

## Angles in Polygons Exam Practice



Q1. A regular polygon has an exterior angle of size  $10^\circ$ . Work out the total number of sides the polygon has.

Total of exterior angles in a regular polygon is  $360^\circ$

$$\frac{360}{10} = 36 \text{ sides}$$

Answer: 36  
(2 marks)

Q2. Mike claims that a regular polygon has an interior angle of size  $72^\circ$ . Could he be correct? You must explain your choice.

• exterior angle is  $180 - 72 = 108^\circ$

•  $\frac{360}{108} = \text{no. of sides}$

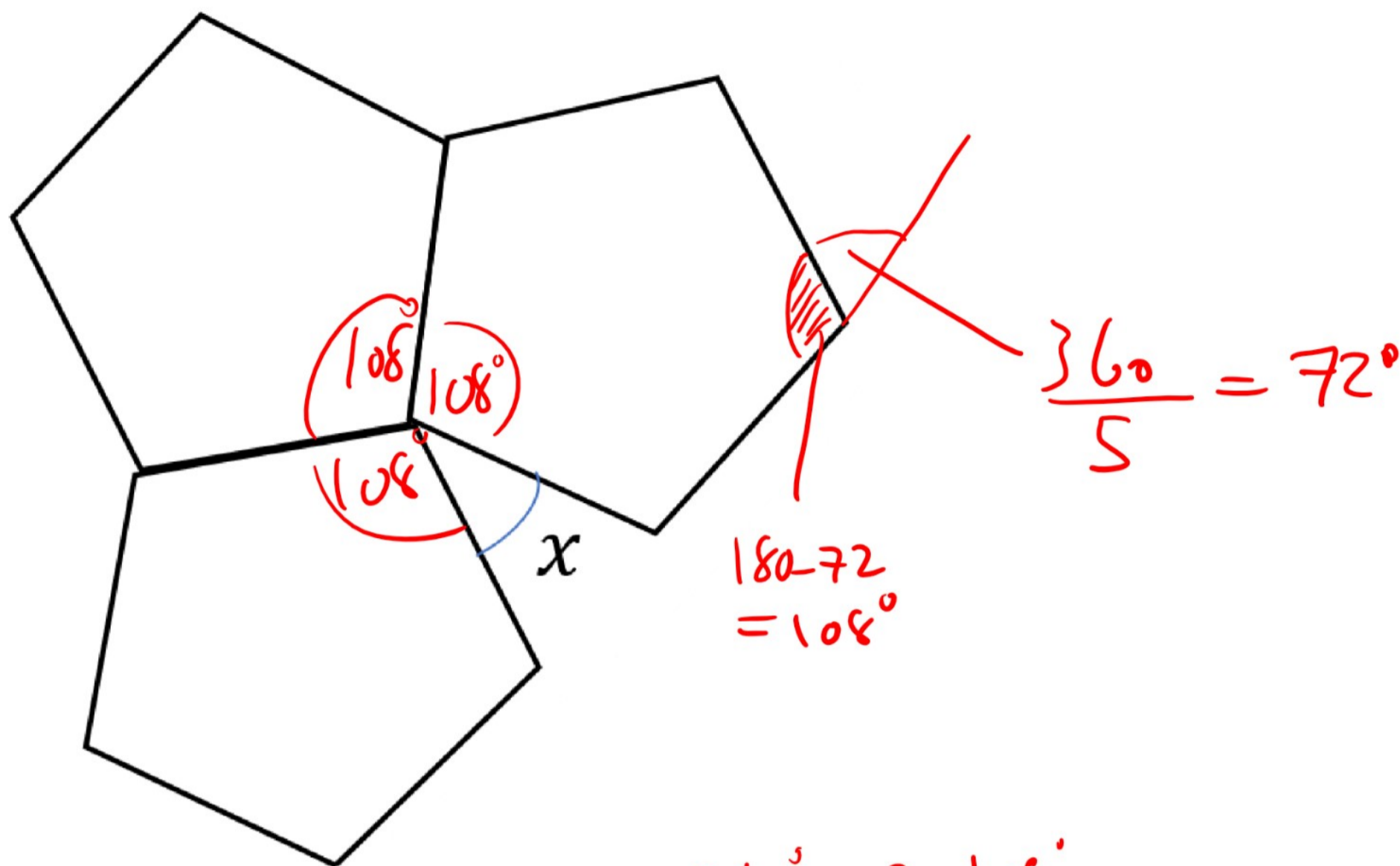
• This is not a whole number, so

Mike cannot be correct.

Answer: Incorrect  
(2 marks)



Q3. The diagram shows 3 identical polygons. Work out angle  $x$ .



$$\frac{360}{5} = 72^\circ$$

$$180 - 72 = 108^\circ$$

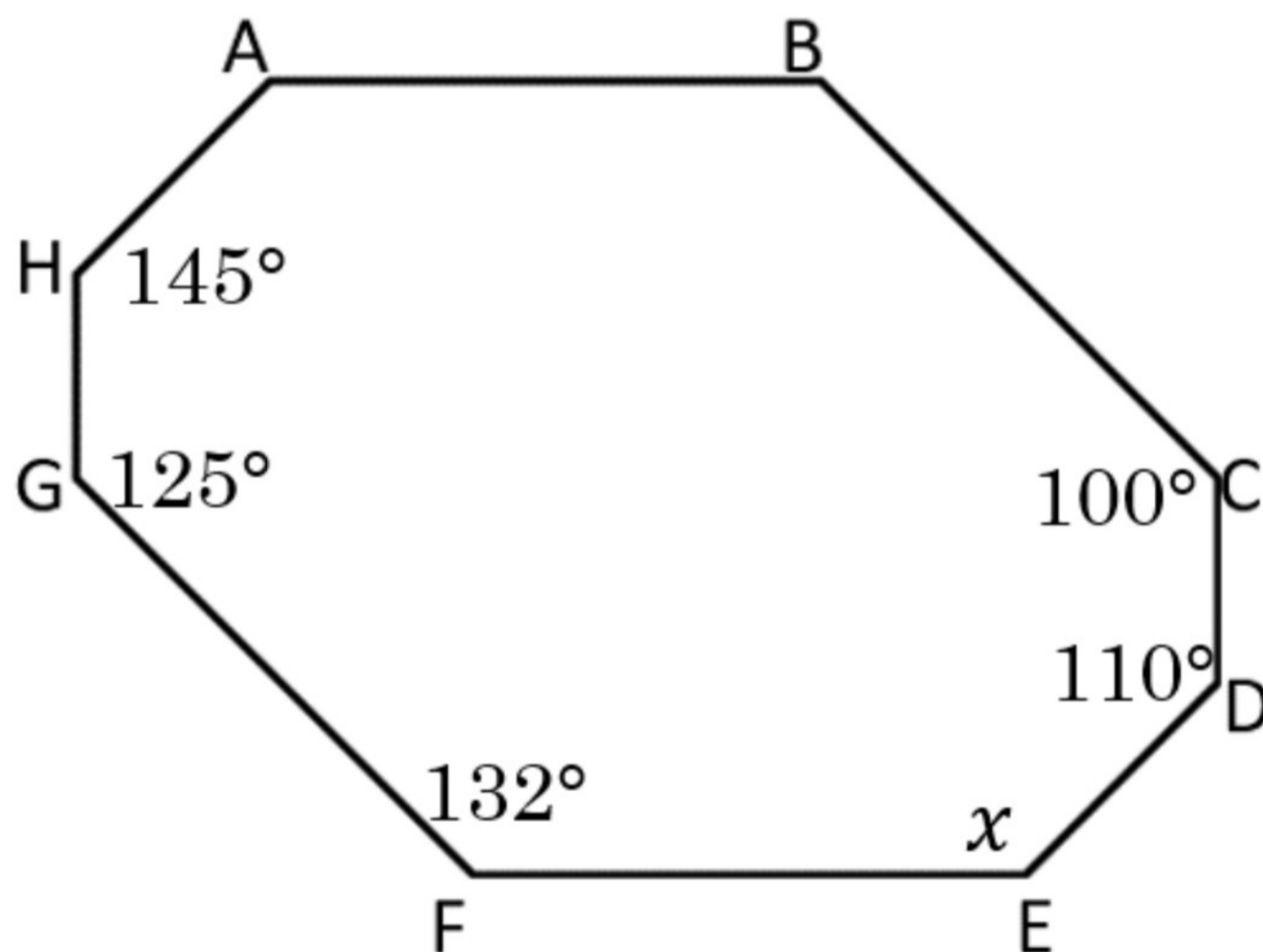
$$x = 360^\circ - 3 \times 108^\circ$$

$$x = 36^\circ$$

Answer: 36°

(3 marks)

Q4. The sizes of angle A and angle B are in the ratio 6 : 5. Work out the value of angle  $x$ , if  $x$  is  $30^\circ$  less than the size of angle A.



• Total of interiors is  $(8-2) \times 180 = 1080^\circ$

• let A be  $6y$ , B be  $5y$  and so E is  $6y - 25$

• Given angles total is  $612^\circ$

$$\Rightarrow A + B + E = 1080 - 612 = 468$$

$$\Rightarrow 6y + 5y + 6y - 25 = 468$$

$$\Rightarrow 17y - 25 = 468$$

$$\Rightarrow 17y = 493$$

$$\Rightarrow y = 29^\circ \text{ so } x = 6 \times 29 - 25 = 149^\circ$$

Answer: 149°

(4 marks)



Q5. Richard draws a polygon. The sum of all the interior angles is  $8640^\circ$ . Work out the number of sides of the polygon.

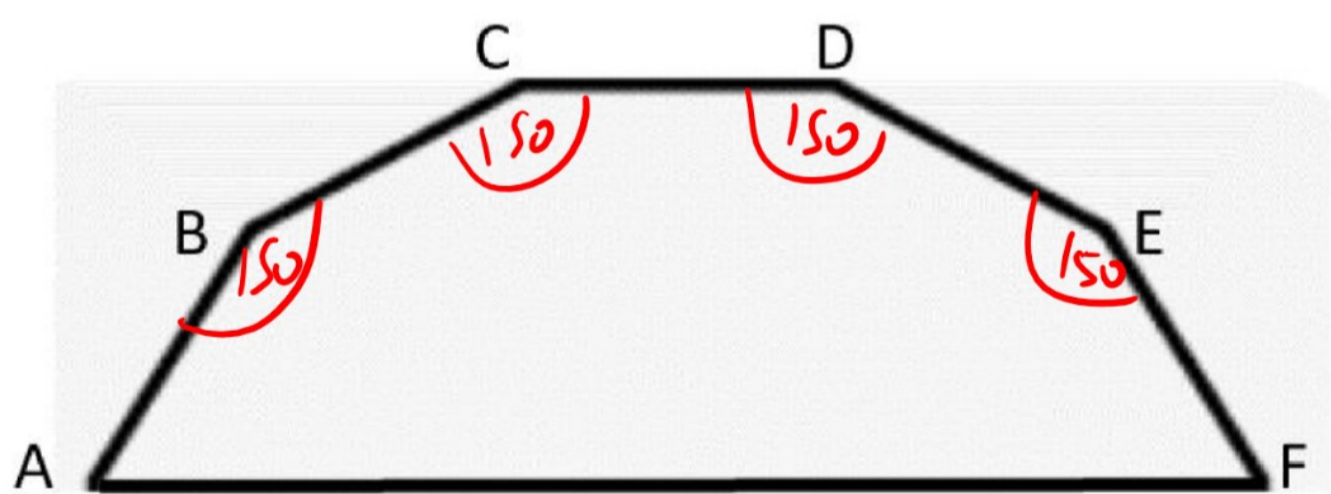
$$(n-2) \times 180^\circ = 8640^\circ$$

$$n-2 = 48$$

$$n = 50$$

Answer: 50 sides  
(3 marks)

Q6. AB, BC, CD, DE and EF are sides of a regular 12-sided shape. Work out the size of angle EFA.



$$\hat{B} = \hat{C} = \hat{D} = \hat{E} \text{ and}$$

$$\hat{B} = 180^\circ - \frac{360^\circ}{12}$$

$$\Rightarrow = 150^\circ$$

$$\cdot \text{ Total of angles in shape} = (6-2) \times 180^\circ = 720^\circ$$

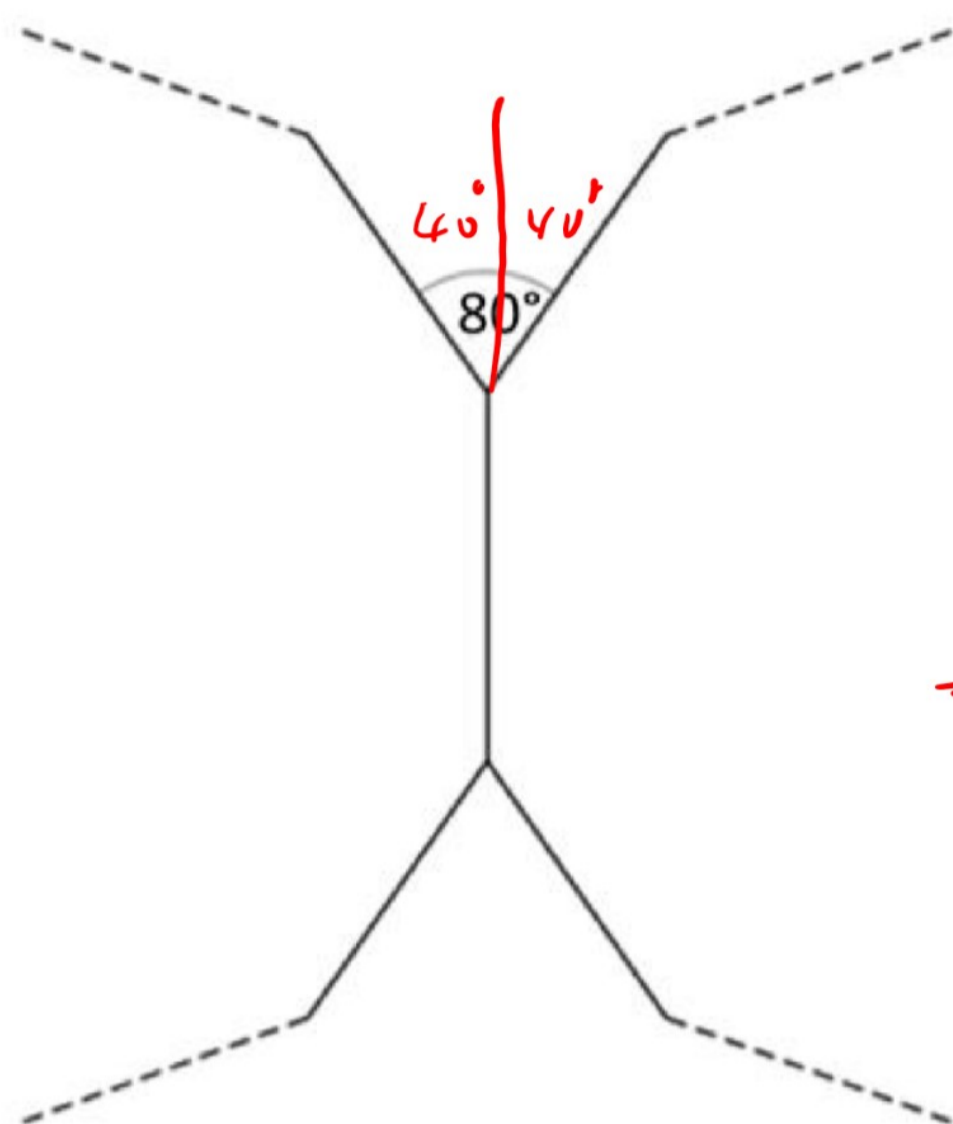
$$\cdot \hat{A} + \hat{F} = 720^\circ - 4 \times 150^\circ = 120^\circ$$

$$\cdot \hat{A} = \hat{F}, \text{ so } \hat{EFA} = \frac{120^\circ}{2} = 60^\circ$$

Answer: 60°  
(4 marks)



Q7. The two polygons shown below are congruent. Work out the number of sides on each polygon.

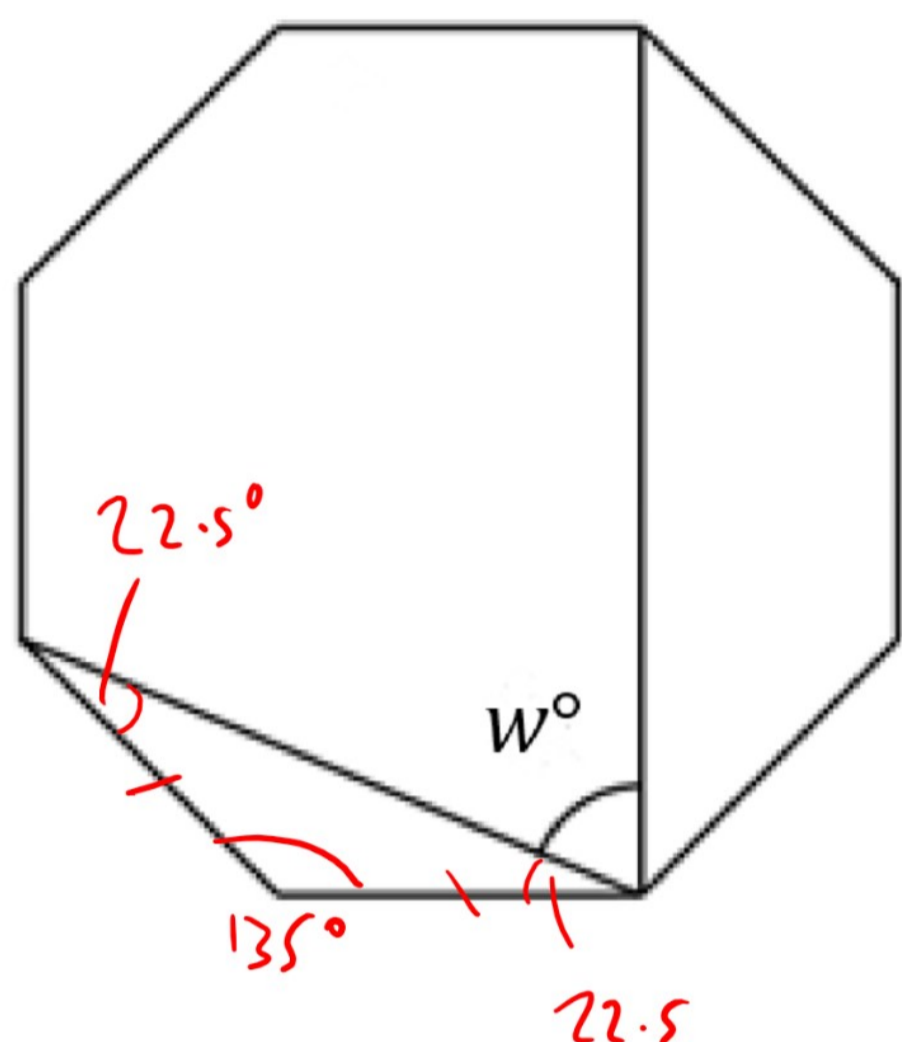


As both shapes are congruent  
each exterior in both shapes is  $40^\circ$   
 $\Rightarrow$  no. of sides is  $\frac{360}{40} = 9$

Answer: 9 sides  
(4 marks)



Q8. The diagram shows a regular octagon. Find the angle  $w$ .



$$\begin{aligned} \cdot \text{ each interior is } & 180 - \frac{360}{8} \\ & = 180 - 45 \\ & = 135^\circ \end{aligned}$$

• The triangle is isosceles  
as the octagon is regular.  
so each of its base angles is

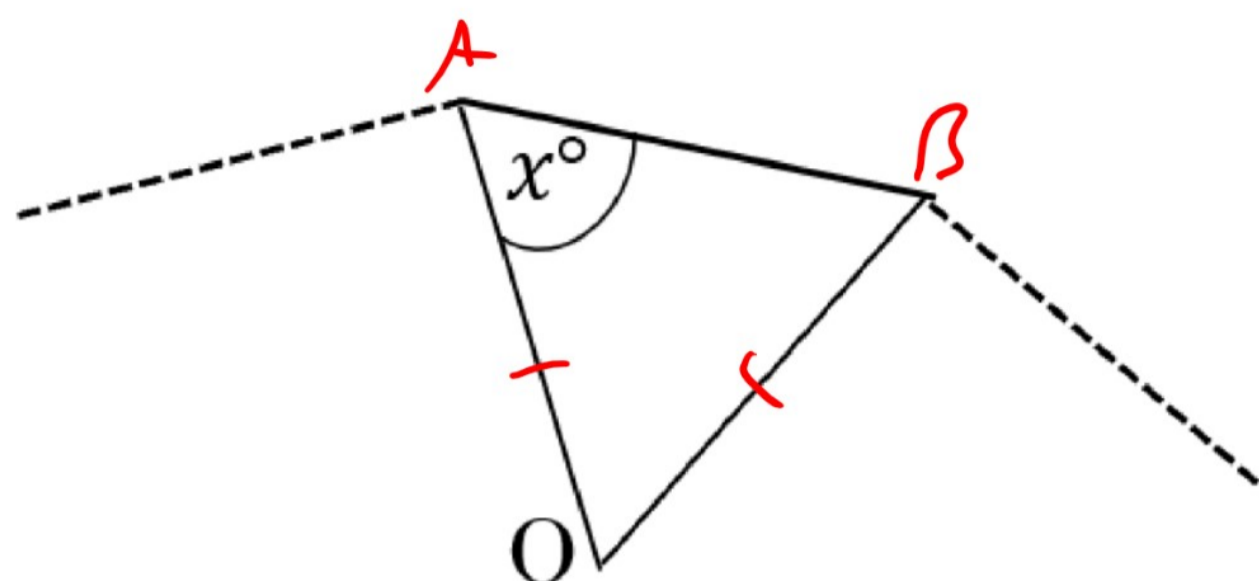
$$\frac{180 - 135}{2} = 22.5^\circ$$

$$\begin{aligned} \cdot w & = 90 - 22.5 \\ & = 67.5^\circ \end{aligned}$$

Answer: 67.5°  
(3 marks)



Q9. Below is part of  $n$ -sided regular polygon, where  $O$  is the centre.



Prove that angle  $x$  is of the form  $a - \frac{b}{n}$  where  $a, b$  are constants to be found.

In  $\triangle OAB$ ,  $\hat{OAB} = \hat{OBA}$

$\cdot \angle AOB = \frac{360}{n}$  as we have a regular polygon

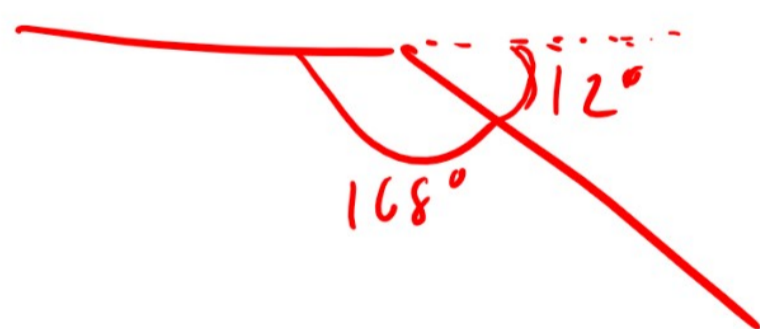
$\cdot \therefore \hat{OAB} = \frac{1}{2}(180 - \frac{360}{n})$

$$= 90 - \frac{360}{2n}$$

$$= 90 - \frac{180}{n}$$

Answer:  $a = 90, b = 180$   
(3 marks)

Q10. In a regular polygon, the size of each interior angle to each exterior angle is in the ratio 14:1. Find the number of sides of the polygon.



$$180 \div (14+1) = 12 \text{ per part}$$

$$\Rightarrow \text{interior} = 12 \times 14 \\ = 168^\circ$$

$$\Rightarrow \text{exterior} = 12^\circ$$

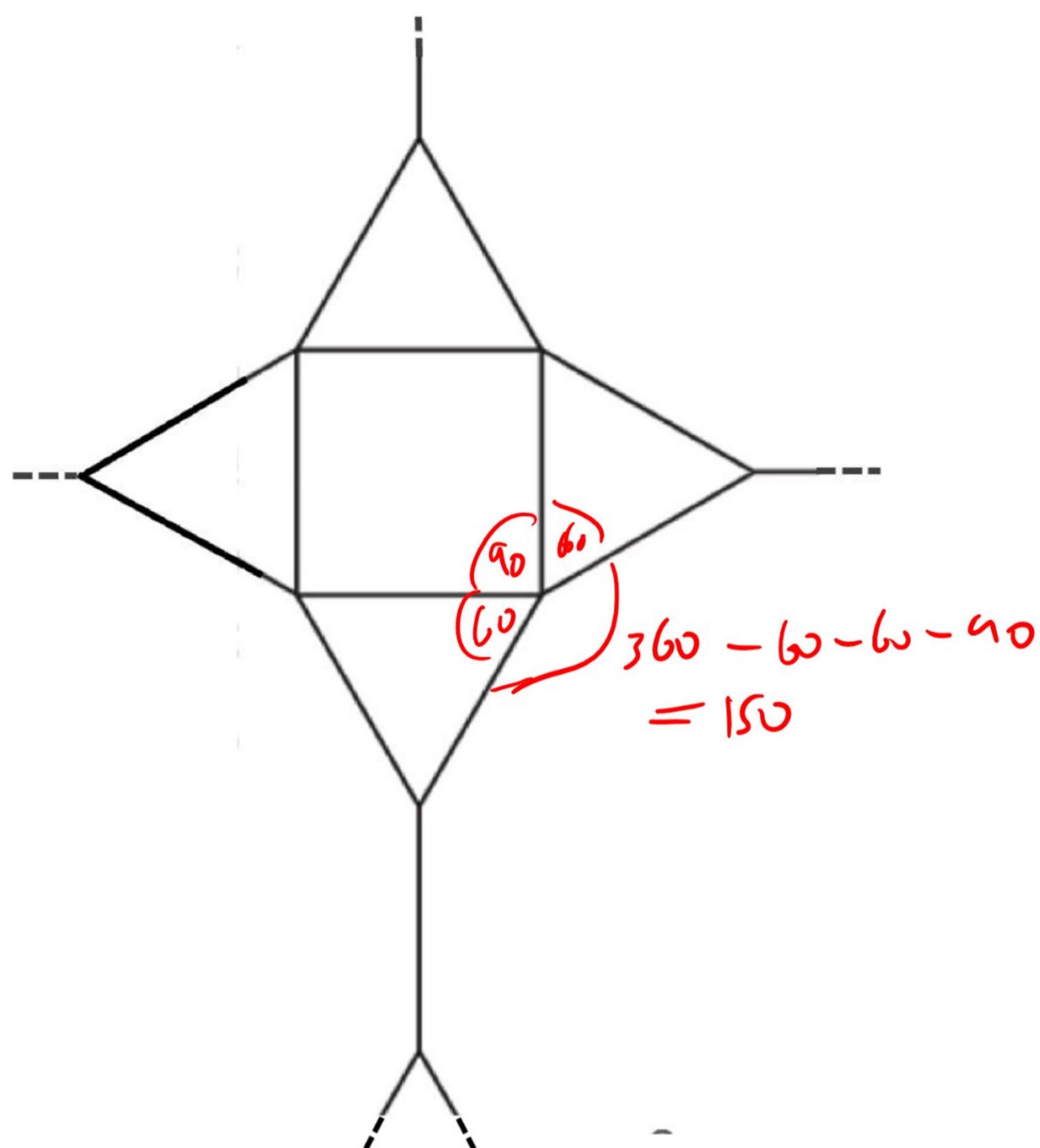
$$\Rightarrow \text{no. of sides} = \frac{360^\circ}{12} \\ = 30 \text{ sides}$$

Answer: 30 sides

(3 marks)



Q11. A tessellation is made up of equilateral triangles, squares and regular  $n$ -sided polygons. Find  $n$ .

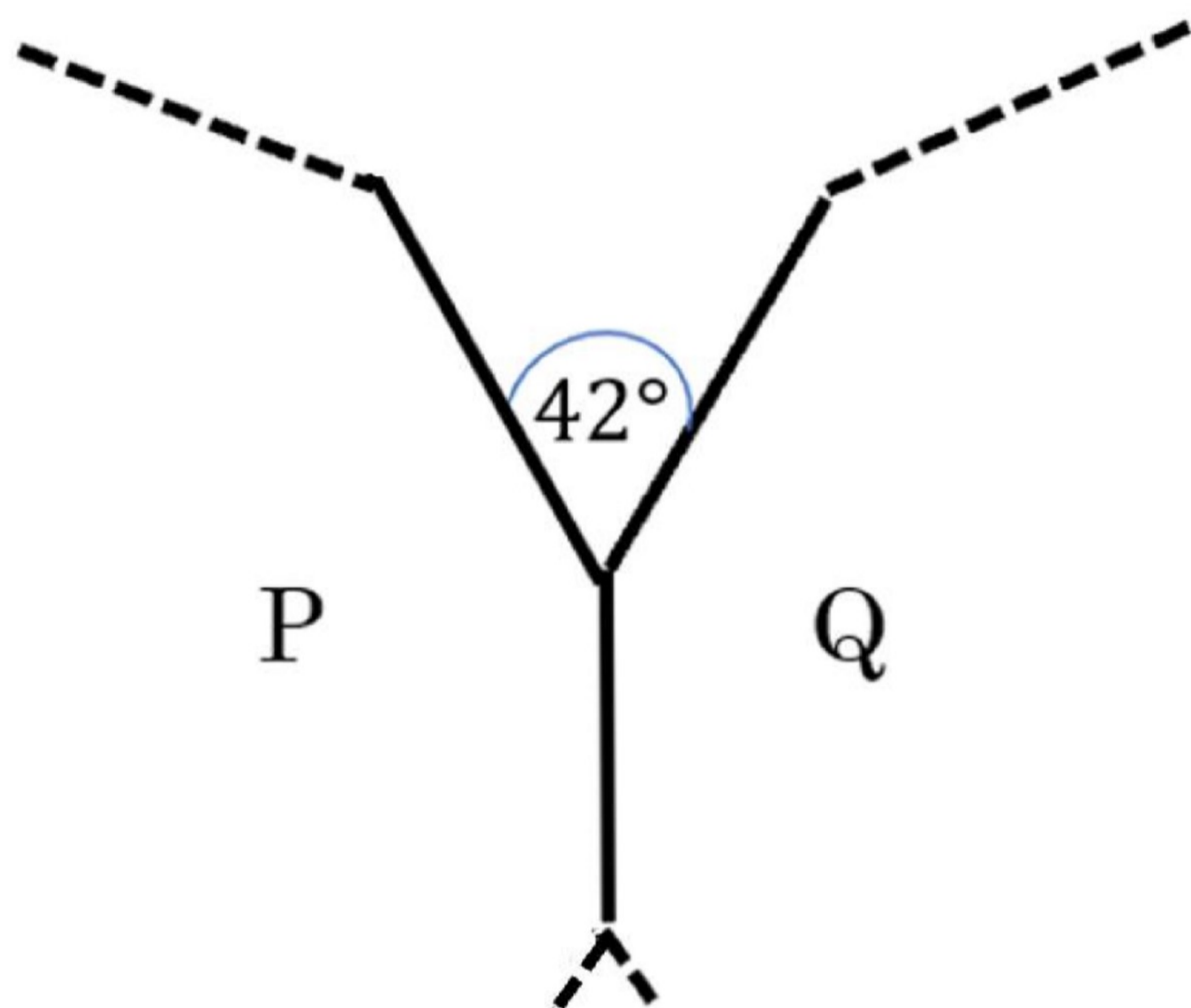


- Each exterior of the  $n$ -sided po sum is  $180 - 150 = 30^\circ$
- no. sides is  $\frac{360}{30} = 12$

Answer: 12 sides  
(4 marks)



Q12. Below, P and Q are 2 regular polygons. P has 5 more sides than Q.  
Find the number of sides in each polygon.



• let P have  $n$  sides, Q have  $n+5$  sides

• Exterior P + Exterior Q =  $42^\circ$

$$\Rightarrow \frac{360}{n} + \frac{360}{n+5} = 42$$

$$\Rightarrow \frac{360n + 1800 + 360n}{n(n+5)} = 42$$

$$\Rightarrow 720n + 1800 = 42(n)(n+5)$$

$$\Rightarrow 0 = 42n^2 + 210n - 720n - 1800$$

$$\Rightarrow 0 = 42n^2 - 510n - 1800$$

$$\Rightarrow 0 = 7n^2 - 85n - 300$$

$$\Rightarrow (7n + 20)(n - 15)$$

$$\Rightarrow n = -\frac{20}{7}, n = 15 \text{ (only 15 possible)}$$

Answer:

P : 15 sides  
Q : 20 sides

(5 marks)