Chapter 11: Grandmother's Quilt

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Exercise 11.1 — Opening Activity — Quilt Border and Perimeter (p. 142)

Q1 Grandmother wants to decorate the entire border of her quilt with lace. Tick the lace option that would cover the entire border.
(i) Red lace — 40 units
(ii) Green lace — 50 units
(iii) Blue lace — 25 units

SOLUTION

The border of the quilt (its perimeter) appears to be about 50 units when you measure all four sides.
Red lace (40 units): NOT enough — 40 < 50.
Green lace (50 units): ENOUGH — 50 = 50. It covers the entire border exactly.
Blue lace (25 units): NOT enough — 25 < 50.

Tick: (ii) Green lace (50 units).

Answer: Tick Green lace (50 units) — it is just long enough to cover the entire border of the quilt.

Q2 Grandmother decides to use TWO different coloured laces. How much lace of each kind will be needed to cover the entire border?

SOLUTION

The quilt border is 50 units long.

Use Blue lace (25 units) for two shorter sides and Red lace (25 units) for the remaining two longer sides.

25 + 25 = 50 units total — exactly covers the border.

So: 25 units of Blue lace + 25 units of Red lace.

Answer: 25 units of Blue lace + 25 units of Red lace = 50 units total, covering the entire border.

Exercise 11.2 — Let Us Do — Perimeter of Shapes (p. 142)

Q1 Find the perimeter of the following shapes. All sides of the following shapes are equal.
(a) A pentagon (5-sided shape) with each side = 4 cm.
(b) A hexagon-like shape with each side = 5 cm.

SOLUTION

(a) Pentagon: 5 sides, each 4 cm.
Perimeter = 5 x 4 = 20 cm.

(b) The shape has 6 equal sides, each 5 cm.
Perimeter = 5 + 5 + 5 + 5 + 5 + 5 = 6 x 5 = 30 cm.

Answer: (a) 20 cm (b) 30 cm

Q2 Draw two rectangles each having the following perimeters.
(a) 26 cm
(b) 18 cm

SOLUTION

(a) Perimeter = 26 cm means 2 x (length + breadth) = 26, so length + breadth = 13 cm.
Example 1: length = 10 cm, breadth = 3 cm. Check: 2*(10+3) = 26 cm. ✓
Example 2: length = 8 cm, breadth = 5 cm. Check: 2*(8+5) = 26 cm. ✓
Draw both rectangles on squared paper with these dimensions.

(b) Perimeter = 18 cm means length + breadth = 9 cm.
Example 1: length = 7 cm, breadth = 2 cm. Check: 2*(7+2) = 18 cm. ✓
Example 2: length = 5 cm, breadth = 4 cm. Check: 2*(5+4) = 18 cm. ✓
Draw both rectangles on squared paper with these dimensions.

Answer: (a) Any two rectangles with length + breadth = 13 cm, e.g. 10x3 cm and 8x5 cm. (b) Any two rectangles with length + breadth = 9 cm, e.g. 7x2 cm and 5x4 cm.

Exercise 11.3 — Tiling and Area — Rug Patches and Table Covering (p. 143)

Q1 Grandmother is making a rug with square patches. The picture shows the rug. How many patches have they used to make it?

SOLUTION

The rug is arranged in rows and columns of square patches.
Count along the horizontal side: 15 columns of patches.
Count the rows going up: 6 rows of patches.
Total patches = 6 rows x 15 columns = 90 patches.

Answer: 90 patches (6 rows x 15 columns = 90).

Q2 Preetha and Adrit cover their table tops with different shapes. Looking at Tables 1, 2, 3, and 4:
— Which shapes cover the top without gaps and overlaps?
— Which shape leaves gaps?
— How many triangles cover Table 1?
— How many squares cover Table 3?
— How many rectangles cover Table 4?
— What is the area of Table 1 in triangle units, Table 3 in square units, Table 4 in rectangle units?

SOLUTION

Triangles, squares, and rectangles tile perfectly — they cover without gaps or overlaps.
Circles leave gaps — they cannot tile a flat surface without leaving empty spaces.

From the image:
Table 1 is covered with triangles: it is a 5 x 2 grid of squares, each split into 2 triangles, so 20 triangles cover the table.
Table 3 is covered with squares: 8 squares (a 4 x 2 grid) cover the table.
Table 4 is covered with rectangles: 8 rectangles (a 4 x 2 grid) cover the table.

Area of Table 1 = 20 triangle units.
Area of Table 3 = 8 square units.
Area of Table 4 = 8 rectangle units.

Answer: Shapes that cover without gaps: triangles, squares, and rectangles. Circles leave gaps. 20 triangles cover Table 1 (area = 20 triangle units). 8 squares cover Table 3 (area = 8 sq units). 8 rectangles cover Table 4 (area = 8 rectangle units).

Q3 Now try to cover the top of YOUR table without gaps and overlaps with the following objects of the same size: (a) Notebooks, (b) Lunch boxes, (c) Pencil boxes, (d) Maths textbooks. Which of the above objects covered the region completely?

SOLUTION

This is a hands-on activity. Place each object flat on your desk and see if they tile without leaving gaps.

Rectangular objects (notebooks, lunch boxes with flat rectangular lids, maths textbooks) will tile perfectly because rectangles cover a flat surface without gaps.

Pencil boxes (if cylindrical or oval-shaped) will leave gaps, just like circles do.

Record which objects covered your table completely and share with the class.

Answer: Guidance: Notebooks and flat rectangular lunch boxes and maths textbooks will tile the table completely. Objects with curved or irregular shapes (like cylindrical pencil boxes) leave gaps.

Exercise 11.4 — Let Us Do — Tiles on a Desk (p. 144)

Q1 Preetha covers her desk (the grid is 9 units wide x 6 units tall = 54 square units) with different tile shapes as shown. How many of each shape will cover the desk?
(a) Green triangles (each = a small right triangle made from half a 1 unit x 1 unit square, area = 1/2 sq unit)
(b) Red triangles (each = a right triangle with legs 3 units x 3 units, area = 4 1/2 sq units)
(c) Blue squares (each = 1 unit x 1 unit = 1 sq unit)

SOLUTION

Count the grid: the desk is 9 squares wide and 6 squares tall.
The desk area = 9 x 6 = 54 square units.

(a) Green triangle area = 1/2 x 1 x 1 = 1/2 sq unit.
Number of green triangles = 54 / (1/2) = 54 x 2 = 108 green triangles.

(b) Red triangle area = 1/2 x 3 x 3 = 4 1/2 sq units.
Number of red triangles = 54 / (4 1/2) = 12 red triangles.

(c) Blue square area = 1 x 1 = 1 sq unit.
Number of blue squares = 54 / 1 = 54 blue squares.

Answer: (a) 108 green triangles (b) 12 red triangles (c) 54 blue squares

Exercise 11.5 — Comparing Shapes — Rectangles A, B, C on Grid (p. 144–145)

Q1 Three rectangles A (yellow), B (pink), and C (purple) are placed on a square grid (1 unit = 1 cm). Which rectangle has the largest area? Compare A and B, B and C, and A and C.

SOLUTION

Count the squares each rectangle covers on the grid:
Rectangle A (yellow) = 3 wide x 4 tall = 12 square units.
Rectangle B (pink) = 2 wide x 4 tall = 8 square units.
Rectangle C (purple) = 2 wide x 5 tall = 10 square units.

A (12) > B (8): Rectangle A has a larger area than B.
C (10) > B (8): Rectangle C has a larger area than B.
A (12) > C (10): Rectangle A has the largest area among all three.

Answer: A = 12 sq units, C = 10 sq units, B = 8 sq units. Rectangle A has the largest area.

Exercise 11.6 — Let Us Do — Area of Gardens on Square Grid (p. 145–146)

Q1 Compare the areas of the two gardens on the square grid (each small square = 1 cm). Garden A and Garden B are shown on the same grid. Find:
Area of Garden A = ___ cm square
Area of Garden B = ___ cm square

SOLUTION

Count the coloured squares in each garden:
Garden A: covers 2 columns x 5 rows = 10 coloured squares.
Area of Garden A = 10 cm square.

Garden B: covers 4 columns x 3 rows = 12 coloured squares.
Area of Garden B = 12 cm square.

Observation: Garden B has a larger area than Garden A (12 > 10).

Answer: Area of Garden A = 10 cm square. Area of Garden B = 12 cm square. Garden B is larger.

Q2 Trace your palm on the square grid and find the approximate area of your palm. Compare it with your friend's palm. Who has a bigger palm?

SOLUTION

This is a hands-on activity.
Place your palm flat on the grid. Trace around it with a pencil.
Count all the squares that are fully inside your palm outline. Also count squares that are more than half covered — count them as 1, and ignore squares that are less than half covered.
Add them up to get the approximate area.
Do the same for your friend's palm and compare the counts.
The palm with the higher count has the bigger area.

Answer: Guidance: Count fully-covered squares as 1 each; count squares more than half covered as 1, and ignore squares less than half covered. The palm with more squares has the bigger area. Answers vary by student.

Q3 Collect leaves of different kinds. Put them on a square grid and find their area.
(a) Name the leaf with the largest area.
(b) Name the leaf with the smallest area.

SOLUTION

This is a hands-on activity.
Collect at least 3 different leaves (e.g. mango, neem, banana).
Trace each leaf on the square grid. Count the squares covered by each leaf using the same rule: fully covered = 1, more than half = 1, less than half = 0.

(a) The leaf that covers the most squares has the largest area. Example: a mango leaf typically

covers more squares than a neem leaf.
(b) The leaf that covers the fewest squares has the smallest area. Example: a small neem leaflet.

Answer: Guidance (answers vary): trace each leaf, count squares, compare totals. The leaf with the highest count has the largest area; the leaf with the fewest has the smallest area.

Q4 The following mats are made of square patches of equal size. How many square patches will be required to cover each mat? Would both mats require an equal or different number of patches? (Trace the small square patch shown and use it to measure each mat.)

SOLUTION

Trace the small square patch and see how many fit along the length and the breadth of each mat.

Mat (a): about 5 patches wide x 2 patches tall = 10 patches. Perimeter = 2 x (5 + 2) = 14 patch units.
Mat (b): about 4 patches wide x 3 patches tall = 12 patches. Perimeter = 2 x (4 + 3) = 14 patch units.

The two mats need DIFFERENT numbers of patches (10 and 12).

Answer: Mat (a): about 10 patches (5 x 2), perimeter 14 units. Mat (b): about 12 patches (4 x 3), perimeter 14 units. Different numbers of patches. (Trace the patch to count exactly.)

Q5 Trisha makes two rectangles. She says: 'I increased the area of my rectangle, and the perimeter increased.' Do you think this is always true?

SOLUTION

Trisha's example: small rectangle 2 x 3 = 6 sq units (P = 10 units), big rectangle 3 x 4 = 12 sq units (P = 14 units).
Here she increased area from 6 to 12 AND perimeter increased from 10 to 14. True for her example.

But is it ALWAYS true? NO.
Counter-example: Compare mat (a) = 4 x 2 (area 8, P 12) with mat (b) = 3 x 3 (area 9, P 12).
Area increased from 8 to 9, but perimeter STAYED THE SAME at 12.

So: increasing area does NOT always increase the perimeter.

Answer: No, Trisha's claim is not always true. Counter-example: a 4x2 rectangle (area 8, P 12) and a 3x3 square (area 9, P 12) — area increased but perimeter stayed the same.

Exercise 11.7 — Let Us Explore — Same Area, Different Perimeters (p. 147–148)

Q1 Tick the shapes (a)–(f) on the square grid (1 cm squares) that have the same area. Find the perimeters of those shapes. What do you notice? Discuss.
(a) Horizontal rectangle: 5 wide x 2 tall
(b) L-shaped: ~6 sq cm
(c) L-shape: ~8 sq cm
(d) Rectangle: 4 wide x 2 tall
(e) Thin strip: 1 wide x 6 tall
(f) Long strip: 1 wide x 10 tall

SOLUTION

Count the coloured squares in each shape:
(a) 5 x 2 = 10 sq cm. Perimeter = 2*(5+2) = 14 cm.
(b) Count squares: approximately 6 sq cm.
(c) Count squares: approximately 8 sq cm.
(d) 4 x 2 = 8 sq cm.
(e) 1 x 6 = 6 sq cm. Perimeter = 2*(1+6) = 14 cm.
(f) 1 x 10 = 10 sq cm. Perimeter = 2*(1+10) = 22 cm.

Shapes with the same area: (a) and (f) both have area 10 sq cm.
(b) and (e) both have area 6 sq cm.
(c) and (d) both have area 8 sq cm.

Notice: (a) and (f) have the same area (10 sq cm) but DIFFERENT perimeters (14 cm vs 22 cm).
Key observation: shapes with the same area can have different perimeters.

Answer: Shapes with same area: (a) & (f) = 10 sq cm (P: 14 cm vs 22 cm); (b) & (e) = 6 sq cm; (c) & (d) = 8 sq cm. Observation: same area, different perimeters are possible.

Q2 Tick the shapes (a)–(e) on the square grid that have the same perimeter. Find the areas of those shapes. What do you notice? Discuss.
(a) 2x2 square
(b) T-shaped or cross shape
(c) L-shaped or staircase
(d) Vertical L-shape
(e) Horizontal bar

SOLUTION

Count the boundary edges (perimeter) of each shape:
(a) 2 x 2 square: area = 4 sq cm, perimeter = 4 x 2 = 8 cm.
(b) Count boundary edges carefully: approximately 12 cm perimeter, area = 5 sq cm.
(c) Count boundary edges: approximately 12 cm perimeter, area varies.
(d) Count boundary edges: approximately 12 cm perimeter, area varies.

(e) Count boundary edges: approximately 12 cm perimeter, area varies.

Shapes with the same perimeter (12 cm) can have DIFFERENT areas.
Key observation: shapes with the same perimeter can have different areas.
A larger perimeter does NOT guarantee a larger area, and vice versa.

Answer: Shapes with the same perimeter can have different areas. Key observation: same perimeter, different areas are possible — just as same area can give different perimeters.

Exercise 11.8 — Let Us Do — Same Area, Drawing Different Shapes; Comparing Areas (p. 149)

Q1 Shape (a) is a green rectangle 7 cm wide x 2 cm tall on the square grid. Draw different shapes having the SAME area as shape (a). Write the perimeter of each. What do you notice?

SOLUTION

Area of shape (a) = 7 x 2 = 14 sq cm.
Perimeter of shape (a) = 2 x (7 + 2) = 18 cm.

Other shapes with area = 14 sq cm:
Shape 1: 14 cm x 1 cm rectangle. Perimeter = 2*(14+1) = 30 cm.
Shape 2: 7 cm x 2 cm (same as (a)). Perimeter = 18 cm.
Shape 3: An L-shape with 14 unit squares arranged differently. Perimeter will vary.

Notice: all these shapes have area = 14 sq cm but their perimeters are DIFFERENT.
A shape with the same area can have many different perimeters depending on its shape.

Answer: Area = 14 sq cm. Examples: 14x1 (P=30 cm), 7x2 (P=18 cm), other 14-square shapes. Observation: same area, different perimeters.

Q2 Is the area of shape (a) less than the area of shape (b) given below?
(a) A blue square on the grid: 3 cm x 3 cm.
(b) A downward-pointing orange triangle on the grid: base = 6 cm, height = 3 cm.
Discuss.

SOLUTION

Count the squares covered by each shape.
Area of shape (a) = 3 x 3 = 9 unit squares.

Area of shape (b): the triangle covers 9 unit squares (6 full squares + 6 half squares = 6 + 3 = 9).

Both shapes cover the same number of squares.
So NO — the area of shape (a) is NOT less than the area of shape (b). They are equal.

Answer: No. Area of (a) = 9 sq units; area of (b) = 9 sq units. Both shapes have equal area.

Exercise 11.9 — Area Formula for Rectangles and Squares (p. 150–151)

Q1 Grandmother's patchwork rectangle has 6 rows of 4 patches each. How many patches does she need? Verify using Area = Length x Breadth.

SOLUTION

By counting: 6 rows x 4 patches per row = 24 patches.
Using the formula: Area = Length x Breadth = 6 x 4 = 24 square cm.
Both methods give the same answer: 24 patches.

Answer: 24 patches. Area = 6 x 4 = 24 sq cm.

Q2 A square has sides 5 cm long. Find its area and perimeter.

SOLUTION

Area of square = Length x Length = 5 x 5 = 25 square cm.
Perimeter of square = 4 x Length = 4 x 5 = 20 cm.

Answer: Area = 25 sq cm. Perimeter = 20 cm.

Exercise 11.10 — Let Us Do — Area and Perimeter with Formula (p. 151–153)

Q1 Find the area of your classroom floor in square metres. Take the help of your teacher to measure the length and breadth of the floor. What is the perimeter of the classroom floor?

SOLUTION

This is a hands-on measurement activity.
Use a measuring tape to find the length and breadth of the classroom floor.
Example: if length = 8 m and breadth = 6 m,
Area = 8 x 6 = 48 square metres.
Perimeter = 2 x (8 + 6) = 2 x 14 = 28 metres.
Record your actual measurements and calculate.

Answer: Guidance: measure the classroom with your teacher. Use Area = length x breadth (in sq m) and Perimeter = 2 x (length + breadth). Answers will vary by classroom.

Q2 Find the area and perimeter of the following shapes on the square grid (1 cm per square). All shapes are rectangles (or squares).
(a) Square: 6 cm wide x 6 cm tall
(b) Rectangle: 4 cm wide x 7 cm tall
(c) Rectangle: 12 cm wide x 4 cm tall
(d) Square: 3 cm wide x 3 cm tall
(e) Rectangle: 6 cm wide x 5 cm tall

SOLUTION

Count the squares along each side, then use Area = length x breadth and Perimeter = 2 x (length + breadth).

(a) Square 6 x 6: Area = 6 x 6 = 36 sq cm. Perimeter = 2*(6+6) = 24 cm.

(b) Rectangle 4 x 7: Area = 4 x 7 = 28 sq cm. Perimeter = 2*(4+7) = 22 cm.

(c) Rectangle 12 x 4: Area = 12 x 4 = 48 sq cm. Perimeter = 2*(12+4) = 32 cm.

(d) Square 3 x 3: Area = 3 x 3 = 9 sq cm. Perimeter = 2*(3+3) = 12 cm.

(e) Rectangle 6 x 5: Area = 6 x 5 = 30 sq cm. Perimeter = 2*(6+5) = 22 cm.

Answer: (a) area=36 sq cm, P=24 cm (b) area=28 sq cm, P=22 cm (c) area=48 sq cm, P=32 cm (d) area=9 sq cm, P=12 cm (e) area=30 sq cm, P=22 cm

Q3 Find the area and perimeter of the following objects by measuring them with a scale or measuring tape. Fill in the table.

1. Cover of the Notebook
2. Newspaper
3. Blackboard
4. Ludo board
5. (Your choice)
6. (Your choice)

SOLUTION

This is a hands-on measurement activity. Use a ruler or measuring tape.
For each rectangular object: measure its length and breadth.
Area = length x breadth. Perimeter = 2 x (length + breadth).

Example estimates:

1. Notebook cover: about 27 cm x 21 cm. Area = 567 sq cm. Perimeter = 96 cm.
2. Newspaper: about 60 cm x 45 cm. Area = 2700 sq cm. Perimeter = 210 cm.
3. Blackboard: about 250 cm x 100 cm. Area = 25,000 sq cm. Perimeter = 700 cm.
4. Ludo board: about 40 cm x 40 cm (square). Area = 1600 sq cm. Perimeter = 160 cm.

Measure your own objects for rows 5 and 6 and record the results.

Answer: Guidance: measure each object, then use Area = L x B and Perimeter = 2*(L+B). Sample: Notebook ~27x21 cm (area 567 sq cm, P 96 cm); Ludo board ~40x40 cm (area 1600 sq cm, P 160 cm). Record actual measurements.

Q4 Find the area of a rectangular field whose length is 42 m and breadth is 34 m.

SOLUTION

Area = Length x Breadth
= 42 x 34
= 1428 square m.

Answer: 1428 square m

Q5 The area of a rectangular garden is 64 square m and its length is 16 m. What is its breadth?

SOLUTION

Area = Length x Breadth
64 = 16 x Breadth
Breadth = 64 / 16 = 4 m.

Answer: Breadth = 4 m

Q6 Find the area of the figure below. The figure is a rectangle whose total width is 32 cm. Its height is marked in two parts: 6 cm and 12 cm.

SOLUTION

The figure is a rectangle.
Width = 32 cm.
Height = 6 cm + 12 cm = 18 cm.
Area = length x breadth = 32 x 18 = 576 sq cm.

You can also split it into two strips: top 32 x 6 = 192 and bottom 32 x 12 = 384; 192 + 384 = 576.

Answer: Area = 576 sq cm (32 cm wide x 18 cm tall; or 32x6 + 32x12 = 192 + 384 = 576).

Exercise 11.11 — Let Us Play — Tile Perimeter Game (p. 154)

Q1 In the tile game, players roll a die and add square tiles (each side = 1 unit) to build a shape. The example in the book shows a shape with perimeter labelled as 10. Find the perimeter of the tile shape shown (a connected arrangement of square tiles with all edge lengths labelled as 1).

SOLUTION

Each tile is a 1-unit square. When tiles share an edge, that shared edge is INSIDE (not part of the perimeter).
Count only the OUTER edges of the arrangement.
From the example in the book, the shape has perimeter = 10 units.
Count the outer boundary: go around the shape and add up the outer edges.
10 outer edges x 1 unit each = 10 units.

Answer: Perimeter of the example shape = 10 units (count all outer edges, each 1 unit long).

Q2 In the game, Player 1 rolls the die and places tiles. Player 2 then adds tiles to the same figure. The goal is for the combined shape to reach a perimeter of 24. The book shows an intermediate stage with perimeter = 12. Explain how adding more tiles can reach perimeter = 24.

SOLUTION

Adding tiles INSIDE the boundary (filling in holes or extending in a straight line) can REDUCE or keep the perimeter the same.
Adding tiles to the OUTSIDE (sticking out as a bump) usually INCREASES the perimeter.
Strategy: to grow the perimeter towards 24, add tiles that stick out individually (each new lone tile on an edge adds +2 to the perimeter).
From perimeter 12 to 24 requires adding 12 more outer edges.
This can be done by adding 6 tiles, each sticking out from a flat edge (each adds +2 to perimeter: adds 3 outer edges, loses 1 shared edge).
Keep taking turns, adding tiles, and measuring the perimeter each time until it reaches exactly 24.

Answer: Guidance: Add tiles that stick out from the boundary to increase perimeter. Each tile added to a flat outer edge increases perimeter by +2 units. Go from 12 to 24 by strategically adding tiles. The player who brings the perimeter to exactly 24 wins.