

Tessellations and regular polygons

Year 8 About 60 minutes No calculator 45 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-8-tessellations-and-regular-polygons/

Date _____

A Do Now

Quick questions to start.

- A1** Last lesson [1 mark] **A2** Needed today [1 mark]
Work out the size of each interior angle of a regular octagon. Work out $360 \div 72$.

Answer

Answer

- A3** Year 7 [1 mark] **A4** From chapter 2 [1 mark]
Three angles meet at a point. Factorise $6x + 15$.
Two of them are 125° and 140° .
Work out the third angle.

Answer

Answer

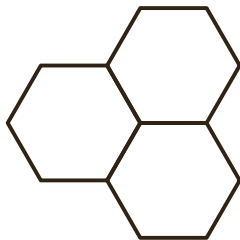
B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Explain why regular hexagons tessellate.



Not drawn accurately

Hint Shapes tessellate when copies fit round a point with no gap. Work out the interior angle first.

- B1** Does a regular polygon with 18 sides tessellate? Give a reason for your answer. [2 marks]

EXAMPLE 2

Two regular decagons are placed side by side at a point. Work out the size of the gap left at the point.

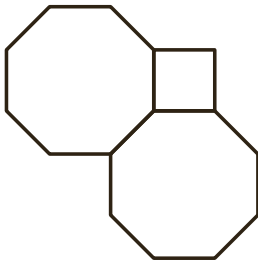
Hint Find the interior angle of a regular decagon. The angles at a point add up to 360° .

- B2** Two regular dodecagons (12 sides) are placed side by side at a point. Work out the size of the gap. Which regular polygon would fill the gap exactly? [3 marks]

Answer gap $^\circ$ polygon

EXAMPLE 3

Show that a square and two regular octagons fit together exactly at a point.



Not drawn accurately

Hint Work out the interior angle of each shape. Do they add up to 360° ?

- B3** Show that a square, a regular hexagon and a regular dodecagon fit together exactly at a point. [3 marks]

EXAMPLE 4

Two regular pentagons and one other regular polygon fit together exactly at a point. How many sides does the other polygon have?

Hint Find the angle that is left. Then find the exterior angle of the polygon that has it.

- B4** A square, a regular pentagon and one other regular polygon fit together exactly at a point. How many sides does the other polygon have? [3 marks]

Answer sides

C Practice

Year 8

C1 Three regular pentagons are placed side by side at a point. [2 marks]
Work out the size of the gap.

Answer

C2 Explain why copies of any quadrilateral can tessellate. [2 marks]

C3 Only three regular polygons tessellate on their own. Name them. Use the fact that the smallest interior angle of a regular polygon is 60° . [2 marks]

Answer

C4 Two regular hexagons and some equilateral triangles fit together exactly at a point. How many triangles are there? [2 marks]

Answer triangles

C5 A square and an equilateral triangle are placed side by side at a point. Could one regular polygon fill the gap? Give a reason. [2 marks]

D Exam-style questions

GCSE Foundation

D1 Ben says, "Every regular polygon with an even number of sides tessellates." [3 marks]
Show that Ben is wrong.

D2 Equilateral triangles and squares fit together exactly at a point. There is at least one of each shape. How many triangles and how many squares are there? You must show your working. [4 marks]

Answer triangles squares

D3 Two regular pentagons and a rhombus $PQRS$ fit together exactly at the point P .

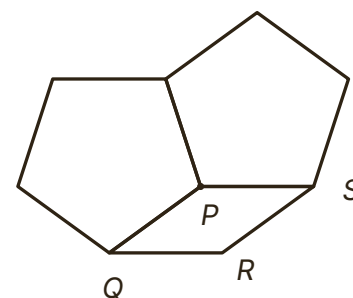
- (a) Work out the size of each interior angle of a regular pentagon. [2 marks]

Answer

- (b) Work out the size of angle QPS . [1 mark]

Answer angle $QPS = \dots\dots^\circ$

- (c) Work out the size of angle PQR . Give a reason. [2 marks]



Not drawn accurately

Answer angle $PQR = \dots\dots^\circ$

Total for D3: 5 marks

D4 In a regular polygon, the interior angle is 4 times the exterior angle. Does the polygon tessellate? You must show your working. [4 marks]

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** Equilateral triangles, squares and regular hexagons fit together exactly at a point. There is at least one of each shape. How many of each shape are there? Show that there is only one answer. [4 marks]

Answer ... triangles ... squares ... hexagons

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The angles are 60° , 90° and 120° , and they must add up to 360° .
- Hint 2** Try one hexagon first: $360 - 120 = 240^\circ$ is left for triangles and squares.
- Hint 3** Two hexagons leave 120° , which cannot hold a triangle and a square ($60 + 90 = 150$).

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can explain why a regular polygon does or does not tessellate. ☐ ☐ ☐

I can work out the gap left when regular polygons meet at a point. ☐ ☐ ☐

I can find mixes of regular polygons that fit together at a point. ☐ ☐ ☐