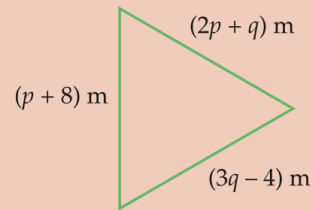


Three sides equal

This triangle is equilateral.
What is its perimeter?



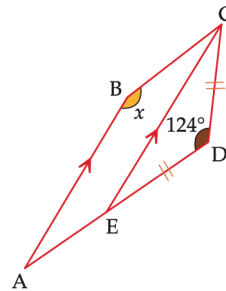
PUZZLE

Parallel Lines application

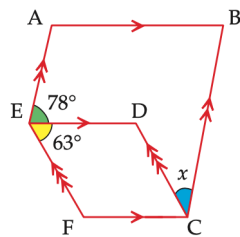
- 21 In this Tamoil sign, each one of the obtuse angles is 115° . What size is each of the acute angles?



- 23 In the diagram ABCE is a parallelogram and $\triangle CDE$ is isosceles, with $CD = DE$. $\angle EDC = 124^\circ$.

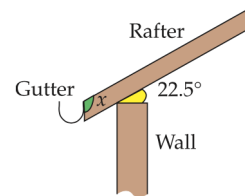


- 22 In the diagram $AB \parallel DE \parallel CF$, $EF \parallel DC$ and $AE \parallel BC$. $\angle AED = 78^\circ$ and $\angle DEF = 63^\circ$.



Calculate the size of $\angle ABC$ (x), giving reasons for each step.

- 24 A rafter meets the top of a wall at an angle of 22.5° . What is the size of the angle marked x ?



Answers

21 65°

22 $\angle DCF = 63^\circ$ (opp \angle 's of ||gram are equal)

$\angle ABC = 78^\circ$ (opp \angle 's of ||gram are equal)

Angles DCF, BCD and ABC are supplementary (co-int \angle 's, || lines, add to 180°)

$$x + 63 + 78 = 180$$

$$x = 39^\circ$$

23 $\angle CED = 28^\circ$ (\angle sum isos Δ)

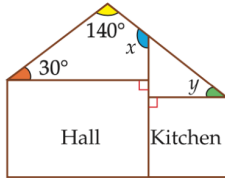
$\angle AEC = 152^\circ$ (\angle 's on line add to 180°)

$x = 152^\circ$ (opp \angle 's of ||gram are equal)

24 112.5°

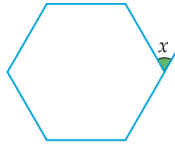
Polygons

- 12 Some regular polygons have special names.
- What is the special name for a regular triangle?
 - What is the special name for a regular quadrilateral?
- 13 The diagram shows the cross-section of a community hall and adjoining kitchen. Calculate the size of the angles marked x and y . Give reasons.



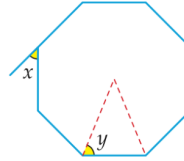
- 14 Explain what is wrong with Lucy's reasoning.
"All regular polygons have equal angles.
A *rectangle* has four equal angles. Therefore a rectangle is a regular quadrilateral."
- 15 Explain what is wrong with Ralph's statement.
Include a drawing to show he is wrong.
"A hexagon with six equal sides must be regular."

- 19 The diagram shows a regular hexagon, with one exterior angle marked.



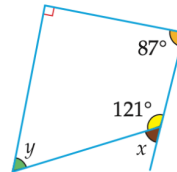
- Calculate the size of the angle marked x .
 - How many lines of symmetry does a regular hexagon have?
 - What is the angle between two adjacent lines of symmetry?
- 20 Calculate the sum of the *interior* angles and hence the size of each angle in a regular 12-sided polygon.
- 21 Find the number of sides of a regular polygon if each *exterior* angle is:
- 30°
 - 40°
 - 18°
- 22 The sum of the *interior* angles of a polygon is 2340° . How many sides does it have?
- 23 Find the number of sides of a regular polygon if each *interior* angle is:
- 120°
 - 144°

- 16 The diagram shows a regular octagon with an exterior angle, and two line segments from the centre to adjacent vertices. Calculate the size of the angles marked x and y .

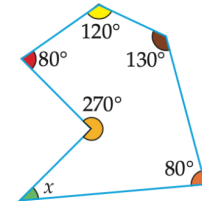


- 17–18 Work out the size of the marked angles.

17



17



- 24 Is it possible to draw a regular polygon with each *interior* angle as:

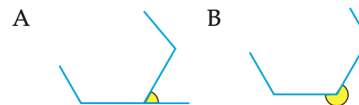
a 160° ? b 145° ?

Explain why or why not.

- 25 If a regular polygon had 360 sides, what would be the size of:

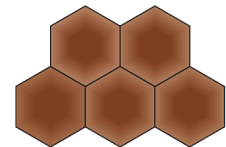
- each *exterior* angle?
- each *interior* angle?
- What would the polygon look like?

- 26 a Which one of these diagrams shows an exterior angle of a polygon?



- b Explain in words, without using a diagram, how you form an exterior angle of a polygon.

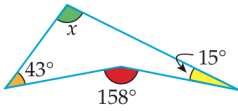
- 27 One property of regular hexagons is that they tessellate. This means that hexagonal cobblestones, for example, fit together without leaving gaps.



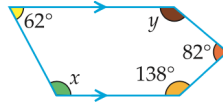
Explain why regular pentagons do not have the same property.

28–33 Calculate the marked angles.

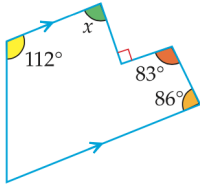
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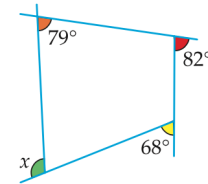
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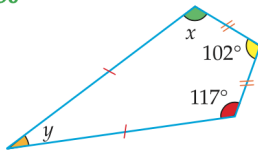
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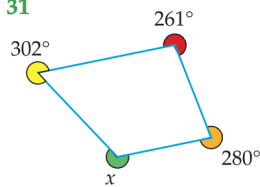
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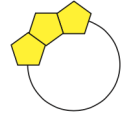
30



31



34 Some equal regular pentagons are placed together with the intention of forming a ring. The diagram shows the first three in position.



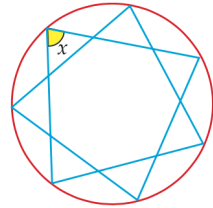
- Will the pentagons form a complete ring or will there be a gap?
- How many pentagons will be needed altogether before no more will fit?

35 A pentagram is a regular five-pointed star.

- How many interior angles does a pentagram have?
- Calculate the size of each acute interior angle.
- Calculate the size of each reflex interior angle.



36 The diagram shows a septagram, or regular seven-pointed star. Calculate the size of the angle at one of its points.



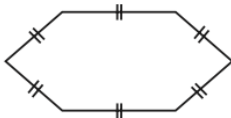
12 a Equilateral triangle

b Square

13 $x = 100^\circ$ (quad, \angle sum is 360°)
 $y = 10^\circ$ (ext \angle of $\triangle =$ sum of int opp \angle 's)

14 To be regular a polygon must not only have equal angles, but must also have equal *sides*, and a rectangle does not necessarily have equal sides.

15 The angles must also be equal – it is possible for a hexagon with 6 equal sides not to have equal angles.



- 16 $x = 45^\circ, y = 67.5^\circ$
 17 $x = 59^\circ, y = 62^\circ$
 18 $x = 40^\circ$
 19 a 60° b 6 c 30°
 20 $1800^\circ, 150^\circ$
 21 a 12 b 9 c 20
 22 15
 23 a 6 b 10
 24 a Yes – the exterior angle would be 20° , and 20 divides into 360 exactly 18 times.
 b No – the exterior angle would be 35° , and 360 is not a multiple of 35.
 25 a 1° b 179°
 c It would look like a circle.
 26 a A
 b Extend one side a short distance and mark in the acute angle between it and the adjacent side.
 27 The interior angle of a regular pentagon is 108° . When three pentagons meet at one point, the total angle is 324° , leaving a gap of 36° , which is not big enough for another pentagon to fit.
 28 $x = 100^\circ$
 29 $x = 118^\circ, y = 140^\circ$
 30 $x = 101^\circ$
 31 $x = 109^\circ$
 32 $x = 117^\circ, y = 24^\circ$
 33 $x = 237^\circ$
 34 a A complete ring.
 b 10
 35 a 10 b 36°
 c 252°
 36 $\left(77\frac{1}{7}\right)^\circ$
 37 75°

PUZZLE

The spider and the fly

11