

Activity 3 — Decorating the new kitchen

This activity and the one that follow both look at area and perimeter measurements within the context of decorating a new office kitchen. Learners are asked to think about how this context impacts on a range of mathematical knowledge and skills.

ABOUT THIS ACTIVITY

In this activity learners calculate areas of rectangular surfaces in the context of tiling walls and floors. They consider rounding off within this context and find out that sometimes it does not pay to round off too early in a calculation. They also see that in some contexts they need to round up, despite the mathematical rule about rounding down when the number is below 5.

This activity prepares learners to meet the following outcomes of Unit Standard 14108:

SO 1: Measure, estimate and calculate physical quantities in practical situations:

- o AC 2, 4, 5, 6

SO 2: Explore, describe and represent, interpret and justify geometrical relationships:

- o AC 1, 2, 3, 4, 5, 6, 7

MANAGING THIS ACTIVITY

Start by checking that learners know how to calculate the area of a rectangular surface and that they understand why we use length multiplied by breadth to get area. If learners are not clear about this then you can use the concept of tiling to lay the conceptual basis.

One can think of simple small tiles (like on the bottom of some swimming pools) that are 1 cm wide and 1 cm high. Learners can use graph paper and colour in the rows of squares mentioned below.

- o 1 row of 10 of these will give an area or $10 \times 1 \text{ cm}^2 = 10 \text{ cm}^2$.
- o 2 rows of 10 of these will give an area or $2 \times 10 \times 1 \text{ cm}^2 = 20 \text{ cm}^2$.
- o 3 rows of 10 of these will give an area or $3 \times 10 \times 1 \text{ cm}^2 = 30 \text{ cm}^2$.
- o 4 row of 10 of these will give an area or $4 \times 10 \times 1 \text{ cm}^2 = 40 \text{ cm}^2$.
- o 5 rows of 10 of these will give an area or $5 \times 10 \times 1 \text{ cm}^2 = 50 \text{ cm}^2$ etc.

Learners should be given worksheet 3 and a copy of handout 3.

In many of these questions learners are asked to estimate their answers before they do the calculations. This will help them to see whether they make any errors. They should also always think about whether they have overestimated or underestimated when they round off the numbers.

- 3.1 The wall area to be tiled is $0,8 \text{ m} \times 2,6 \text{ m} = 2,08 \text{ m}^2$.
- 3.2 One box of small wall tiles will tile an area of 2 m^2 . They will need 2 boxes. No matter how much over 2 m^2 they need, they will need another box of tiles. The activity worksheet gives the reasons why they need to buy more tiles than they need to cover the area.
- 3.3 Two boxes of tiles will give you 4 m^2 of tiles.
- 3.4 Estimation: $2 \times \text{R}90 = \text{R}180$. The 2 boxes of tiles will cost just under $\text{R}180$.
Calculation: Two boxes of small white wall tiles will cost $2 \times \text{R}88,95 = \text{R}177,90$.
- 3.5 One box of large wall tiles will tile an area of $1,5 \text{ m}^2$. So you will need 2 boxes of these tiles.
- 3.6 Two boxes of large tiles will tile an area of 3 m^2 .
- 3.7 Estimation: $2 \times \text{R}120 = \text{R}240$. The two boxes of big tiles will cost just under $\text{R}240,00$
Calculation: Two boxes of the large wall tiles will cost $2 \times \text{R}119,95 = \text{R}239,90$.
- 3.8 The floor area to be tiled is:
The "kitchen" area : $2,8 \text{ metres} \times 3,6 \text{ metres} = 10,08 \text{ m}^2$.
The "dining" area: $4,5 \text{ metres} \times 3,2 \text{ metres} = 14,4 \text{ m}^2$.
The total floor area is $24,48 \text{ m}^2$.

3.9 Number of boxes of linoleum tiles needed: $24,48 \div 0,81 = 30,2222222$. You can't buy parts of boxes of tiles. So this means that you will need 31 boxes of tiles.

3.10 31 boxes will be able to tile an area of $31 \times 0,81 \text{ m}^2 = 25,11 \text{ m}^2$ of tiles.

3.11 Estimation: $31 \times R20 = R620$. The actual cost will be a bit less than R620.
Calculation: 31 boxes of linoleum tiles will cost: $31 \times R19,95 = R618,45$.

3.12 Number of boxes of ceramic tiles needed $24,48 \div 1,75 = 13,98$. This means that you will need at least 14 boxes of tiles.

3.13 14 boxes of tiles will tile an area of $24,5 \text{ m}^2$.

3.14 $24,5 \text{ m}^2$ of tiles will only allow $0,02 \text{ m}^2$ of extra tiles. This is less than 1 tile extra, and so it is unlikely that you will be able to cut tiles to fill the small spaces and there will be nothing over for breakage. This means that you should probably buy 15 boxes of tiles. 15 boxes of tiles will tile an area of $26,35 \text{ m}^2$.

Discuss with learners that the answers to all calculations must be considered in context. This lies at the heart of Mathematical Literacy.

3.15 Estimation: $15 \times R150 = R2\,250$. The cost of 15 boxes of the tiles will be a bit less than R2 250.
Calculation: Cost of 15 boxes = $15 \times R149,95 = R\,2\,249,25$

3.16 Estimation of the floor area to be tiled is:
Estimation of the "kitchen" area : $3 \text{ metres} \times 4 \text{ metres} = 12 \text{ m}^2$.
Estimation of the "dining" area: $5 \text{ metres} \times 3 \text{ metres} = 15 \text{ m}^2$.
Estimation of The total floor area is 27 m^2 .

Discuss with learners that this estimation is more than $2,5 \text{ m}^2$ greater than the calculation and alert them to the fact that this will lead to an increase in the number of boxes of tiles they would purchase and so increase their costs.

3.17 Floor tiles needed based on the estimation above:

3.17.1 Linoleum floor tiles 34 boxes of tiles.

3.17.2 Ceramic floor tiles 16 boxes of tiles.

3.18 Costs of floor tiles needed based on the estimation above.

3.18.1 Linoleum floor tiles R678,30.

3.18.2 Ceramic floor tiles R2 399,20.

Let learners compare the amounts of money based on the real and estimated area calculations. Let them see how much extra they would have spent if they had rounded off the area of the floor. Talk about how sometimes it is not a good idea to round off numbers at the start of a calculation.

3.19

Type of wall tile	Cost per box of tiles	Number of boxes needed	Total cost
Plain / standard white	R88,95	2	R177,90
Large white	R119,95	2	R239,90

Type of floor tile	Cost per box of tiles	Number of boxes needed	Total cost
Linoleum tile	R19,95	31	R618,45
Ceramic tile	R145,95	15	R2 249,25

Activity 3 — Decorating the new kitchen

Your company is moving to new offices. One room has been set aside for an open-plan kitchen and dining area. Your manager has asked you to cost various options for decorating it. The first task is to find out about tiling the floors and walls.

Here is what you need to tile:

Walls:

- o The length of wall to be tiled is 2,6 metres. The area above the counters and the sink needs to be tiled to a height 0,8 metres above these surfaces.

Floors. There are two sections of floor to be tiled.

- o The "kitchen" area is 2,8 metres wide and 3,6 metres long.
- o The "dining area" is 4,5 metres long and 3,2 metres wide.

In handout 3 are quotes of the costs of different kinds of tiles. Tiles are sold in boxes of set amounts. Different types of tiles are sold in boxes that contain different amounts of tiles. Each kind of tile will say on the box how many square metres of tiles the box contains.

You need to work out how much the different options cost. First you need to work out how many boxes of tiles you need for each kind of tile. To calculate how many boxes of tiles you need you must work out the area to be tiled.

3.1 What is the wall area to be tiled?

3.2 How many boxes of the small tiles will this take?

Remember that you will need extra tiles for the following reasons:

- o You need extra tiles for cutting and fitting into the places that are too small to take a whole tile.
- o Some tiles may break during the cutting and laying process.
- o You may need tiles over in case some tiles are damaged in later years.

3.3 What area can be tiled by the number of boxes of small tiles that you need to buy?

3.4 How much will these small tiles cost? Estimate first, then calculate.

3.5 How many boxes of the big tiles do you need?

3.6 What area can be tiled by the number of boxes of large tiles that you need to buy?

3.7 How much will these tiles cost? Estimate first, then calculate.

3.8 What is the floor area to be tiled?

3.9 How many boxes of the linoleum tiles will this take?

3.10 What area can be tiled by the number of boxes of linoleum tiles that you need to buy?

3.11 How much will these tiles cost? Estimate first, then calculate.

3.12 How many boxes of the ceramic tiles do you need?

3.13 What area can be tiled by the number of boxes of ceramic tiles that you need to buy?

- 3.14 Will your answer to question 3.13 above be enough to give you extra tiles for breakages and cutting to fit the space. See whether you need to adjust your answer.
- 3.15 How much will these tiles cost? Estimate first, then calculate.
- 3.16 If you had started by rounding off the length and breadth of the floor, what area would you have based your calculations on?
- 3.17 How would this estimated area have changed the number of boxes that you would have purchased of:
- 3.17.1 Linoleum tiles?
- 3.17.2 Ceramic tiles?
- 3.18 Now calculate what your cost would have been for:
- 3.18.1 Linoleum tiles.
- 3.18.2 Ceramic tiles.
- 3.19 Draw up a table for your manager in which you summarises the following information:
- o Number of boxes of each type of tile needed.
 - o Cost per box of tiles.
 - o Total cost of buying each type of tile.

Wall tiles

Plain white kitchen/bathroom tiles 150 mm × 150 mm.
Boxes of tiles can cover an area of 2m².
Cost R88.95 for a box.

Large white kitchen tiles 195 mm × 245 mm.
Boxes of tiles can cover an area of 1,5m².
Cost for a box R119,95.

Floor tiles

Linoleum tiles 225 mm × 225 mm.
Boxes of tiles cover an area of 0,81 m².
Cost per box R19,95 per pack.

Ceramic tiles 295 mm × 295 mm.
Boxes of tiles can cover an area of 1,75 m².
Cost R 149,95 for a box.