to 1 cm (or 1 mm)

Bar Scale: 2 cm = 3 m

$$1 \text{ cm} = 1,5 \text{ m}$$

- Measure the required length on the plan and then use the bar scale written in the form 1 cm = ... m to determine actual length.

Length of room 1 on plan = 3,6 cm

Bar scale: 1 cm = 1,5 m

$$\begin{aligned} \text{Actual length} &= 3,6 \text{ cm} \times 1,5 \text{ m/cm} \\ &= 5,25 \text{ m} \end{aligned}$$

VALUES

- Learners should be able to read maps and plans, using the appropriate scale
- Calculate simple costs procedures when buying material or tiles per square meter.