

SMILE WORKCARDS

Angle Properties Pack One

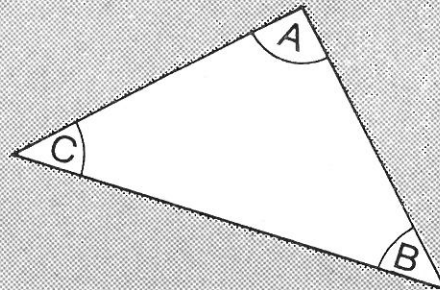
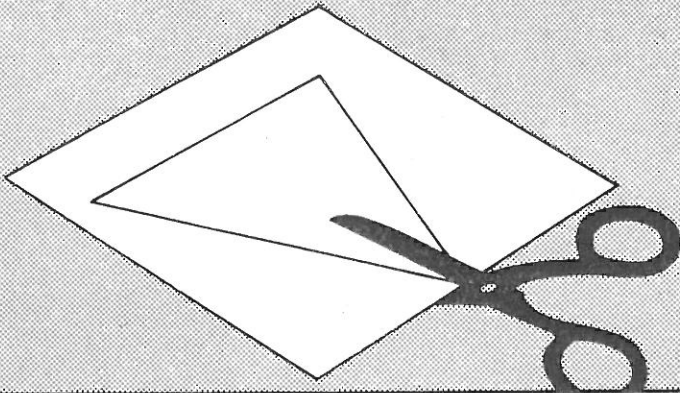
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Angles of a triangle

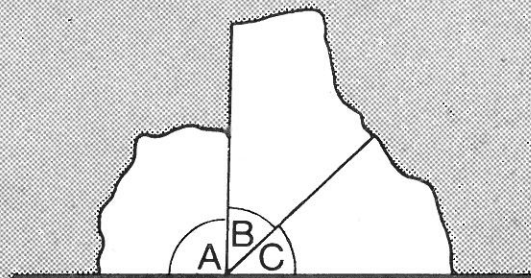
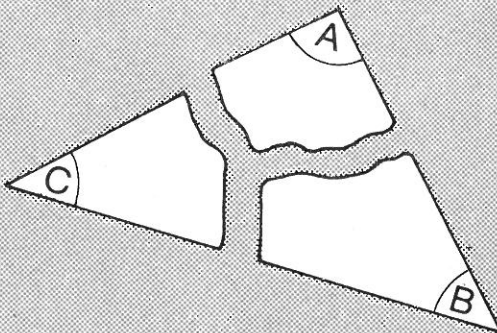
Draw a large triangle on a sheet of gummed paper and cut it out.

Label the angles A, B and C.



Tear the triangle carefully into 3 pieces.

Fit the pieces together like this:
No overlapping — no gaps.
Stick them down.



You should see that the 3 angles fit together on a straight line.

1) Will the angles make a straight line if you use any triangle?
Cut out some different triangles and try.

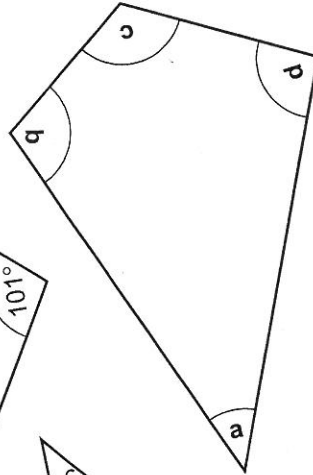
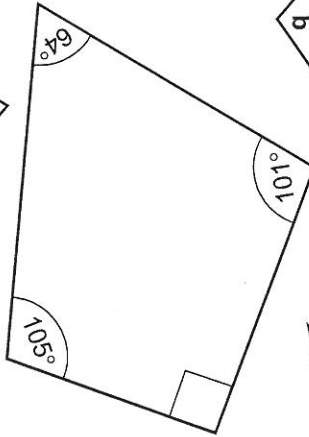
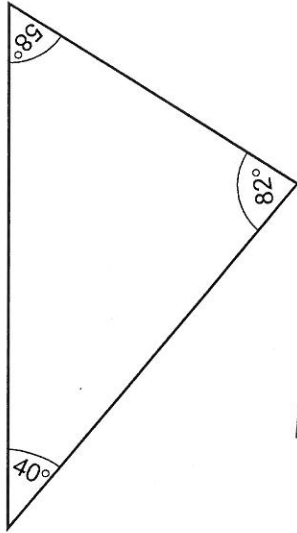
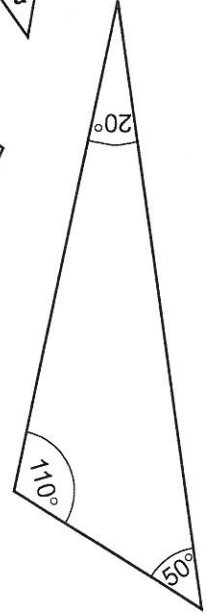
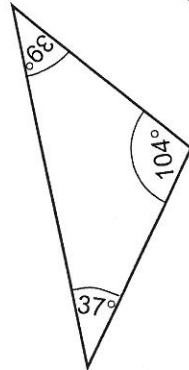
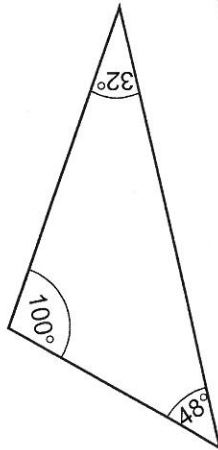
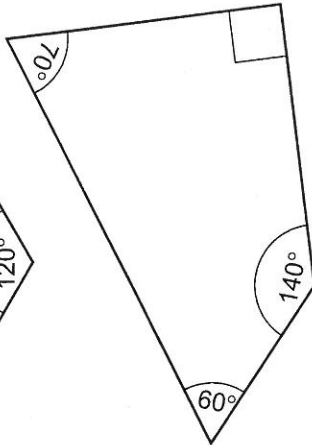
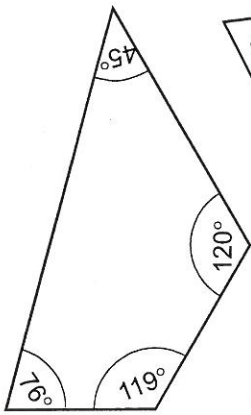
2) Copy and complete:

(a) The 3 angles of any triangle fit together to make a

(b) The 3 angles of a triangle add together to make degrees and this is the same as right angles.

Angle Fit

Carefully cut out the following shapes.

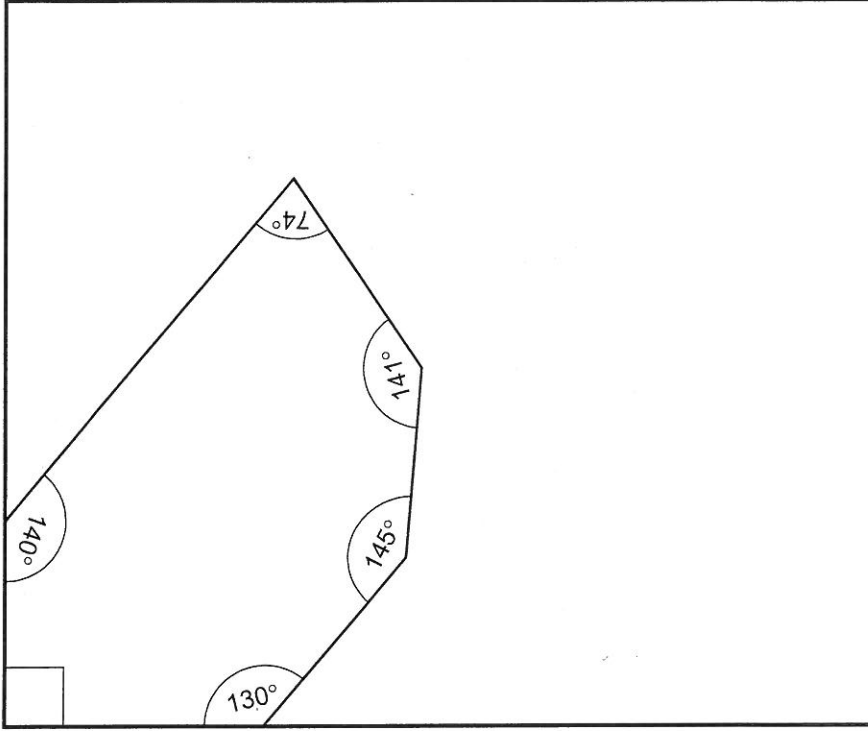


The following angle facts might help:

Angles on a straight line add up to 180°

Angles in a complete turn add up to 360°

- By looking at the size of the angles, fit them in this rectangle.



- Calculate angles **a**, **b**, **c** and **d**.

a =

b =

c =

d =

Finding the Angles of a Triangle

Draw a large triangle

Measure the angles at A, B and C with your angle indicator.

(Look at Smile card 0775 if you are not sure how to do this).

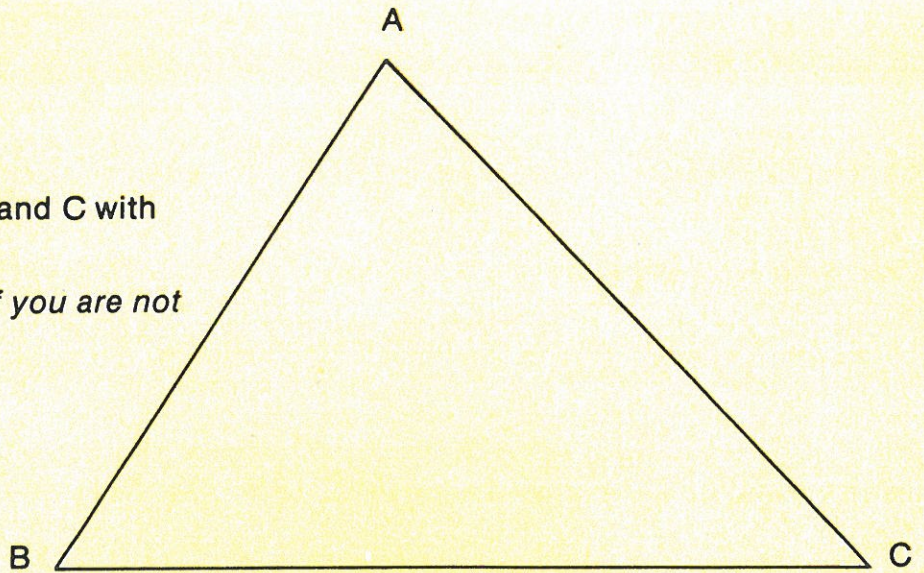
Write your results and add them up.

A =

B =

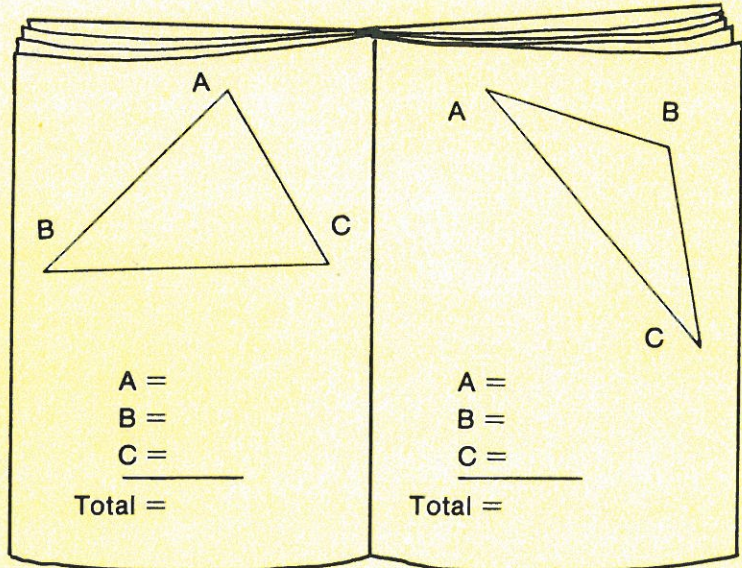
C =

Total =



Draw 3 more large triangles.

Measure the angles and add them up each time.



You may have found that the angles of each triangle add up to 180° .

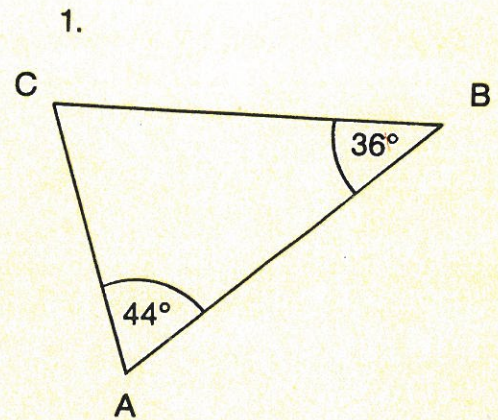
Why is it likely that you did not get exactly 180° for each triangle?

If you know two angles of a triangle it is possible to find the third angle *without* using an angle indicator.

$$\begin{array}{r} A = 44^\circ \\ B = 36^\circ \\ C = ? \\ \hline \hline 180^\circ \end{array}$$

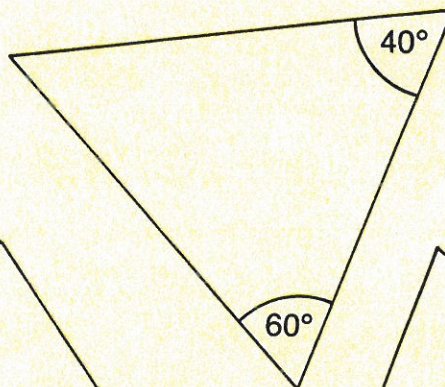
You know that the three angles add up to 180° so what must the third angle be?

Check that the total is 180°

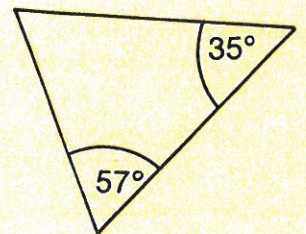


Find the third angle in these triangles by calculation. Draw a sketch to show the working for each one.

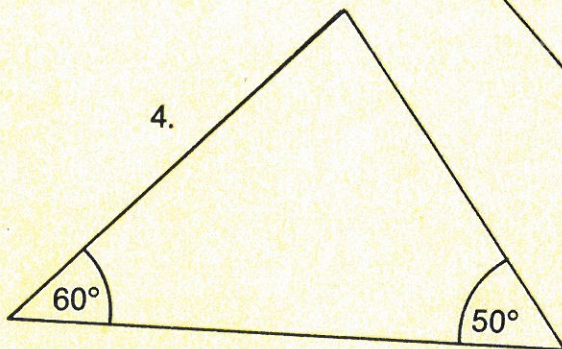
2.



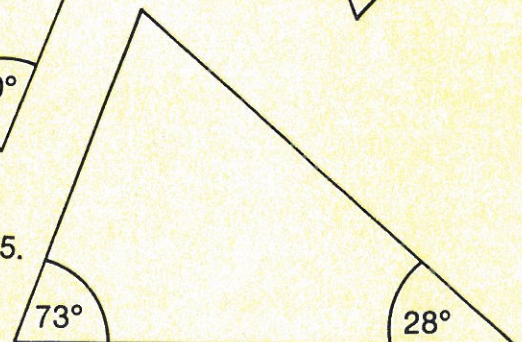
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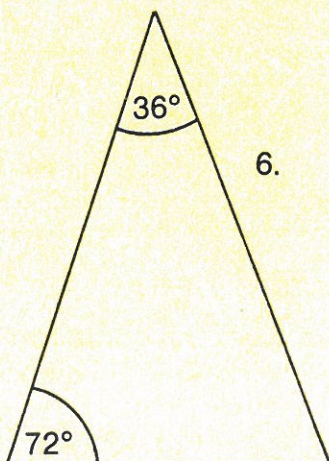
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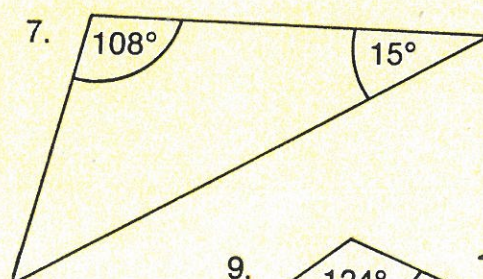
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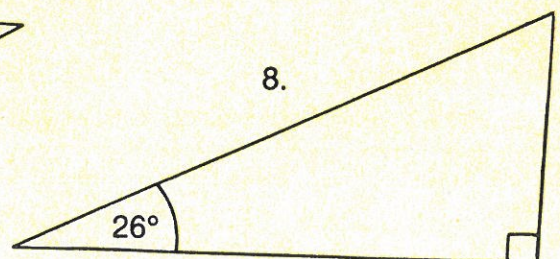
6.



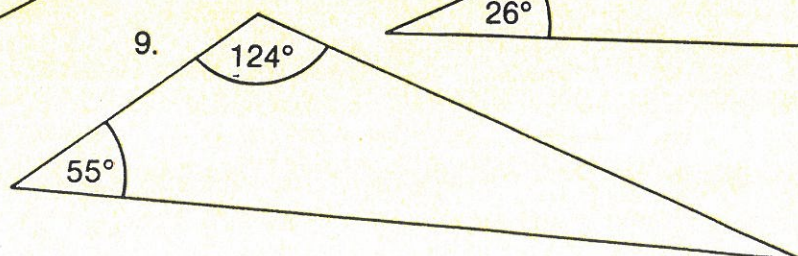
7.



8.



9.



You will need: coloured gummed paper, scissors

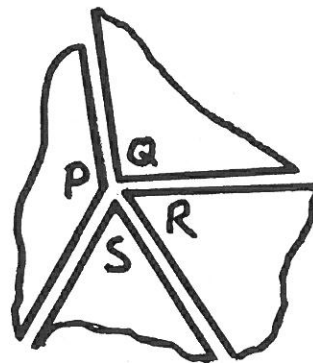
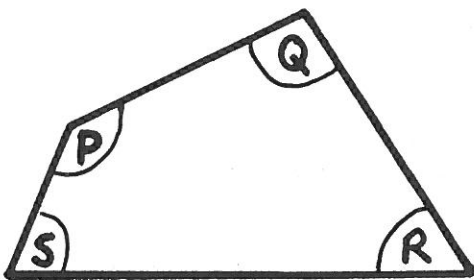
Angles of a Quadrilateral

A quadrilateral is a shape with 4 straight sides.

Draw a large quadrilateral on a sheet of coloured gummed paper and cut it out.

Label the angles P, Q, R and S and tear the angles off.

Now fit the angles P, Q, R and S together



Stick the angles together in your book.

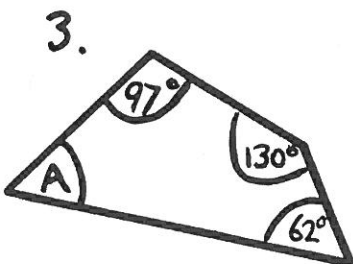
What do you find?

Try several different quadrilaterals. What happens every time?

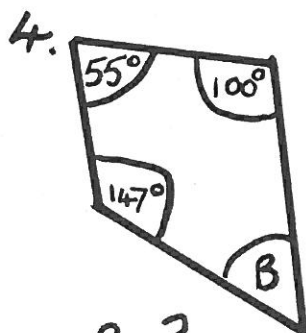
Copy and complete:-

1. The angles of a quadrilateral add up to _____ right angles (how many?)
2. The angles of a quadrilateral add up to _____ degrees (how many?)

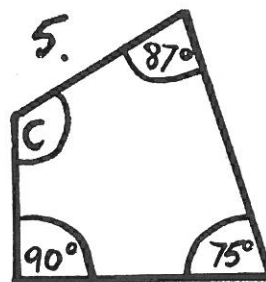
Work out the missing angles in these quadrilaterals:



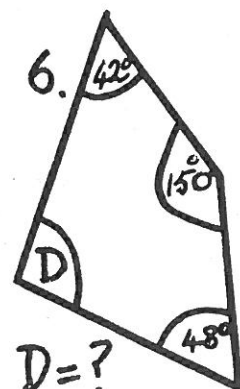
$A = ?$



$B = ?$

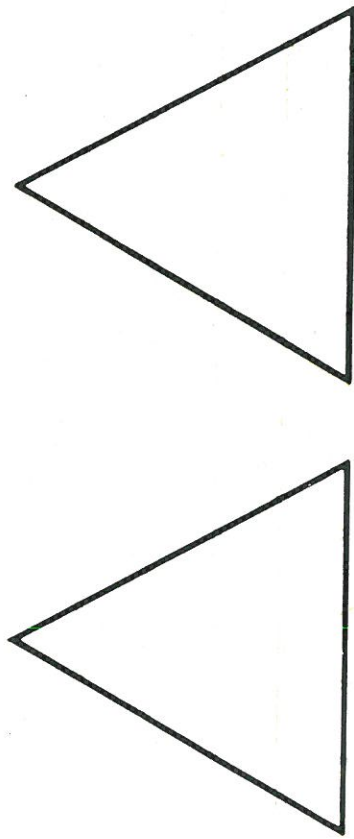


$C = ?$

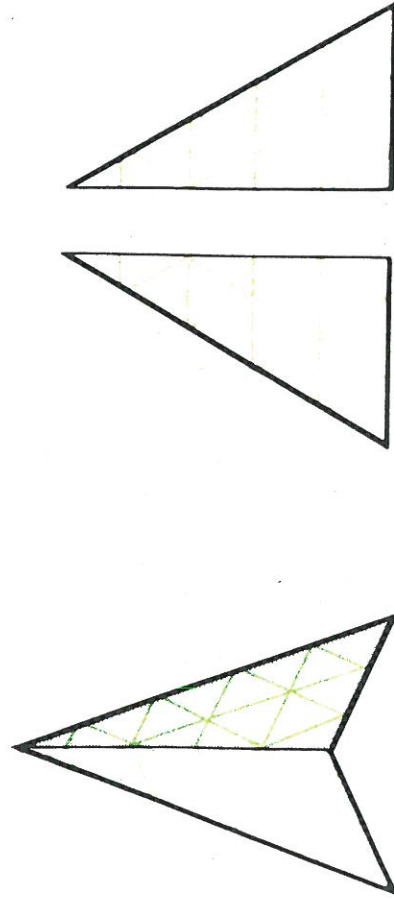


$D = ?$

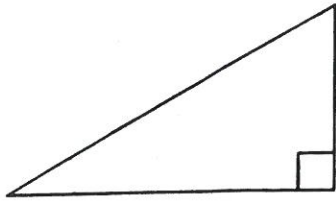
ABOUT ANGLES



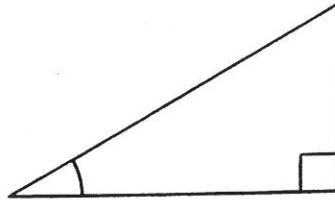
Draw 2 equilateral triangles and cut them out.
Fold each triangle in **half** and cut along the **fold**.



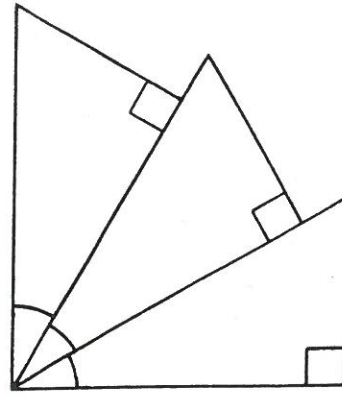
1) On each small triangle mark the right angle. *Mark it on both sides.*
How many degrees in a right angle?



2) On each small triangle mark the smallest angle. - *both sides again.*



3) Place 3 of the smallest angles together.

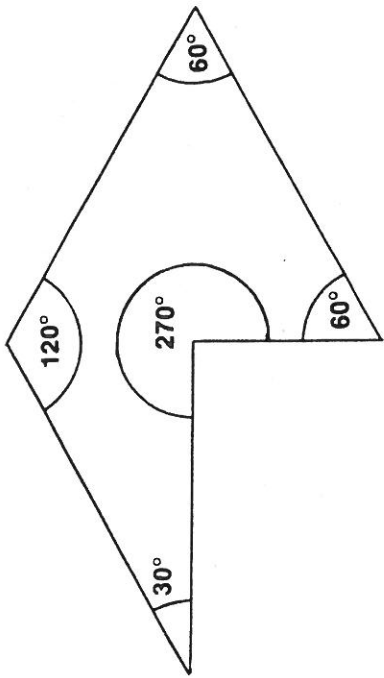


What is the size of the angle they make?

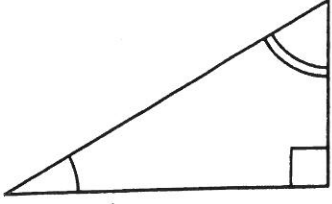
So each of the smallest angles must be degrees.

Write the size of the smallest angle on each triangle.

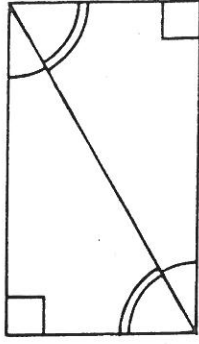
3 small triangles were used to make this shape and to work out its angles.



4) On each triangle mark the third angle.



5) Make this shape.



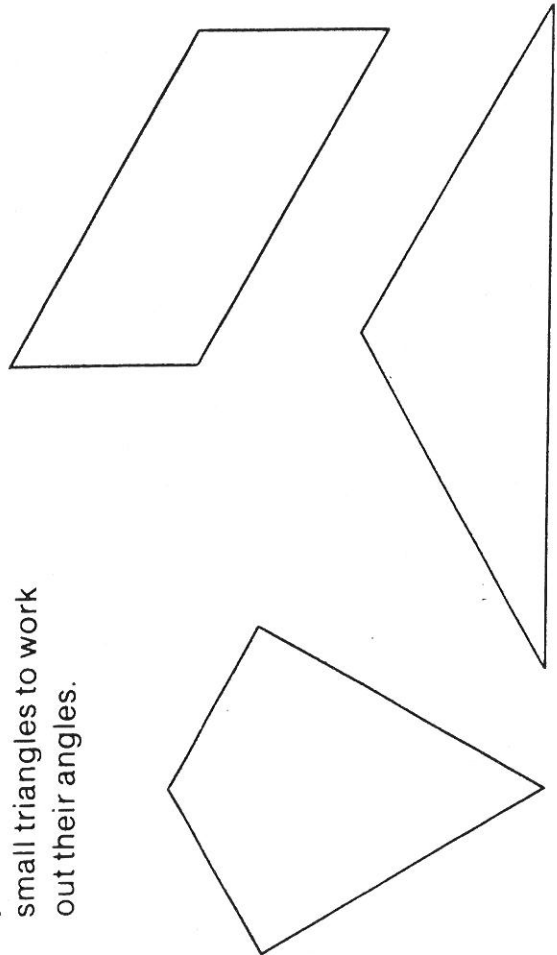
What is it called?

What is the size of each corner?

So the third angle of the triangle must be degrees.

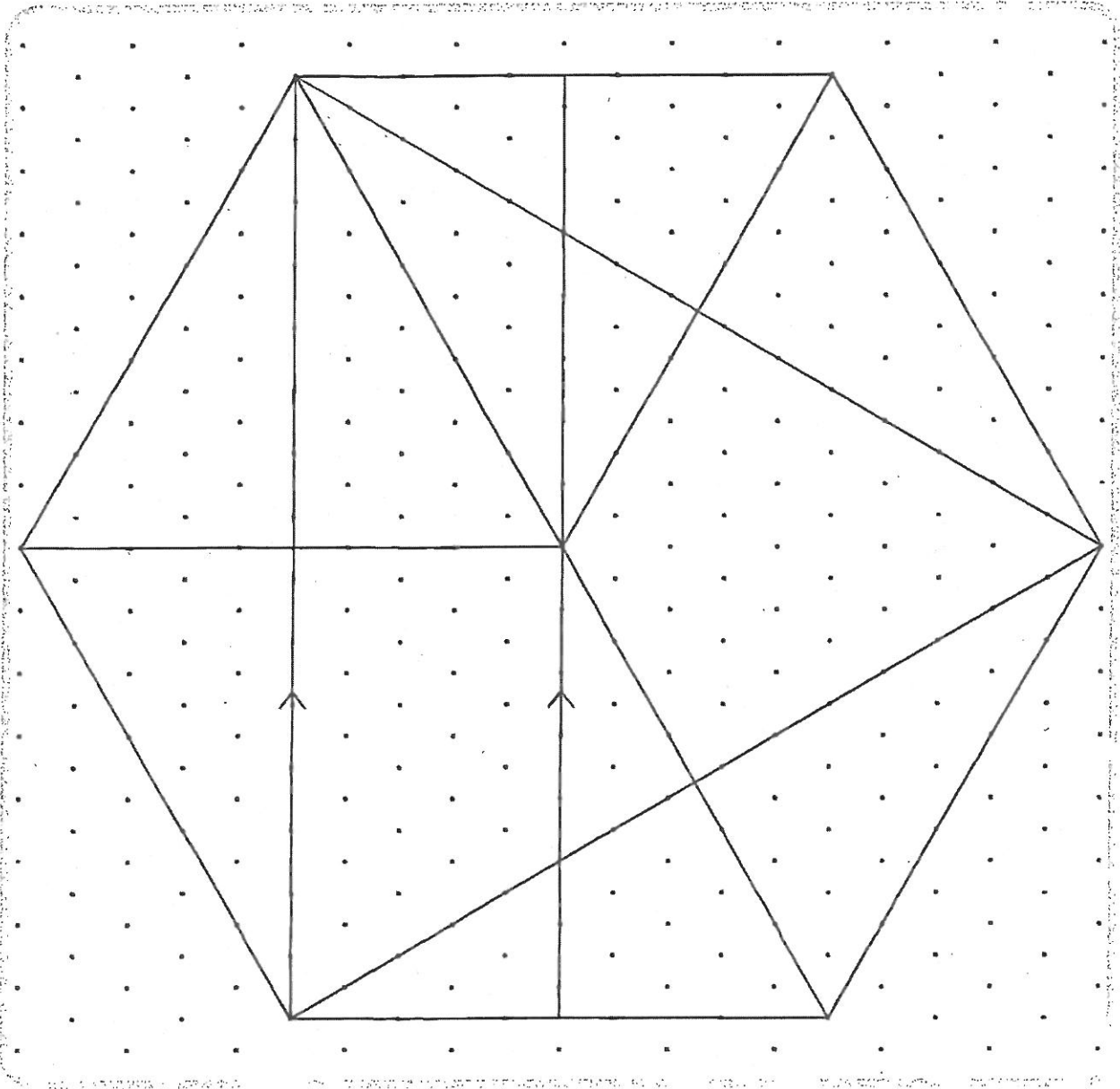
Write the size of the third angle on each triangle.

6) Trace these shapes into your book and use the small triangles to work out their angles.



Angles in a Regular Hexagon

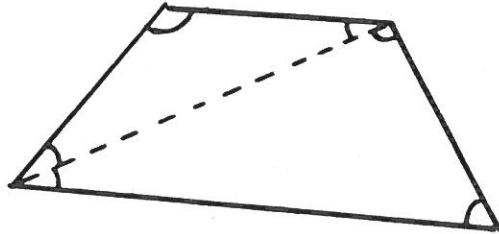
The regular hexagon below is drawn on isometric dotted paper.
Find all the unmarked angles.



Angles of a Polygon

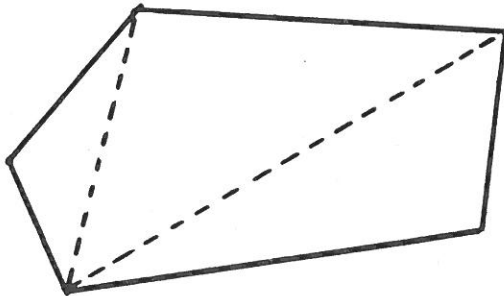
A polygon is a closed shape with straight sides

- (1) Draw a quadrilateral and put in the diagonal from one corner. There are 2 triangles and the angles of each triangle total 180° .



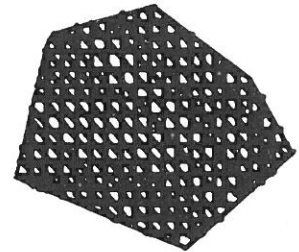
So what do the angles of a quadrilateral total?

(2)



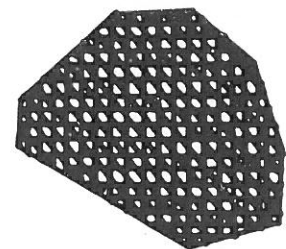
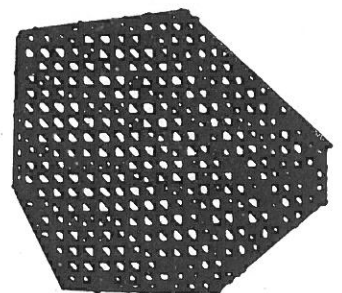
Do the same for a pentagon. How many triangles are there now? So what do the angles of a pentagon total?

- (3) Do the same for a hexagon (6 sides)
a heptagon (7 sides)
and an octagon (8 sides).



(4) Copy and complete this table

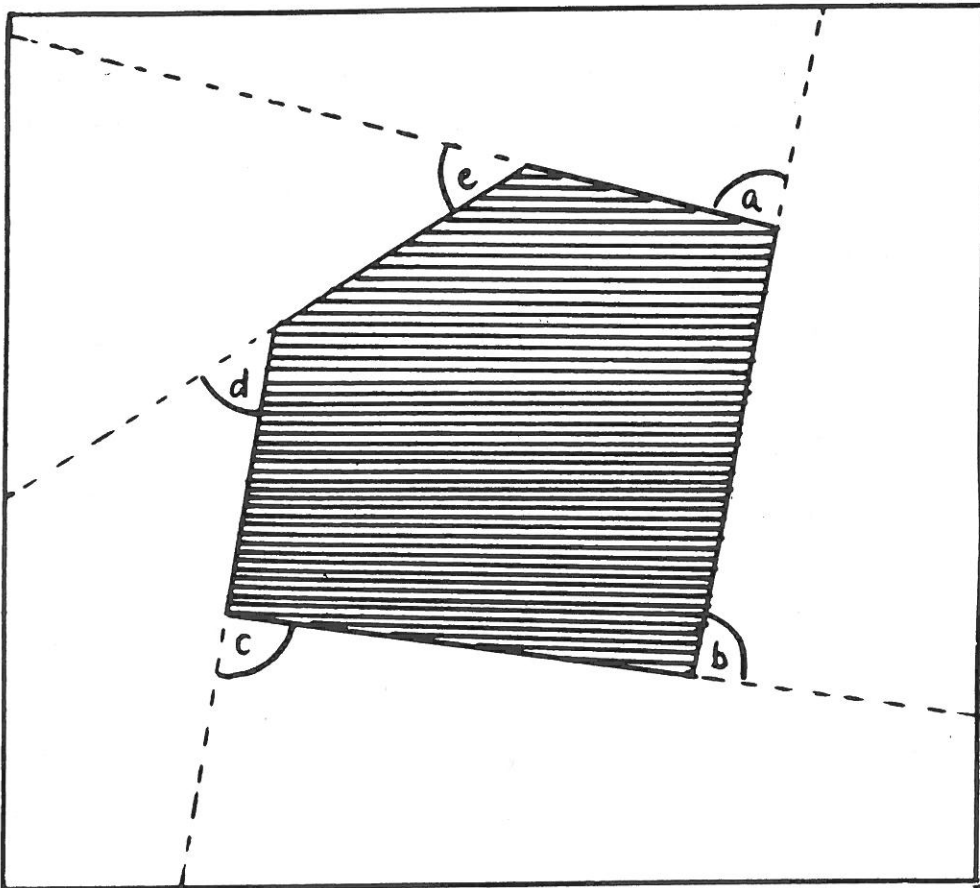
Shape	Number of sides	Number of triangles	Angle sum
Triangle	3	1	180°
Quadrilateral	4	2	360°
Pentagon	5		
Hexagon	6		
Heptagon	7		
Octagon	8		
Decagon	10		



- (5) Try to explain how to find the angle sum if you know how many sides a polygon has.

You will need: gummed paper, scissors

Exterior Angles of Polygons

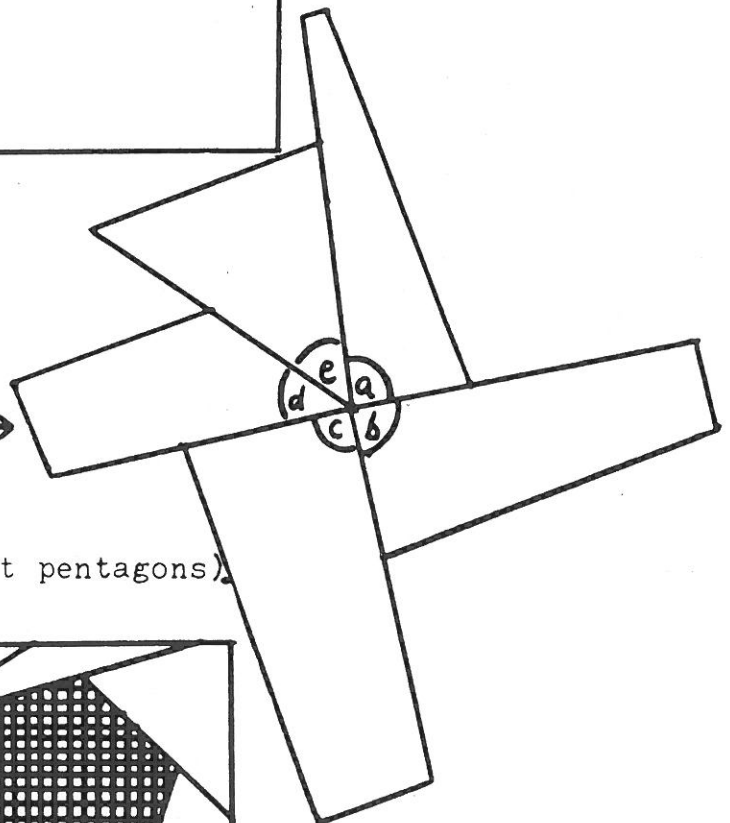


A pentagon has 5 sides and also 5 exterior angles.

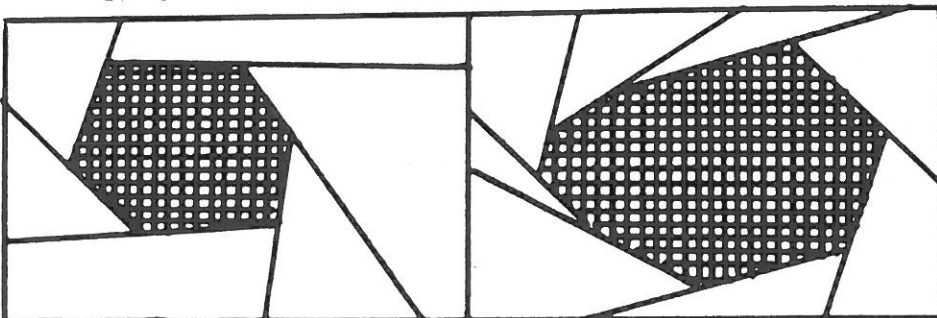
Draw a pentagon on gummed paper and label the exterior angles a, b, c, d and e.

Cut out the 5 exterior angles and fit them together. Stick them down.

The angles should fit together to make 1 whole turn or 360° .



Do this with 5 more polygons (not just pentagons). Perhaps you can explain your results.

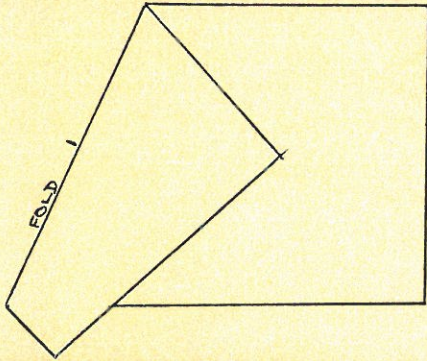


FOLD IT

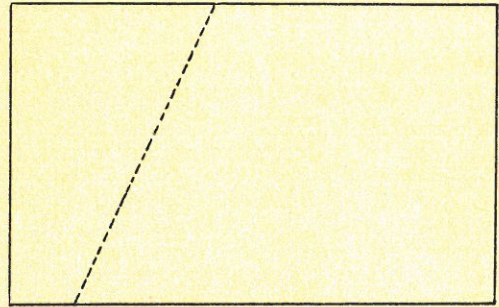
SMILE 0809

You will need: a rotagram

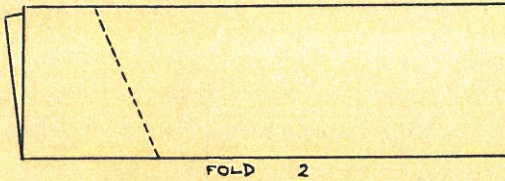
1 Fold a sheet of paper



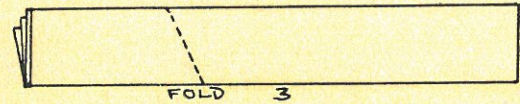
2 Open it out



3 Fold the bottom edge on to the upper edge

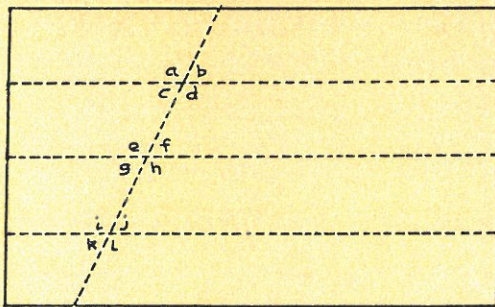


4 Now fold the fold on to the upper edge.....



.....and open it out.

5 Use a ruler to draw along the folds.



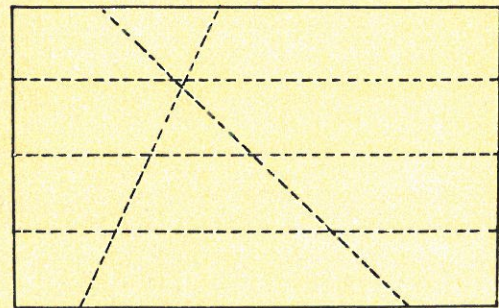
Use a rotagram to find sets of equal angles.

$$a = h = \dots$$

$$b = \dots$$

6 Comment on these sets of equal angles and the folds.

7 Fold the paper again and unfold to get

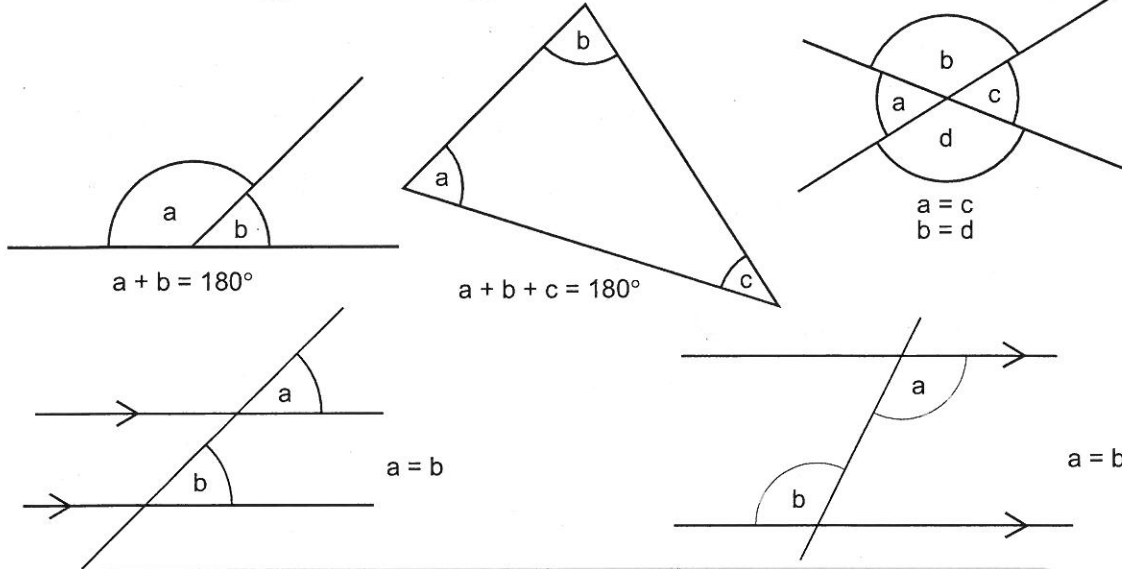


8 Label some angles and note which ones you expect to be equal.

Check with a rotagram.

9 Look back and comment on all you have found out.

Missing Angles



1. Calculate and mark in all the missing angles. Do not use an angle indicator.
2. Show how you found angle x, angle y and angle z.

