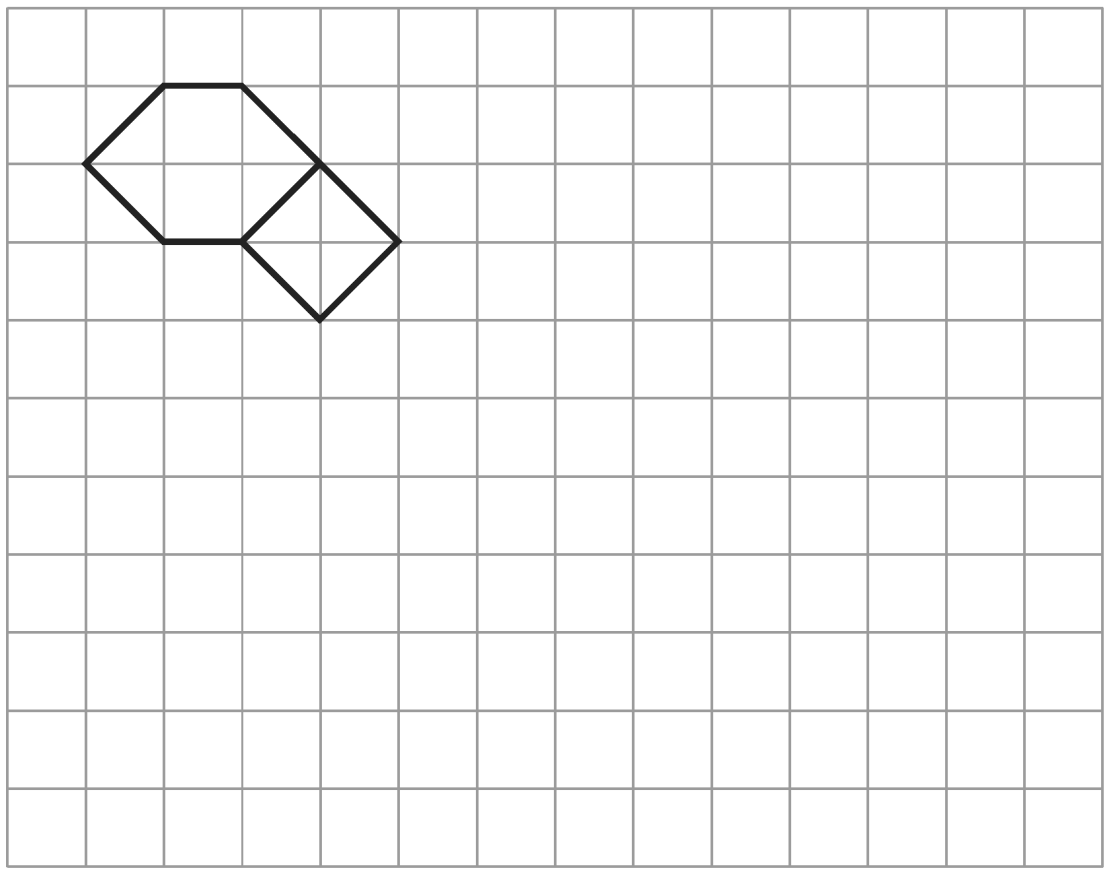
Tessellation PPQs

pdfcrowd.com

1.

Ben needs to tile his kitchen floor and decides to use the two types of tiles shown in the diagram.
By drawing more tiles in the diagram, show that the tiles will tessellate.

[2]



pdfcrowd.com

2.

Maggie has lots of tiles.
All of her tiles are in the shape of regular polygons.
The edges of all the tiles have the same length.

She places two 12-sided tiles to meet edge-to-edge.
Maggie places a different-shaped tile with these two tiles.
She finds that the 3 tiles tessellate.

By calculation, find the number of sides of this third tile.
You must show all your working. [5]

pdfcrowd.com

3. Ali has a number of tiles.
He has some squares tiles and some tiles in the shape of equilateral triangles.
The edges of all the tiles are of equal length.
He uses some tiles of each shape to make an example of a tessellation.

- Sketch how Ali can use square tiles **and** tiles in the shape of equilateral triangles to make an example of a tessellation.
- Explain, using your knowledge of angle facts, why this is an example of a tessellation. You must include at least one tile of each shape and show all your calculations.

.....

.....

.....

.....

.....

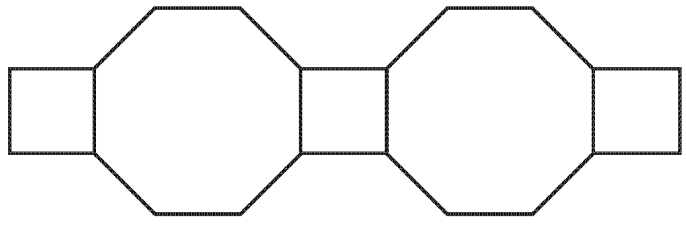
.....

[4]

pdfcrowd.com

4. *You will be assessed on the quality of your written communication in this question.*

The pattern below is made using small square tiles and regular octagonal tiles.



Is it possible to use this pattern of tiles to tessellate and completely cover a rectangular area with only the need to cut tiles at the edges of the rectangle?
You must show **all** your working and explain your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[8]

pdfcrowd.com

5.

(a)

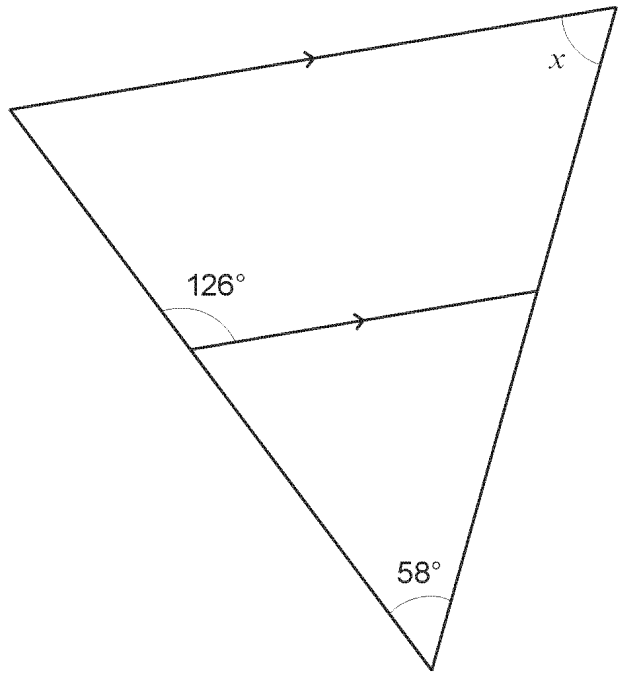


Diagram not drawn to scale

Calculate the size of angle x.
You must show all your working and explain each step of your answer. [3]

.....

.....

.....

.....

.....

.....

pdfcrowd.com

(b) The tile shown is a rhombus.

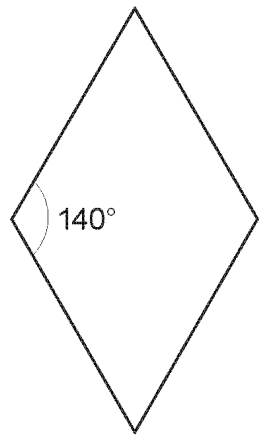


Diagram not drawn to scale

Explain why tiles identical to the one shown tessellate.
You must give reasons for your answer. [3]

.....

.....

.....

.....

.....

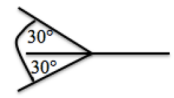
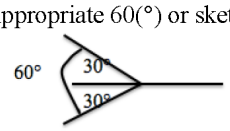
pdfcrowd.com

Marking Scheme

1.

9. At least 3 additional given shapes tessellating correctly with at least one that meets given shapes At least 6 additional given shapes tessellating correctly	M1 A1 2	The additional shapes must consist of at least 1 square **and** 1 hexagon. Award A0 for any error in their tessellation.

2.

21. 12 sided shape: exterior angle 360/12 (= 30°) interior angle (180° - 30° =) 150(°) OR sketch showing one 30° exterior angles, e.g.  	B1 B1	OR M1 Interior 10× 180 ÷ 12 A1 = 150(°) OR B2 for interior angle found to be 150(°)
Gap is 360 – 150 – 150 OR sketch implying the sum of the 2 angles of 30° is the remaining exterior angle, e.g.  	M1	FT for use of 'their 150'
Appropriate 60(°) or sketch showing 60° e.g.  	A1	
Third shape: 3 (sides)	A1	CAO. Allow (equilateral) triangle ***If correct answer with sight of angles:*** Sight of 150(°) or 30(°) AND 60° followed by an answer 3 (sides) or triangle is awarded 5 marks or Sight of 150(°) or 30(°) followed by an answer 3 (sides) or triangle is awarded 4 marks only (as working is incomplete) or Sight of 360(°)/12 followed by an answer 3 (sides) or triangle is awarded 3 marks only (as working is incomplete) ***OR if no working or errors in calculations:*** *Award SC2 for an answer of **3 sides** or(equilateral) **triangle**.* *OR* *Award SC2 for a diagram of **a tessellation** of a number of sides of two 12-sided polygons showing a triangle.* *Award SC1 for a diagram of **an attempt at a tessellation** of a number of sides of two 12-sided polygons showing a triangle.*

3.

7. An example of a tessellation covering a space having an element of a **repeating** pattern with at least one 360° point formed by using both of the shapes of tiles	B2	B1 for an example of a tessellation covering a space with at least one 360° point formed by using **both** of the shapes of tiles.
Use of angles at a point is 360(°)	B1	Accept sight of knowledge that angles at a point is 360(°)
Shows sum to 360(°) including at least one 90(°) and at least one 60(°)	B1 4	Accept if implied, e.g. '2 squares 180° and 3 (isosceles) triangles 180°'

pdfcrowd.com

4.

8. Square 90° Octagon: 360÷8 Exterior 45° Interior 135° Gap shown to be either 90+45 OR 360 – 135 – 90 Suitable explanation of filling the gap, e.g. 'no gaps', 'fit perfectly together', 'fit together' Confusion between interior and exterior angles will affect the QWC mark, giving a maximum QWC1. If no calculation, still could be QWC2 if sufficient text (e.g. 2 short meaningful sentences, or one long clear meaningful sentence) Do not penalise no ruler in a sketch QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps **AND** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps **OR** • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	B1 M1 A1 A1 B1 E1 QWC 2 8	Or alternative methods At least 1 of the exterior or interior maybe implied FT 180 – their exterior, or equivalent Or equivalent Conclusions must be stated not just implied. Must imply 'Yes' *If no calculations shown:* *SC2 for at least another 2 rows drawn, e.g. hexagons above and hexagons below, with squares OR* *SC1 for at least another 1 row drawn, OR appropriate cuts with 'fill in' described or shown, to continue the pattern or complete a rectangle. THEN E mark if appropriate* QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.

5.

14(a) 180 – 126 (=54°) x indicated as (180 – 58 – '54' =) 68(°) Two appropriate stages of explanation given, e.g. 'angles on a straight line 180°'AND • 'angles in a triangle 180°', or • corresponding angles or equivalent, or • interior angles, or equivalent (b) Sight of 40(°) Showing or stating 140 + 140 + 40 + 40 OR 140 + 40 = 180° WITH straight line sum 180° stated Use of, or statement that, angles at a point add to 360(°)	B1 B1 E1 B1 B1 E1 6	1st step of appropriate working OR an appropriate 54(°) indicated on the diagram. Allow B1 even if then incorrectly assuming an 'isosceles trapezium' FT 'their 54°' (=180 – 126) evaluated correctly May be on diagram, do not accept contradiction in answers for x in working space and on diagram Accept reference to 'C' and 'F' angles Allow FT for 'isosceles trapezium' provided both stages explained, i.e. parallel fact and sum 360° If no marks: SC2 for x = 61° from an isosceles triangle with explanation of triangle sum 180° AND a parallel line fact, OR SC1 for x = 61° from an isosceles triangle *Alternative method* *M1 126 – 58* *A1 = 68(°)* *B1 Explanation: 'exterior angle of a triangle is the sum of the two other angles' AND 'corresponding angle'* May be shown on a diagram, showing angles at a point, or a diagram showing they do tessellate FT their '180 - 140' OR 'angle sum of the tile is 360(°). For award of E1 360(°) at a point MUST be stated, not simply implied If no marks then allow B2 for the statement 'all quadrilaterals tessellate', then possible E1 for an explanation, e.g. 'angle sum at a point is 360(°)'

pdfcrowd.com