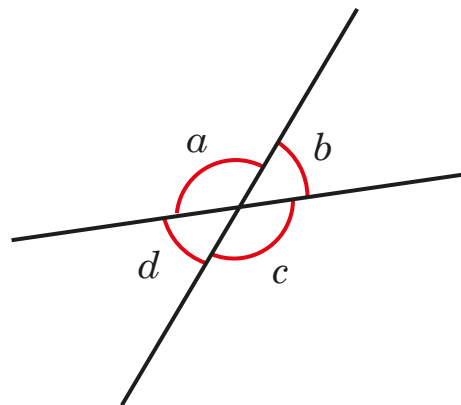


Vertically opposite angles

- 1 The diagram shows four angles formed by two straight lines.



- a) Measure the sizes of the angles.

$a =$ $b =$ $c =$ $d =$

- b) What is the total of angles a and b ?

Explain why.

Do any other pairs of angles have this same total?

- c) Angles a and c are vertically opposite angles.

What do you notice about the sizes of angles a and c ?

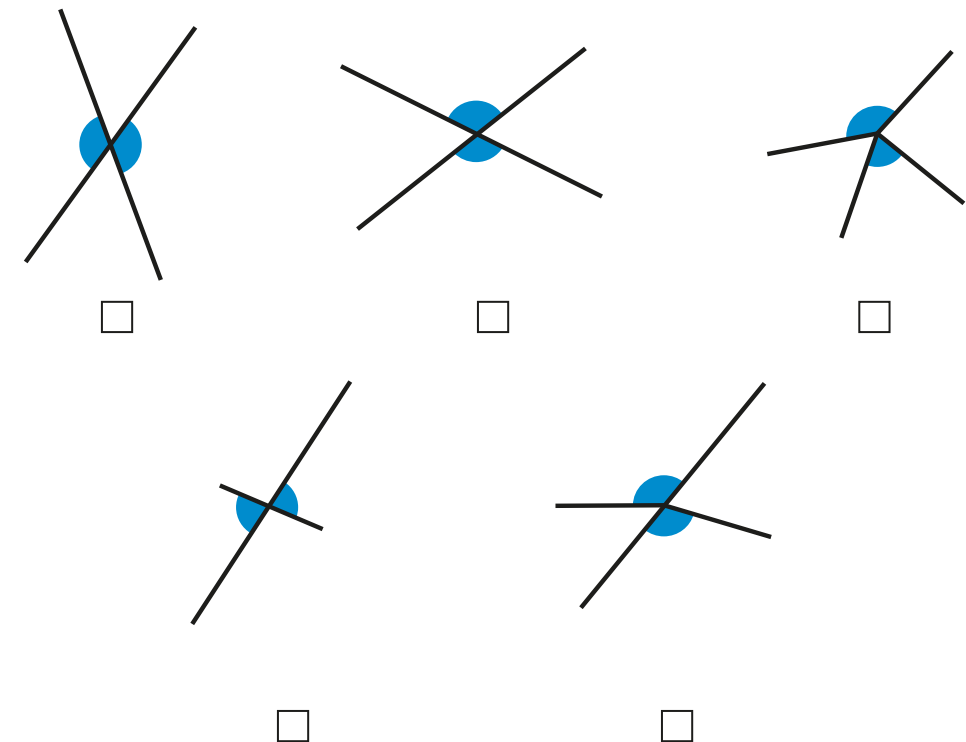
- d) Angles b and d are also vertically opposite angles.

What do you notice about the sizes of angles b and d ?

- e) Complete the sentence.

Vertically opposite angles _____

- 2 Tick the pairs of angles that are vertically opposite.

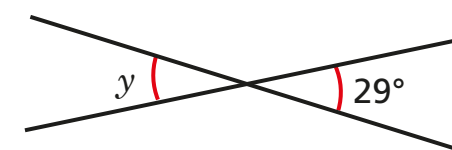


Compare answers with a partner.

- 3 Work out the sizes of the unknown angles.

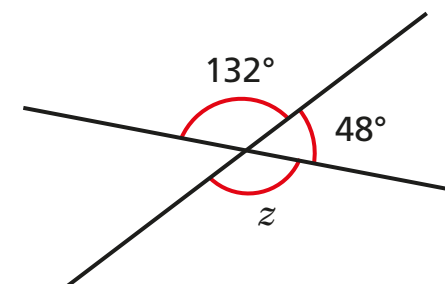
Give reasons for your answers.

- a)



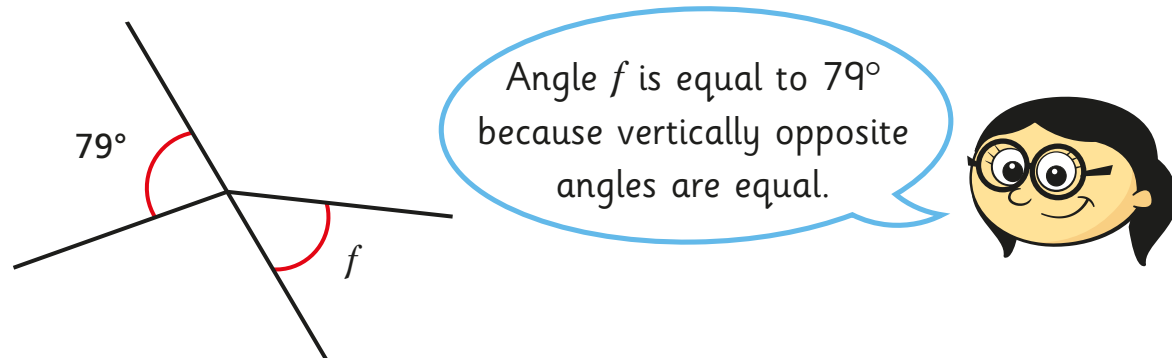
$y =$ because _____

- b)



$z =$ because _____

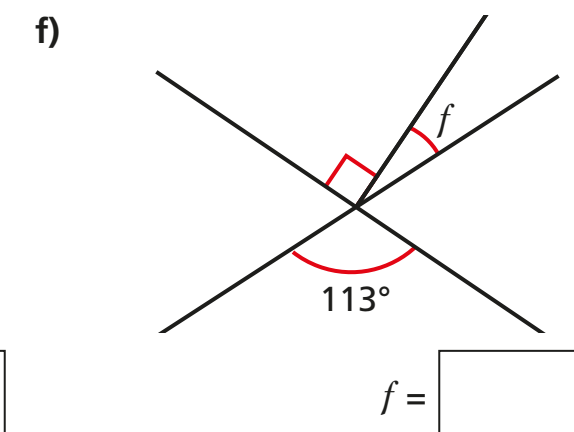
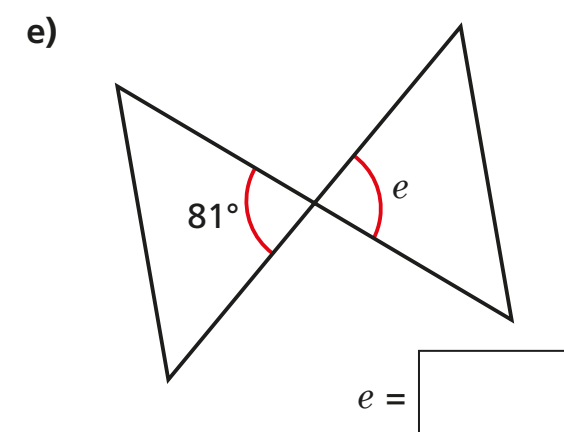
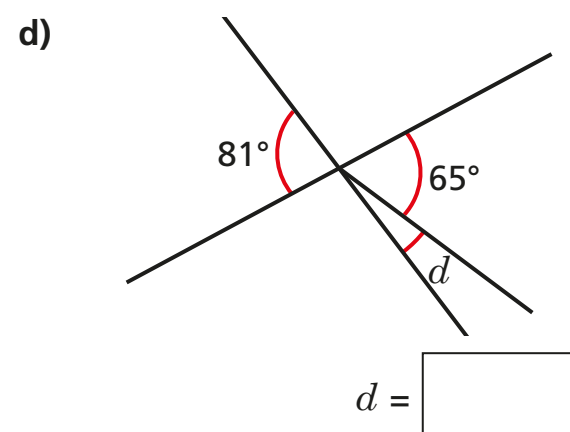
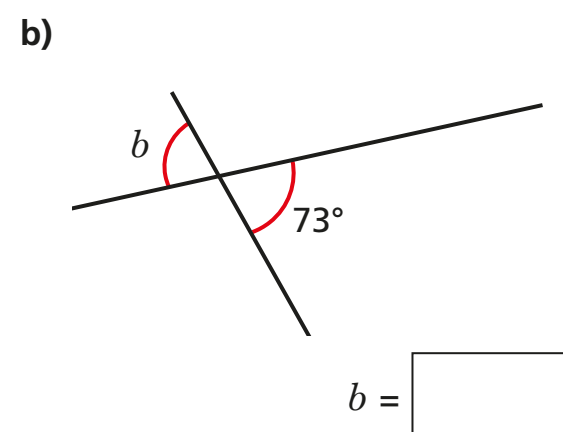
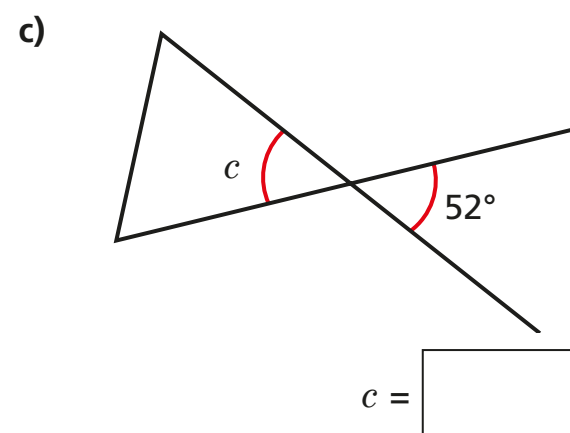
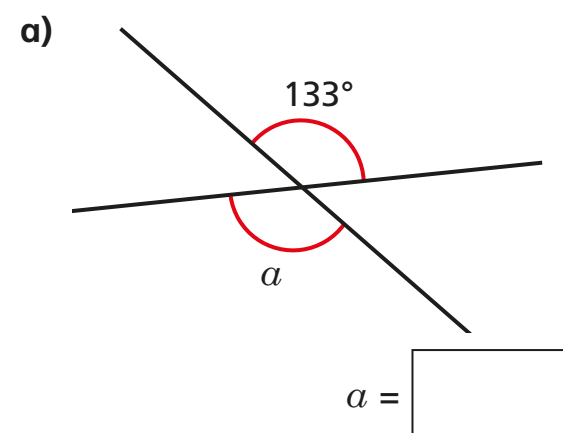
- 4 Annie is working out the size of angle f .



Do you agree with Annie? _____

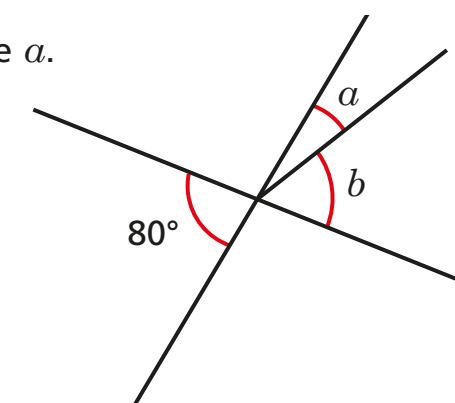
Explain your answer.

- 5 Work out the unknown angles.



Talk about your reasons with a partner.

- 6 Angle b is three times the size of angle a .

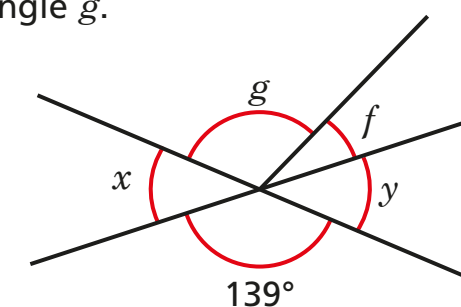


Work out the sizes of angles a and b .

$a = \boxed{} \quad b = \boxed{}$

- 7 Angle f is one quarter of the size of angle g .

Angle f is 28° .

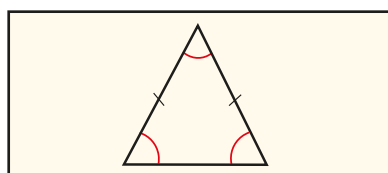


Are angles x and y vertically opposite? _____

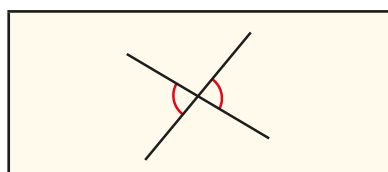
Explain your answer.

Angles in a triangle – missing angles

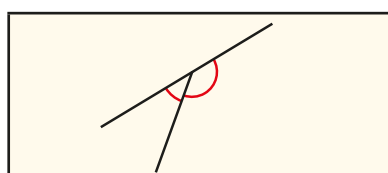
1 Match each diagram to the correct rule.



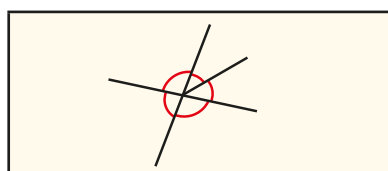
Angles on a straight line sum to 180°



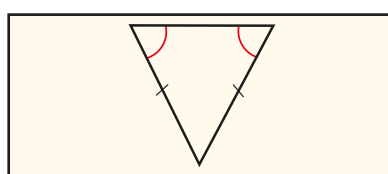
Angles around a point sum to 360°



Angles in a triangle sum to 180°



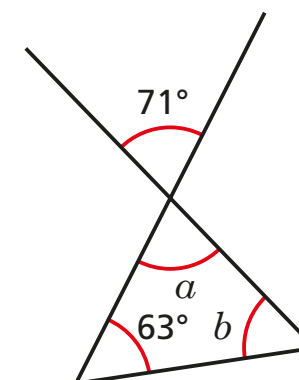
In an isosceles triangle, two angles are equal



Vertically opposite angles are equal

2 Work out the sizes of the unknown angles.
Give reasons for each stage of your working.

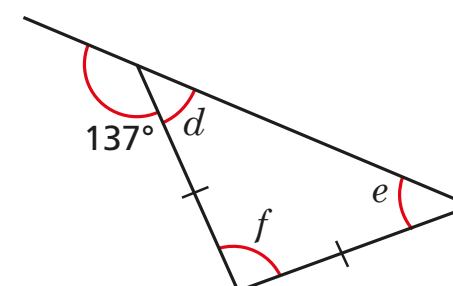
a)



$a =$ because _____

$b =$ because _____

b)

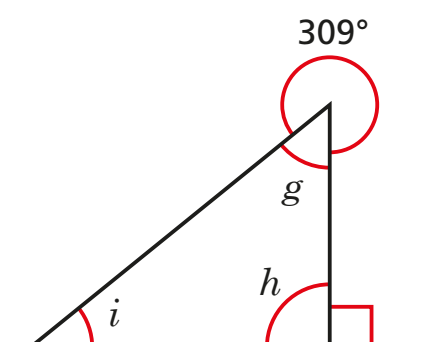


$d =$ because _____

$e =$ because _____

$f =$ because _____

c)

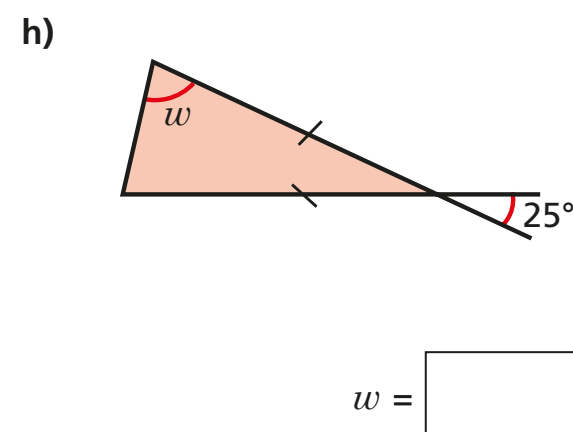
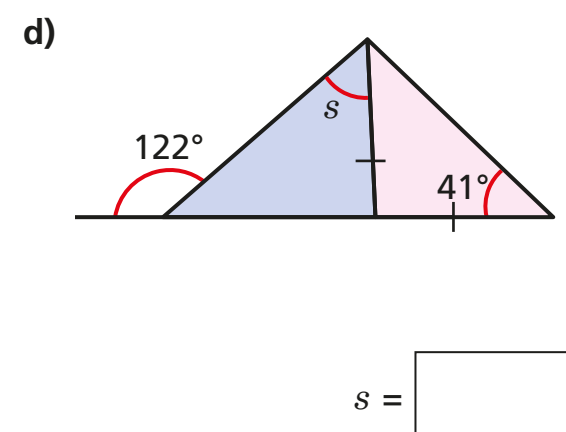
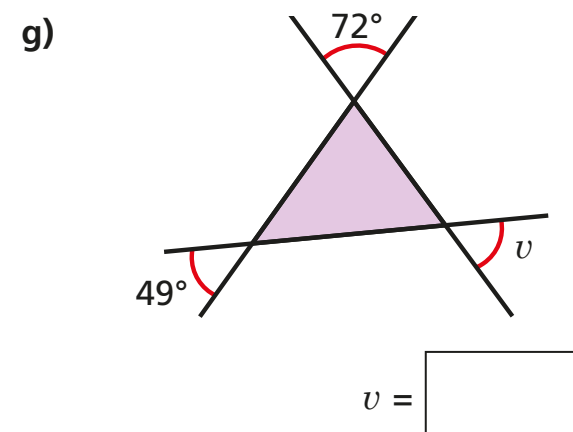
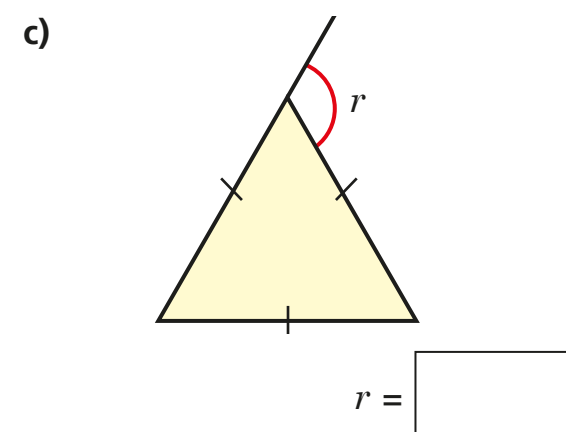
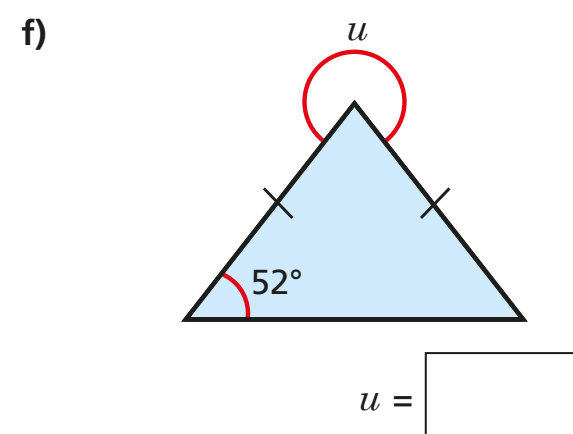
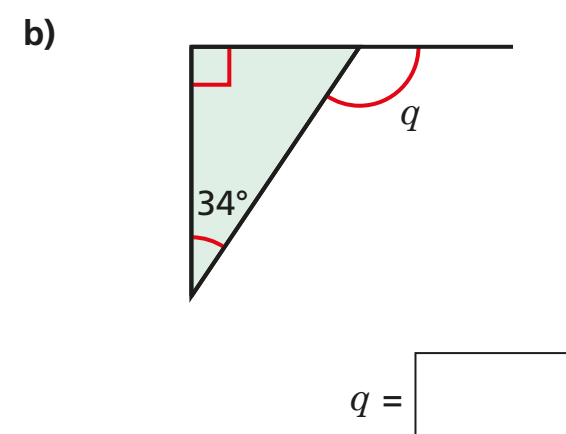
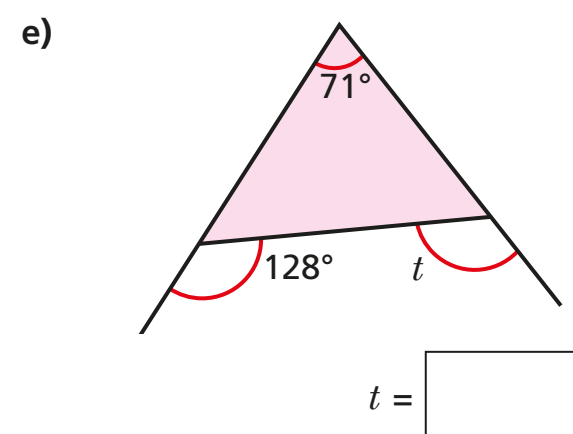
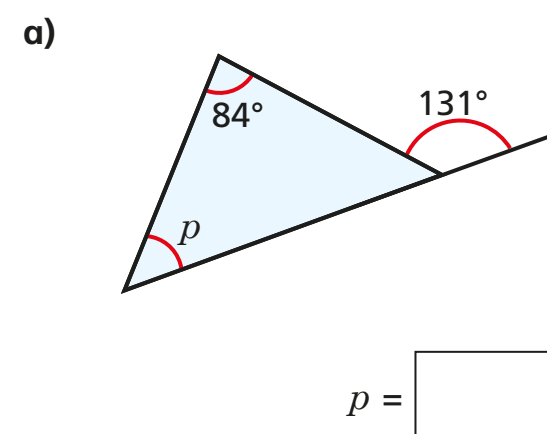


$g =$ because _____

$h =$ because _____

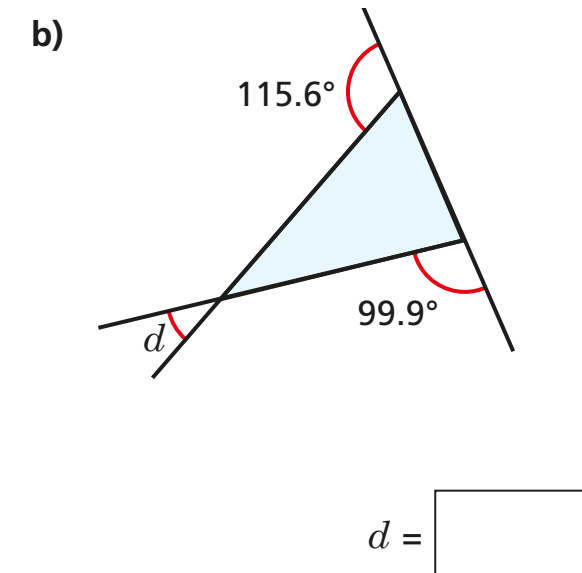
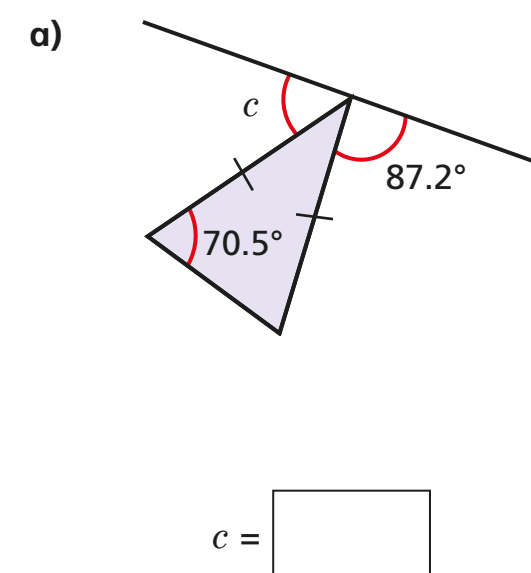
$i =$ because _____

3 Work out the sizes of the angles marked with letters.

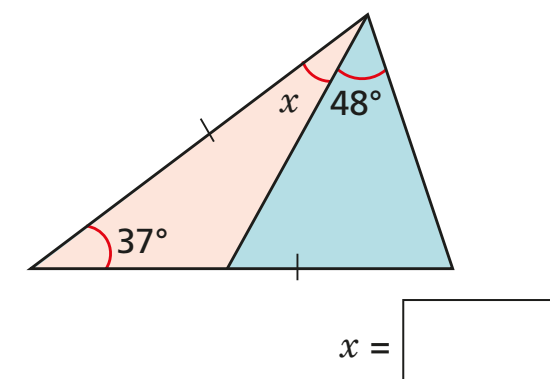


Talk about your reasons with a partner.

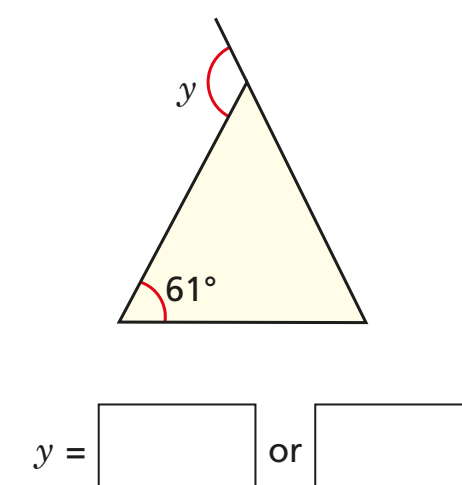
4 Work out the sizes of the unknown angles.



5 Work out the size of angle x .

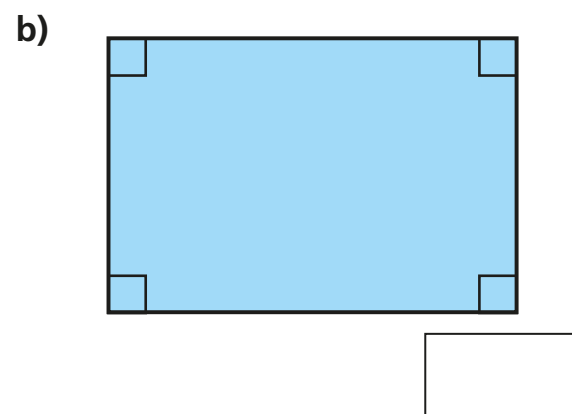
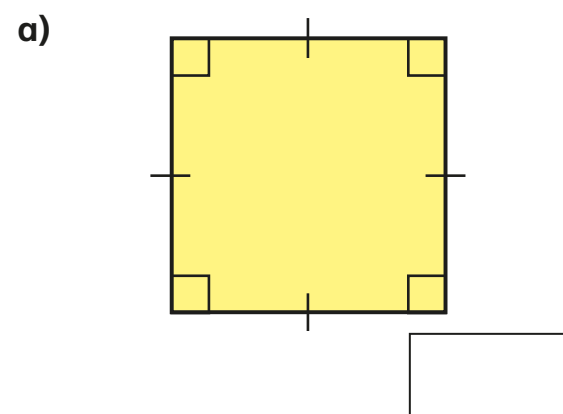


6 Here is an isosceles triangle. Find two possible sizes of angle y .



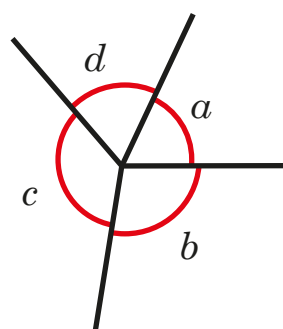
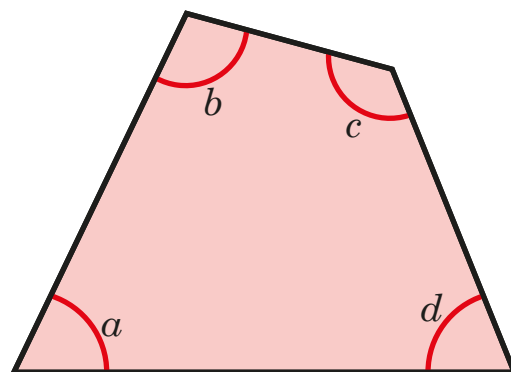
Angles in special quadrilaterals

1 Work out the sum of the angles in each shape.



What do you notice?

2 The diagrams show the four vertices of a quadrilateral arranged around a point.

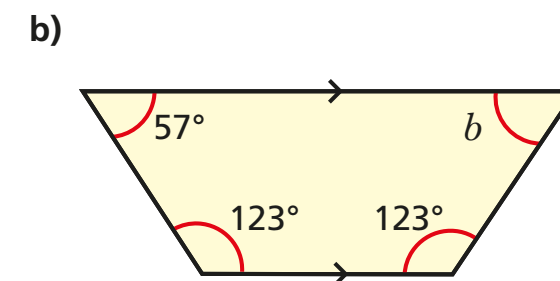
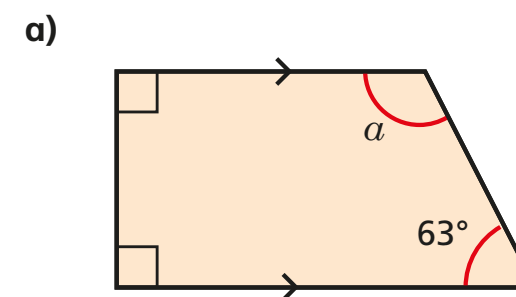


What do the diagrams illustrate about the sum of the angles in a quadrilateral?

Complete the sentence.

Angles in a quadrilateral _____

3 Work out the size of the unknown angle in each trapezium.

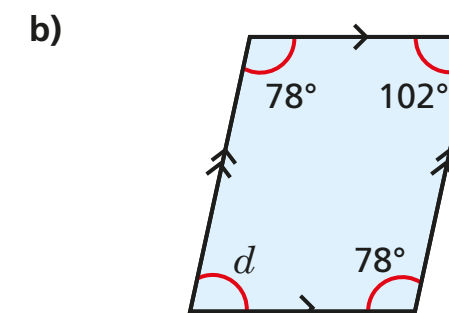
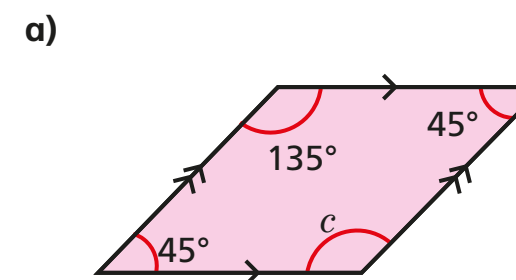


$$a = \boxed{}$$

$$b = \boxed{}$$

c) What is the same and what is different about the trapeziums?

4 Work out the sizes of the unknown angles.



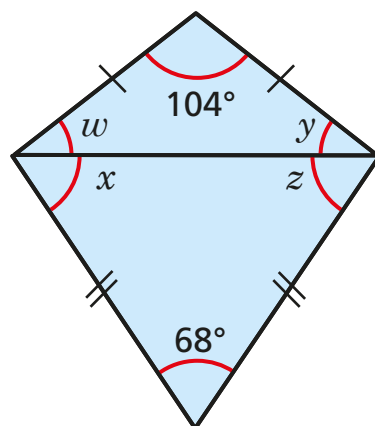
$$c = \boxed{}$$

$$d = \boxed{}$$

c) What do you notice about opposite angles in a parallelogram?

- 5 Two isosceles triangles are joined to form a kite.

a) Work out the sizes of the unknown angles.



$$w = \boxed{} \quad y = \boxed{} \quad x = \boxed{} \quad z = \boxed{}$$

b) Work out $w + x$.

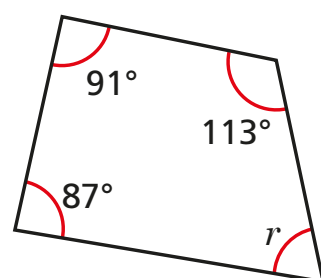
c) Work out $y + z$.

What do you notice? Talk about it with a partner.



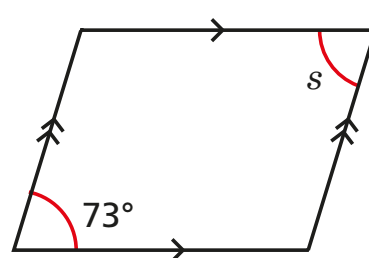
- 6 Work out the sizes of the unknown angles.

a)



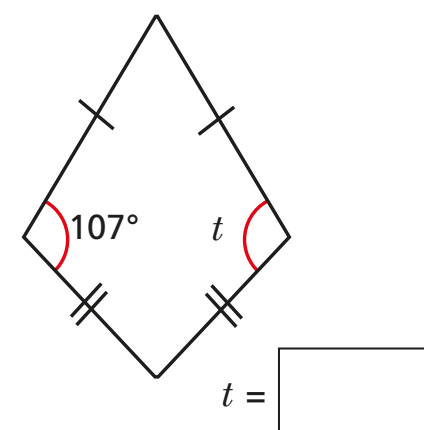
$$r = \boxed{}$$

b)



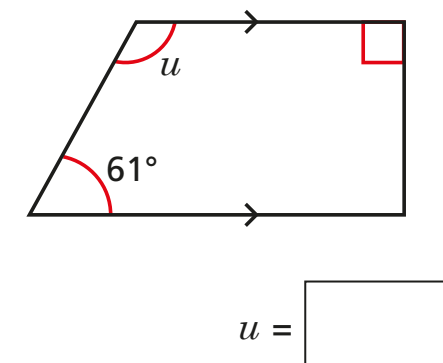
$$s = \boxed{}$$

c)



$$t = \boxed{}$$

d)

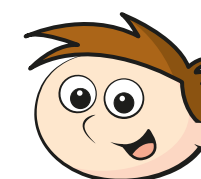


$$u = \boxed{}$$

Compare your reasoning with a partner.

- 7 Teddy is drawing a quadrilateral.

My quadrilateral has exactly three right-angles.



Is Teddy's quadrilateral possible? _____

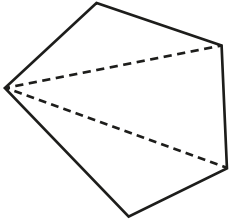
Explain your answer.

Angles in regular polygons

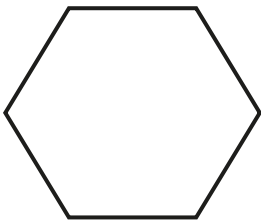
1 The sum of the interior angles of a triangle is 180° .

Split the polygons into triangles to work out the sum of their interior angles. Your lines should not overlap.

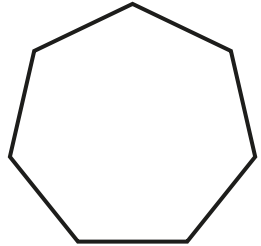
The first one has been done for you.

a)  number of sides =
number of triangles =
 $3 \times 180 =$

The sum of the interior angles of a pentagon is

b)  number of sides =
number of triangles =
 $\times 180 =$

The sum of the interior angles of a hexagon is

c)  number of sides =
number of triangles =
 $\times 180 =$

The sum of the interior angles of a heptagon is

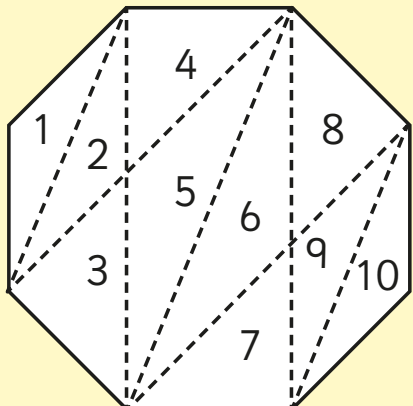
What do you notice about the number of sides compared to the number of triangles?

2 Complete the table.

Shape	Number of sides	Number of triangles	Sum of interior angles
quadrilateral	4	2	360°
pentagon			
nonagon			
decagon			
	6		
		6	
			$1,800^\circ$

Compare answers with a partner.

3 Dani is working out the sum of the interior angles of a polygon. Here are her workings.



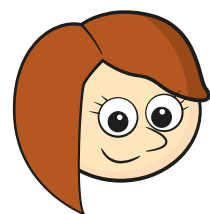
$10 \times 180 = 1,800^\circ$

Do you agree with Dani? _____

Explain your answer.

- 4 Rosie, Amir and Eva are drawing polygons.

a)



Rosie

I have split my polygon into four triangles.

What polygon has Rosie drawn?

b)

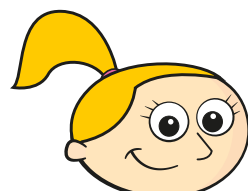
The sum of the interior angles of my polygon is $1,080^\circ$.



Amir

What polygon has Amir drawn?

c)



Eva

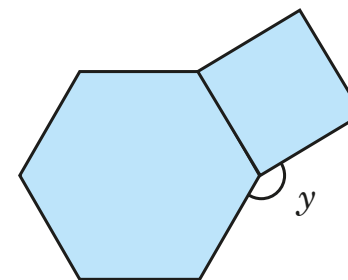
My polygon has more sides than Rosie's but fewer than Amir's.

What is the sum of the interior angles of Eva's polygon?



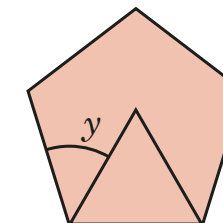
- 5 Each compound shape is made up of regular polygons. Work out angle y in each case.

a)



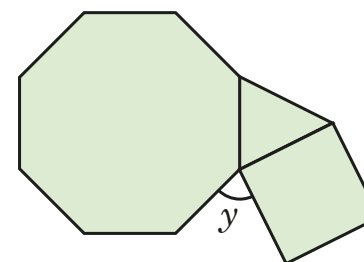
$$y = \boxed{}$$

c)



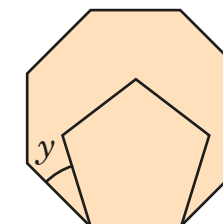
$$y = \boxed{}$$

b)



$$y = \boxed{}$$

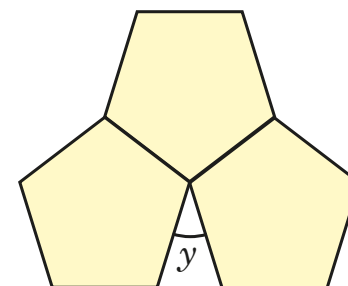
d)



$$y = \boxed{}$$

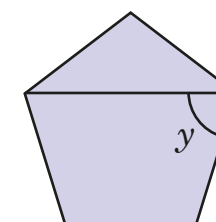
- 6 The pentagons shown are regular. Work out the size of angle y in each case.

a)



$$y = \boxed{}$$

b)

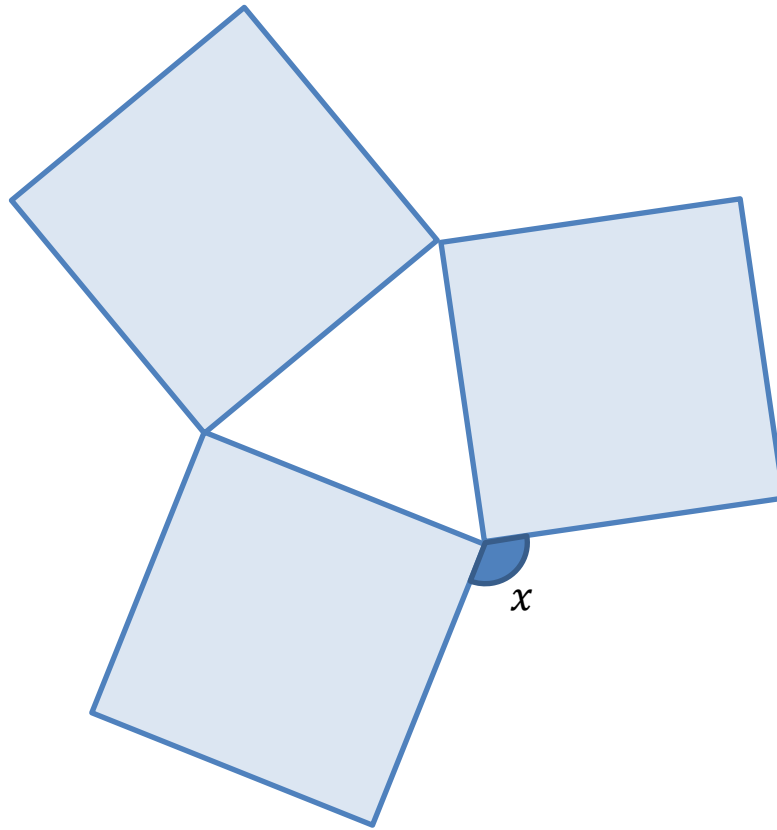


$$y = \boxed{}$$



Angle Problems

1.

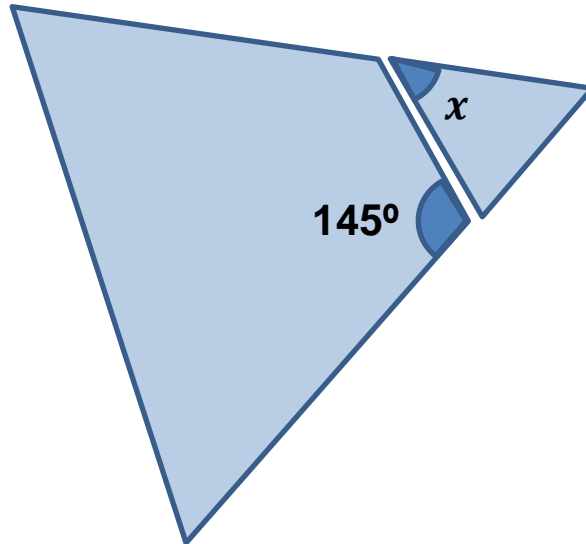


The diagram shows three identical squares.

Find the size of angle x

Explain your answer.

2. Adam has an equilateral triangle.
- He cuts off a corner of the triangle.
- Here are the two pieces.



Find the size of the angle marked x