11 Properties of Triangles

My kite is made up of 4 right-angled triangles.

All the three sides of that triangle are equal.

What do you notice about the sides and angles of the different types of triangles?

SINGAPORE
STUDENT LEARNING SPACE

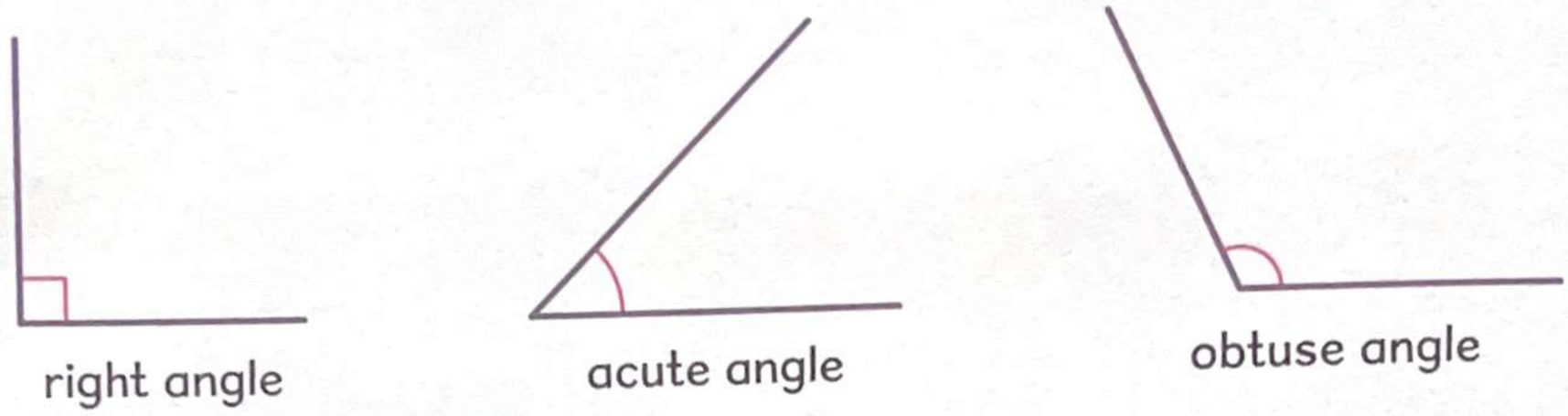
Do you know about triangles?
Learn more at *go.gov.sg/pm518*

Do you know how to find angles in a triangle?
Learn more at *go.gov.sg/pm519*

Types of Triangles

Recall

1 Angles are formed when 2 straight lines meet at a **vertex**.
The size of an angle depends on the **amount of turning**.

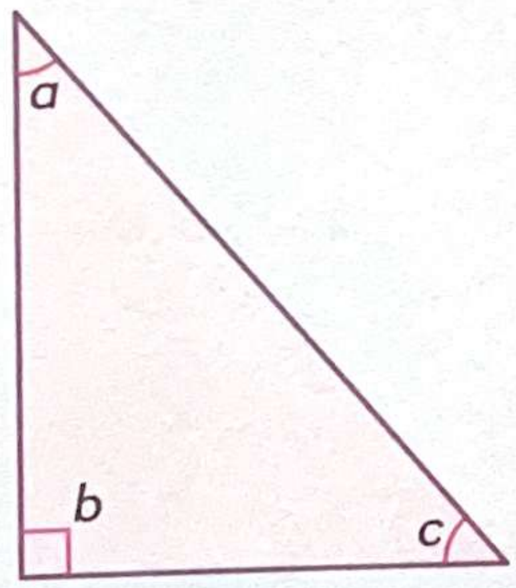


(a) An acute angle is _____ than a right angle.

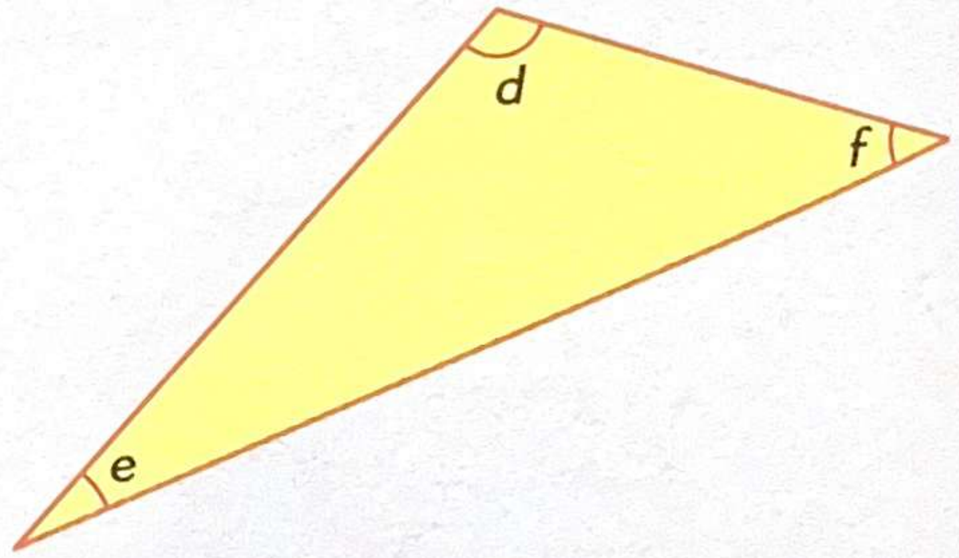
(b) An obtuse angle is _____ than a right angle.

2 Identify the types of angles in each triangle.
Are they acute, obtuse or right angles?

(a)



(b)

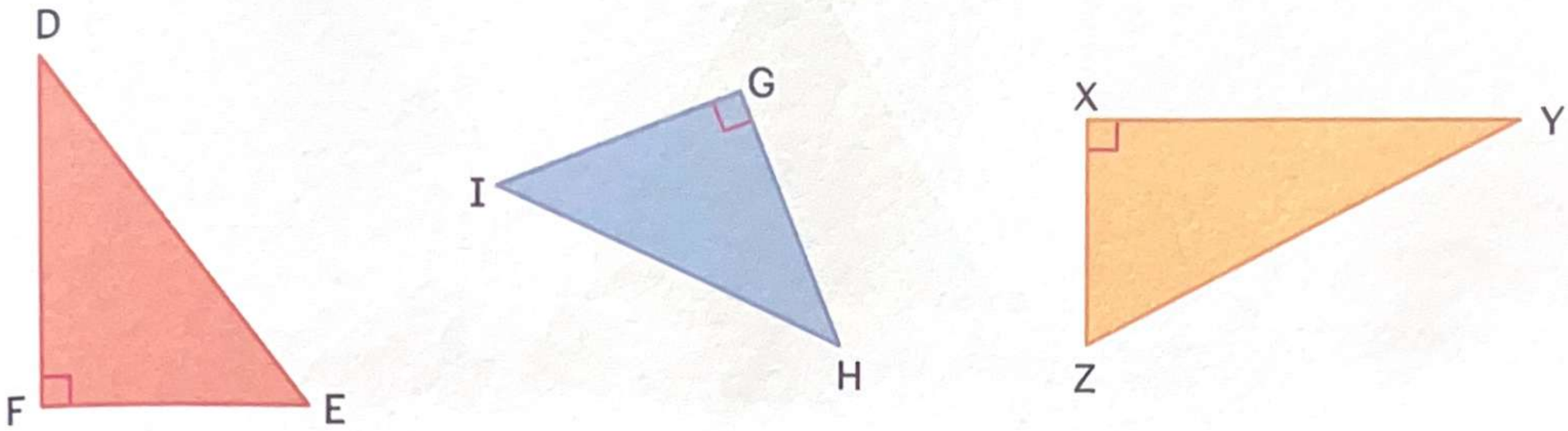


Angle	Type of angles
a	
b	
c	

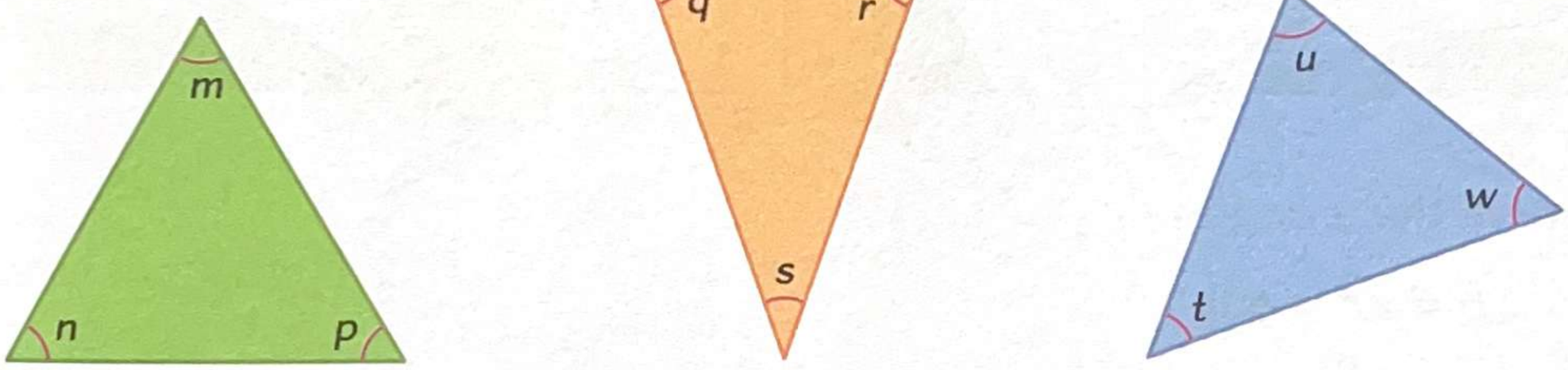
Angle	Type of angles
d	
e	
f	

Go to PB 5B Practice 1

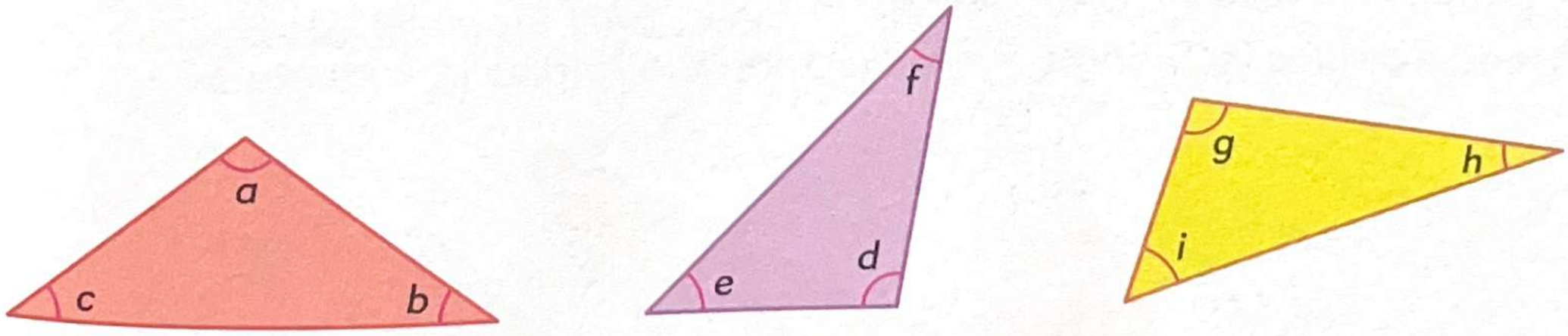
These are **right-angled triangles**.
A right-angled triangle has **two sides** that are **perpendicular** to each other.
One of its angles is a **right angle**.



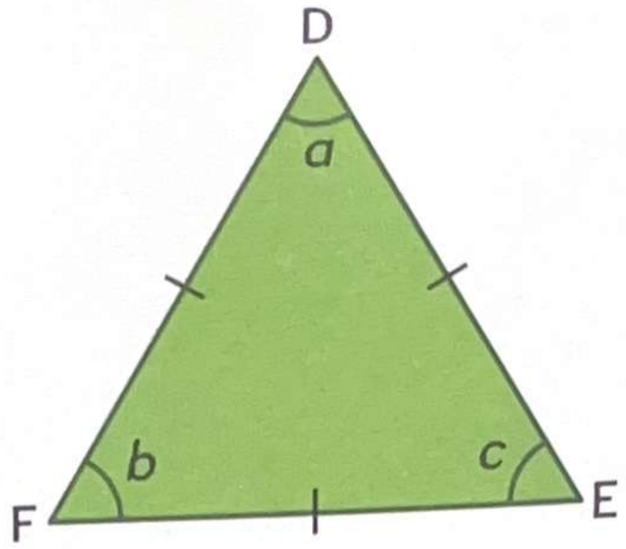
These are **acute-angled triangles**.
All the angles in the 3 triangles are **acute angles**.



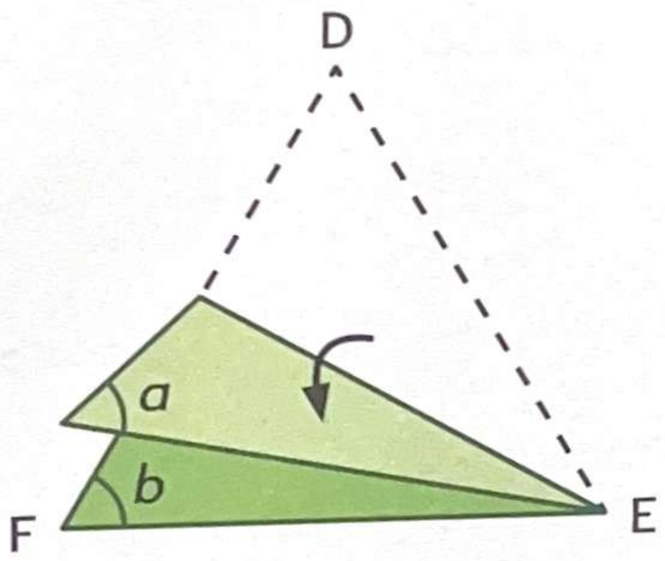
These are **obtuse-angled triangles**.
One of its angles is an **obtuse angle**.
$\angle a$, $\angle d$ and $\angle g$ are obtuse angles.

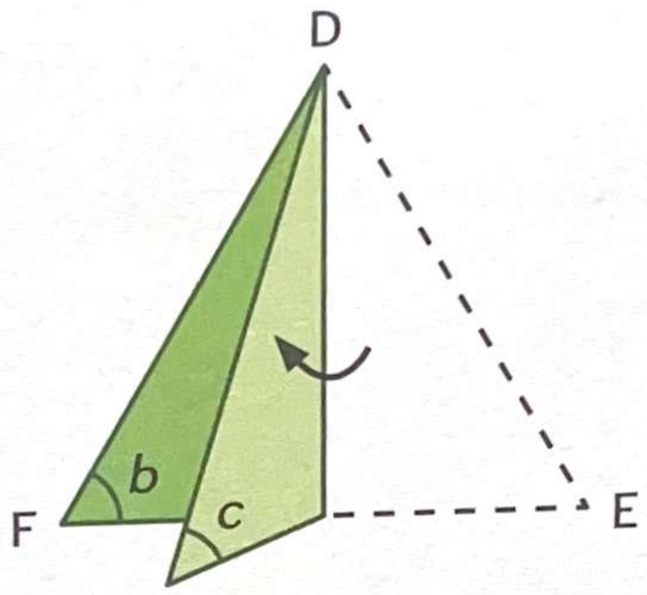


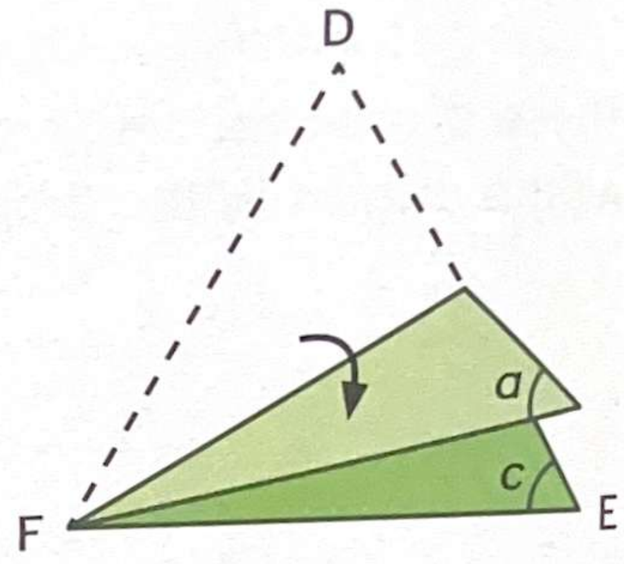
This triangle is an **equilateral triangle**.
An equilateral triangle has **3 equal sides** and **3 equal angles**.



Label and fold a cut-out of an equilateral triangle in the following 3 ways.







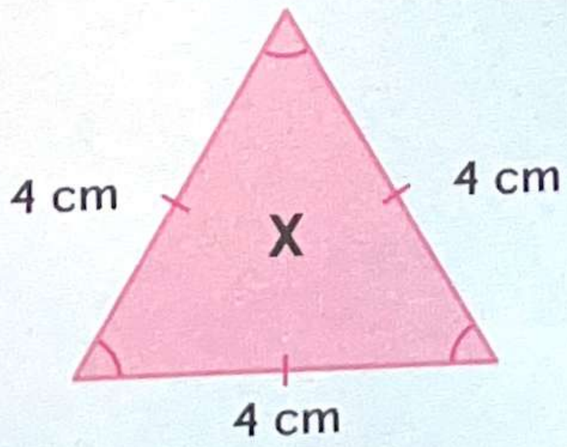
Observe the 3 angles.

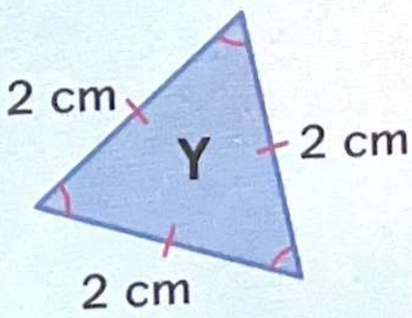
$\angle a = \angle b = \angle c = 60°$

Each angle in an equilateral triangle is 60°.

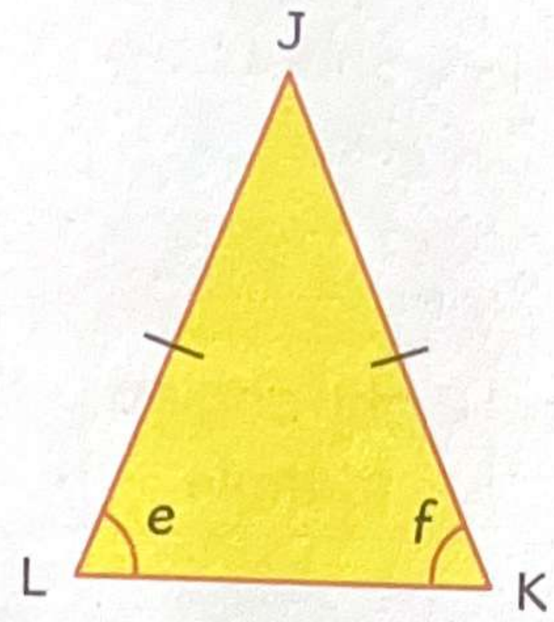
Math Talk

Triangle Y is smaller than Triangle X.
Are the angles in Triangle Y smaller than the angles in Triangle X?

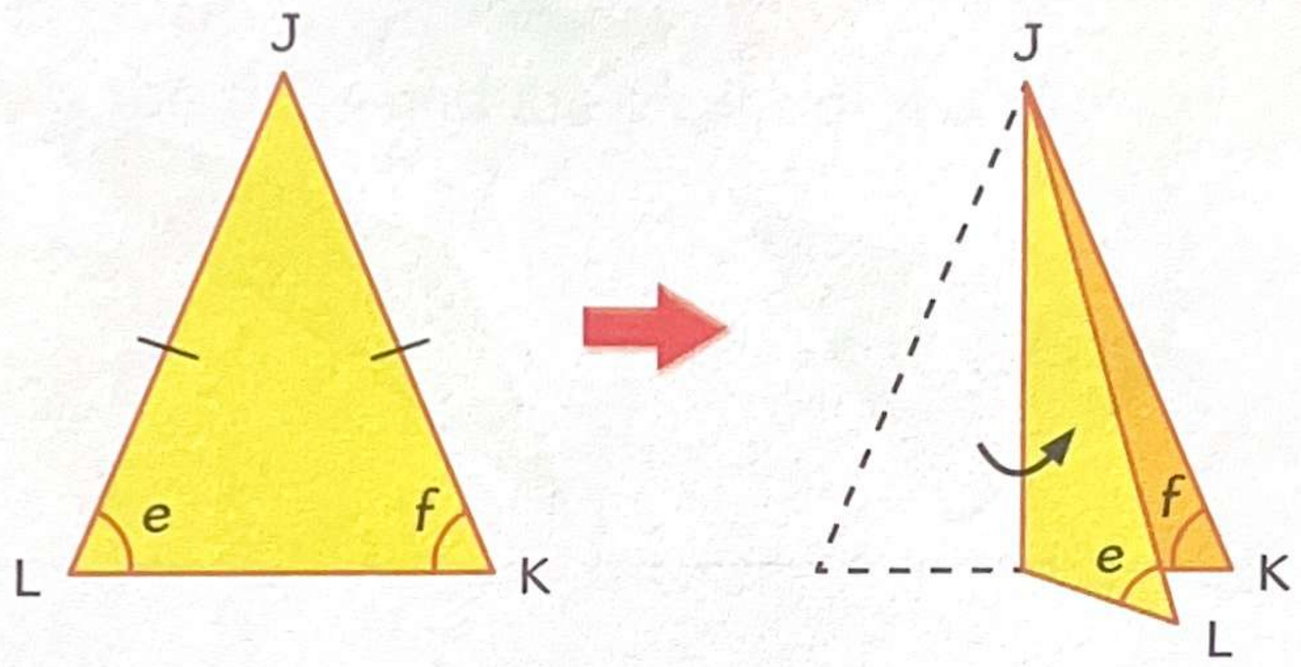




This triangle is an **isosceles triangle**.
An isosceles triangle has **two sides equal in length**.



Label and fold a cut-out of an isosceles triangle in half as shown.



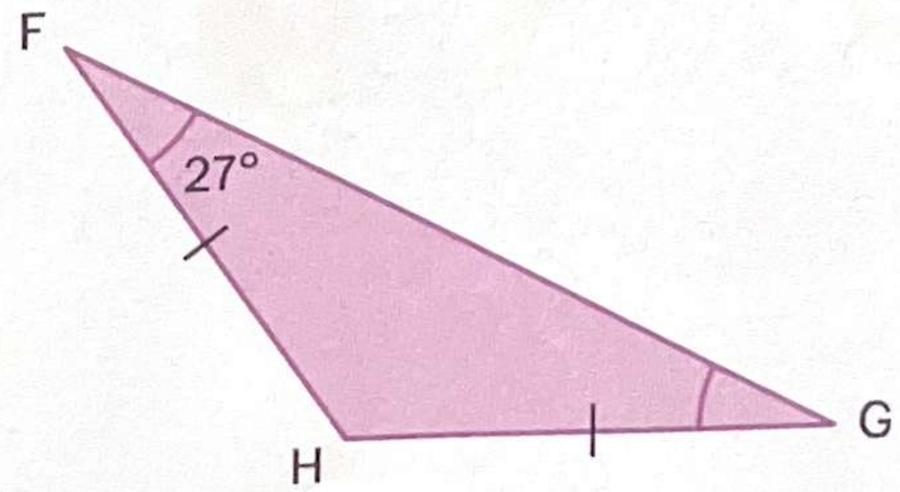
Observe the 2 angles.

$\angle e = \angle f$

The angles opposite the equal sides are equal.

The base angles of an isosceles triangle are equal.

FGH is an isosceles triangle. Find $\angle FGH$.

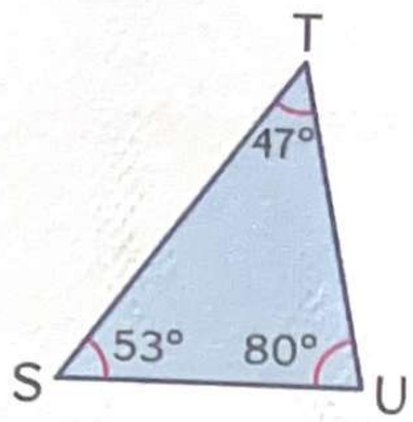


$\angle FGH = \angle HFG$
$= \mathbf{27°}$

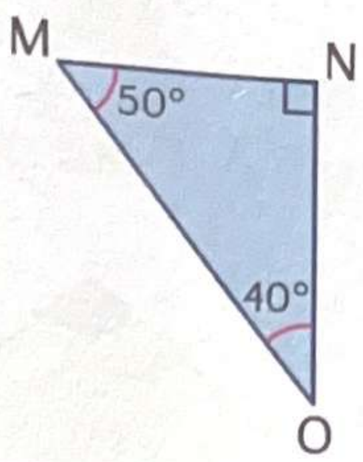
Let's Try! 1

(a) Name the types of triangles.

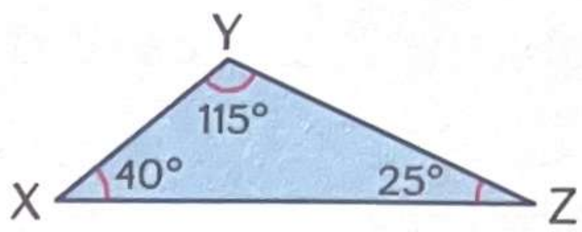
(i)



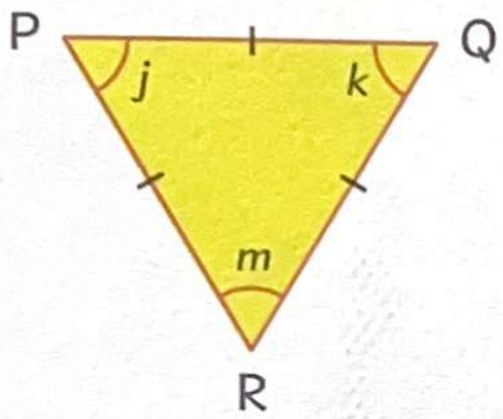
(ii)



(iii)



(b) PQR is an equilateral triangle.
Identify the sides and the angles of the triangle.

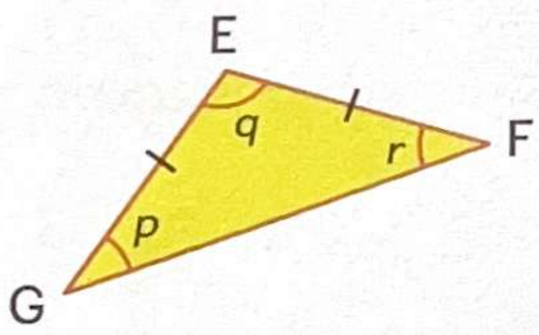


PQ = ☐ = ☐

$\angle j = \angle k = \angle$ ☐

= ☐°

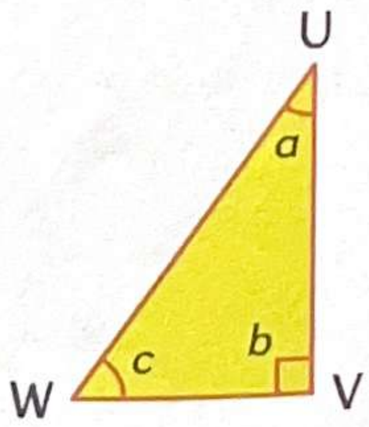
(c) EFG is an isosceles triangle.
Identify the sides and the angles of the triangle.



$\angle p = \angle$ ☐

EG = ☐

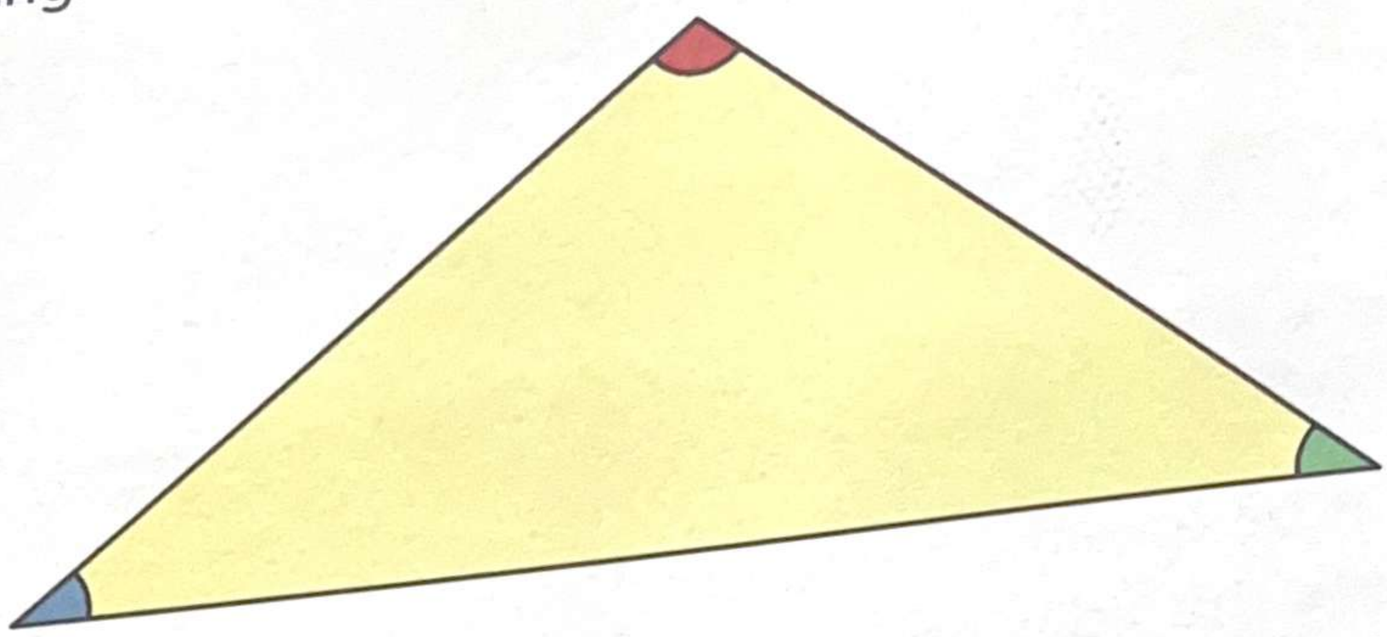
(d) UVW is a right-angled triangle.
Which angle is equal to 90°?



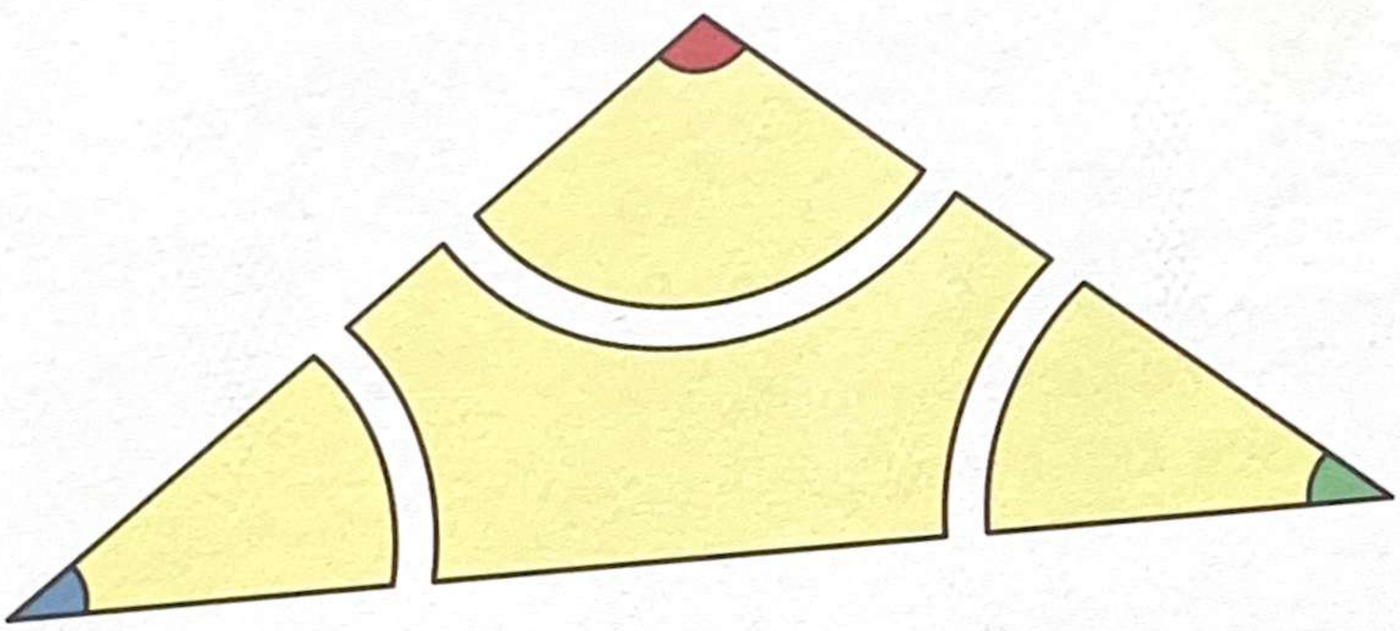
$\angle$ ☐ = 90°

Angle Sum of a Triangle

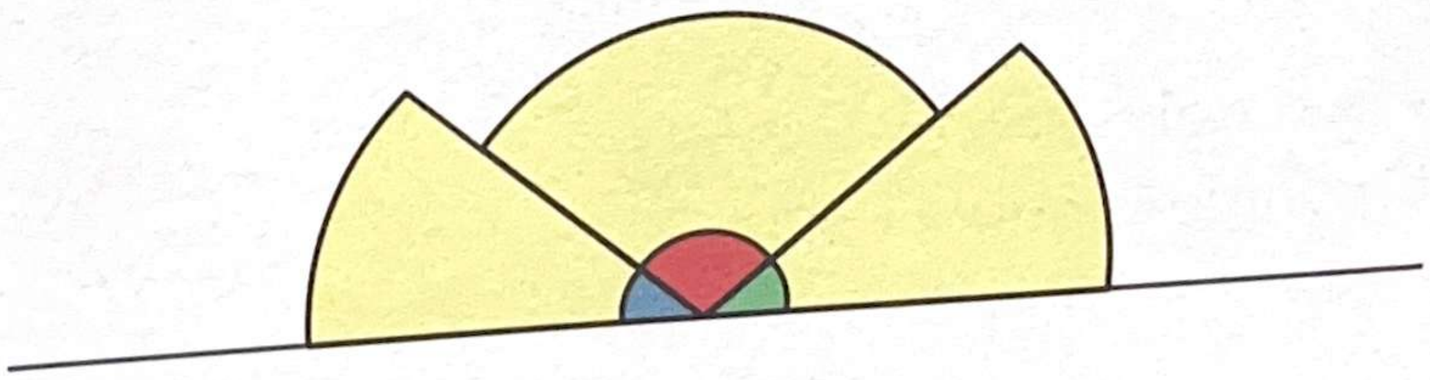
This is an obtuse-angled triangle.
Colour the 3 angles of a triangle cut-out using different colours.



Cut out the 3 angles as shown.



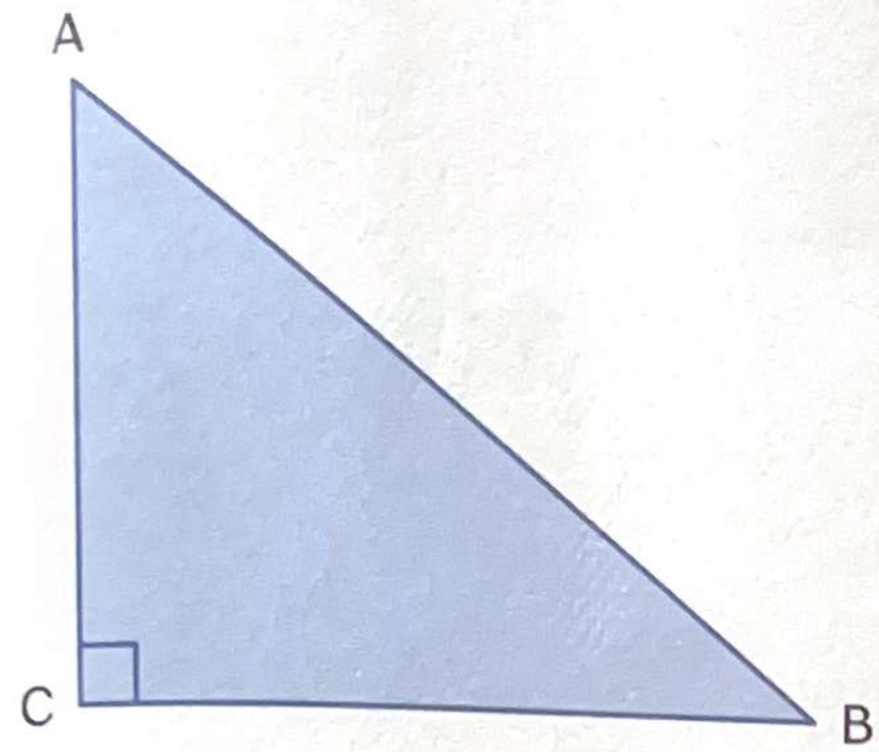
Arrange the 3 angles as shown.



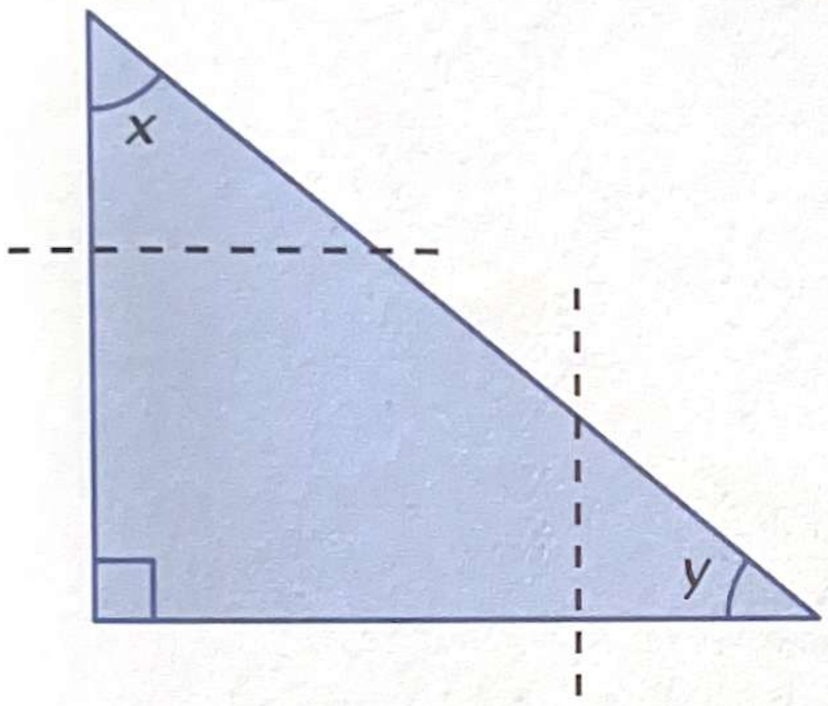
The 3 angles form angles on a straight line. The sum of angles on a straight line is 180°.

The sum of angles in a triangle is 180°.

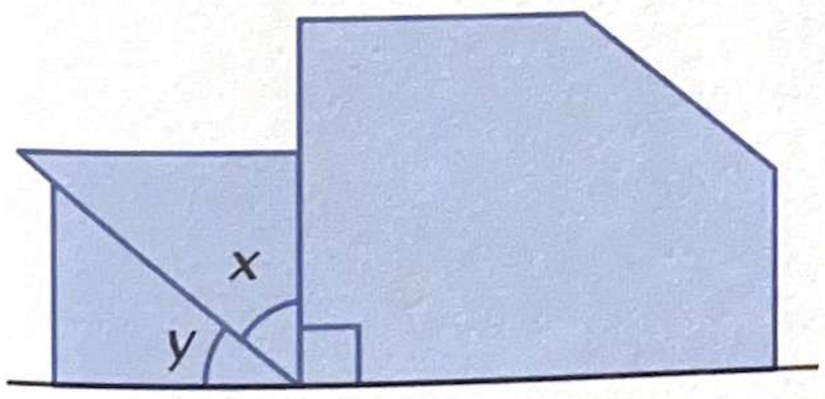
This is a right-angled triangle.



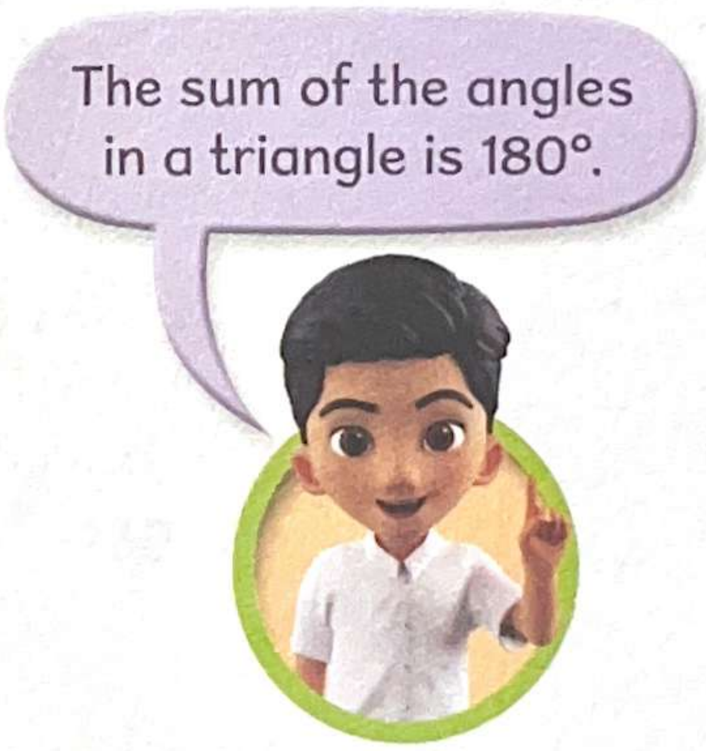
Cut the triangle along the dotted lines as shown.

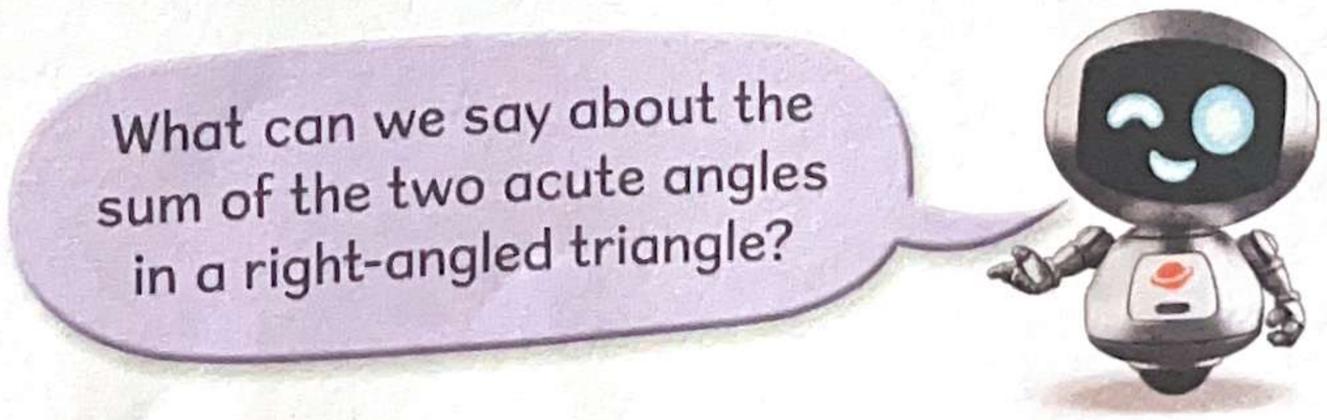


Arrange and observe the 3 angles as shown.

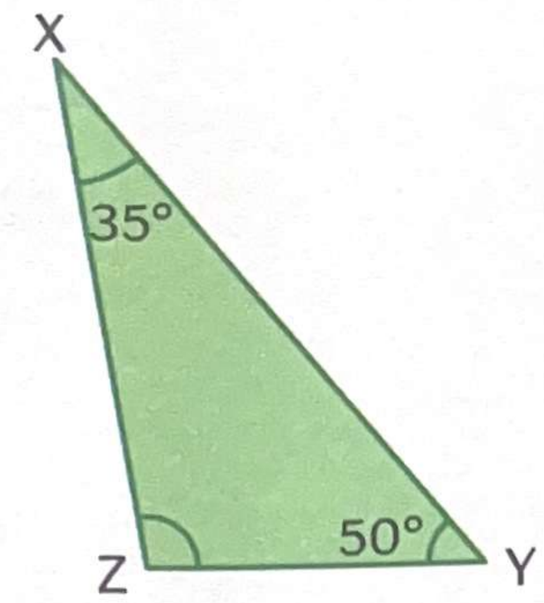


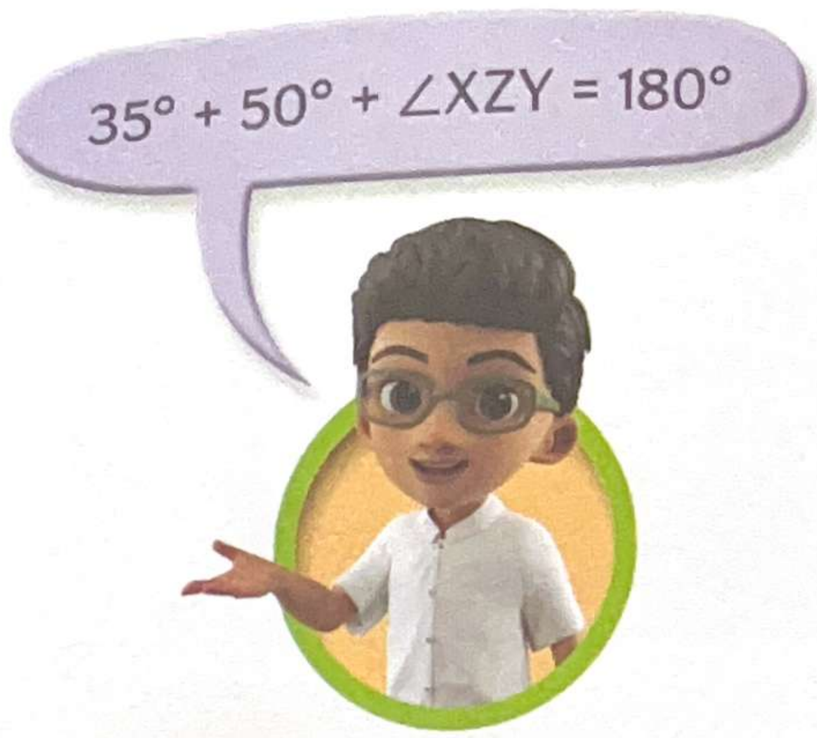
$\angle x + \angle y + 90° = 180°$





Find ∠XZY.

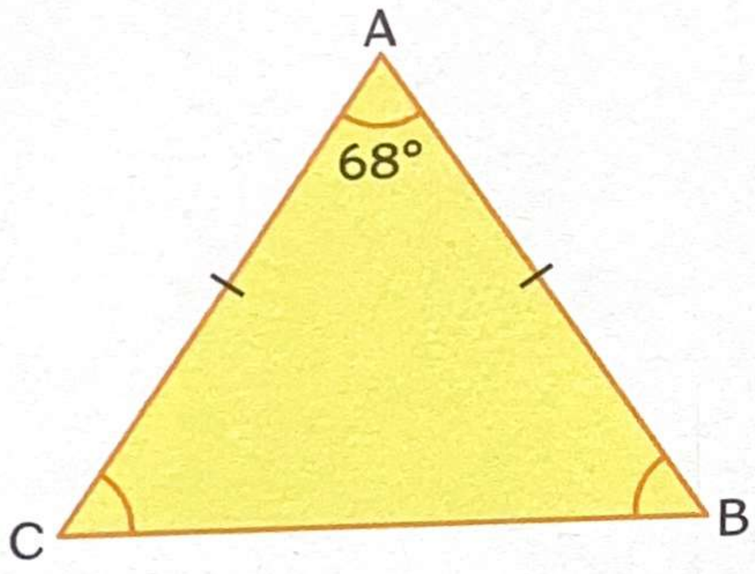


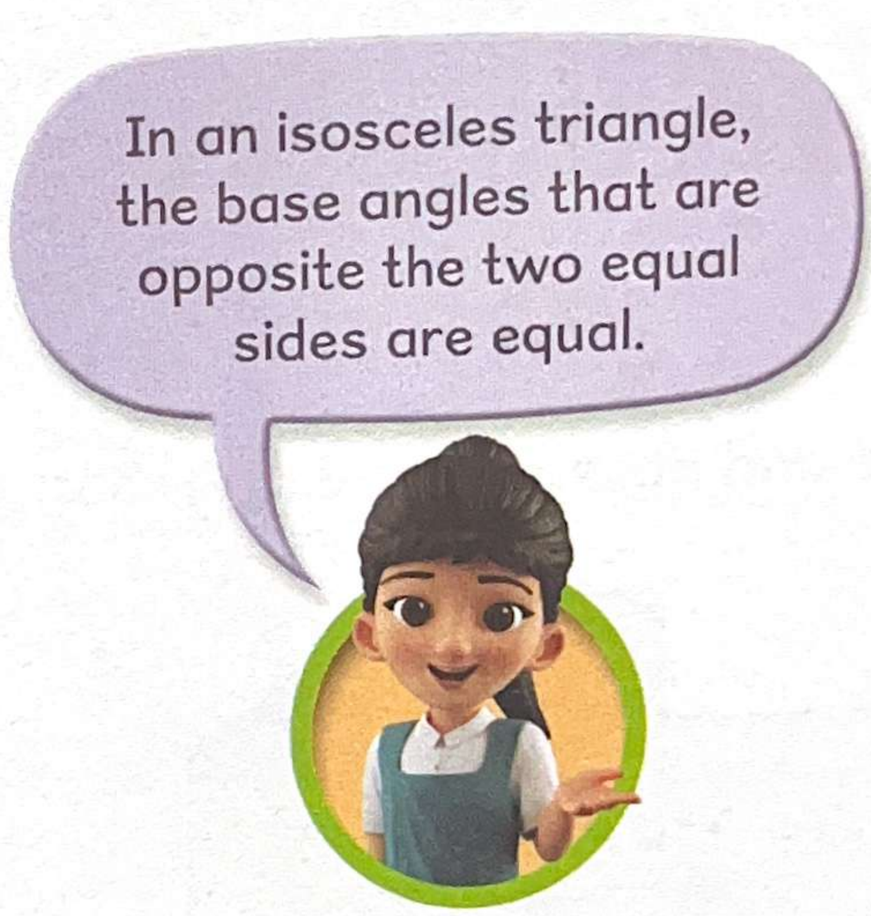


$\angle XZY = 180° - 35° - 50°$

$= \mathbf{95°}$

ABC is an isosceles triangle. Find ∠ACB.





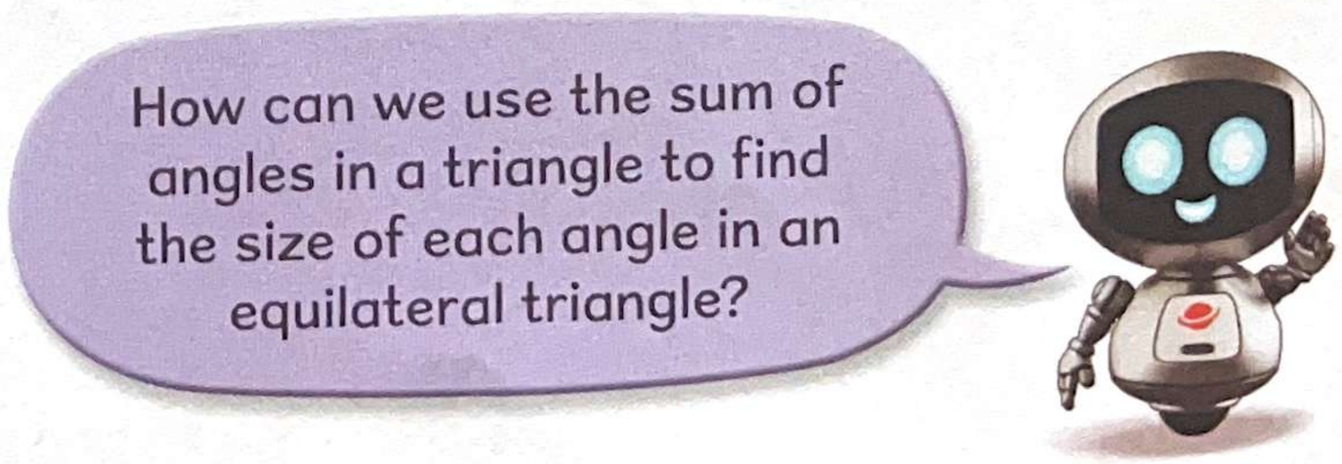
$\angle ACB = \angle ABC$

$\angle ACB + \angle ABC = 180° - 68°$

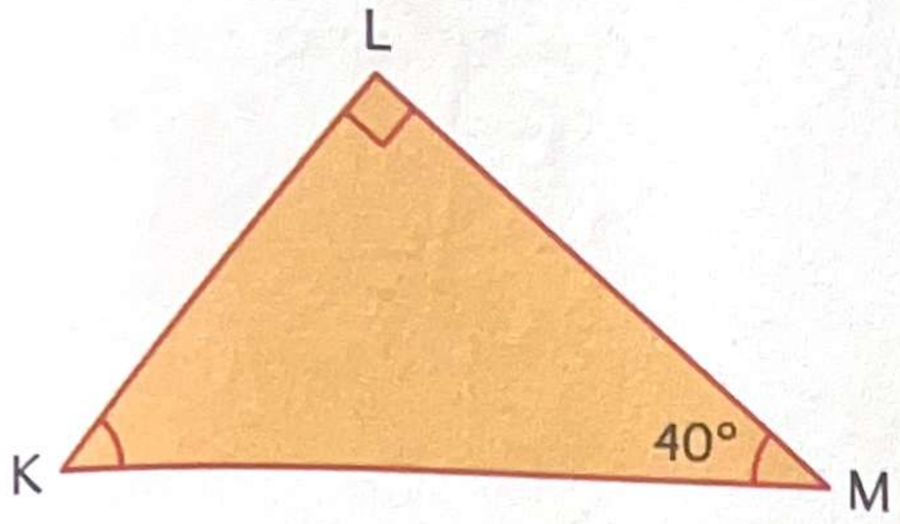
$= 112°$

$\angle ACB = 112° \div 2$

$= \mathbf{56°}$



KLM is right-angled triangle. $\angle LMK = 40°$.
Find $\angle MKL$.

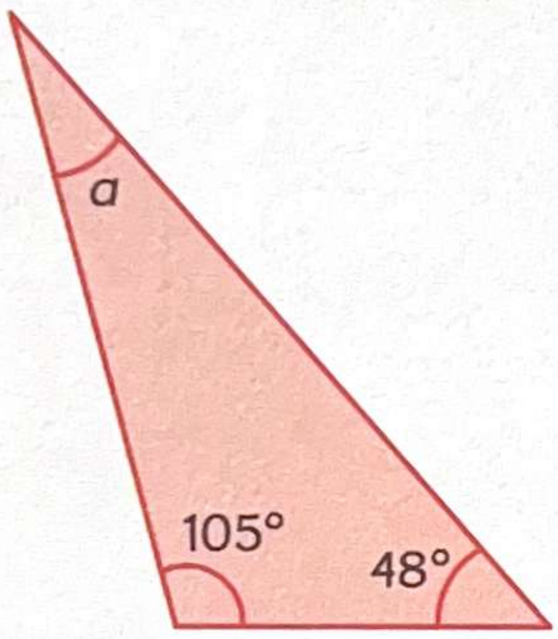


$\angle MKL = 180° - 90° - 40°$
$= \mathbf{50°}$

Let's Try! 2

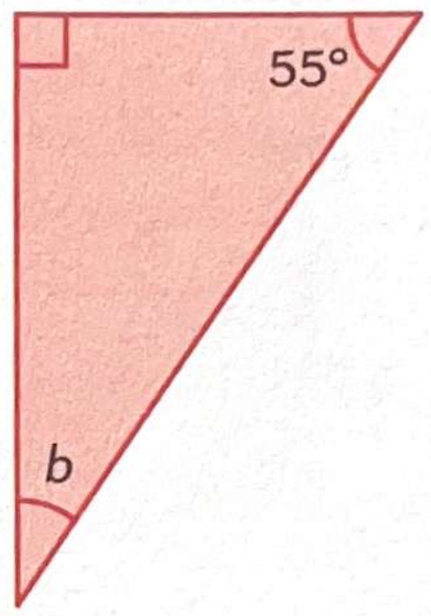
Find the unknown angle for each triangle.

(a)



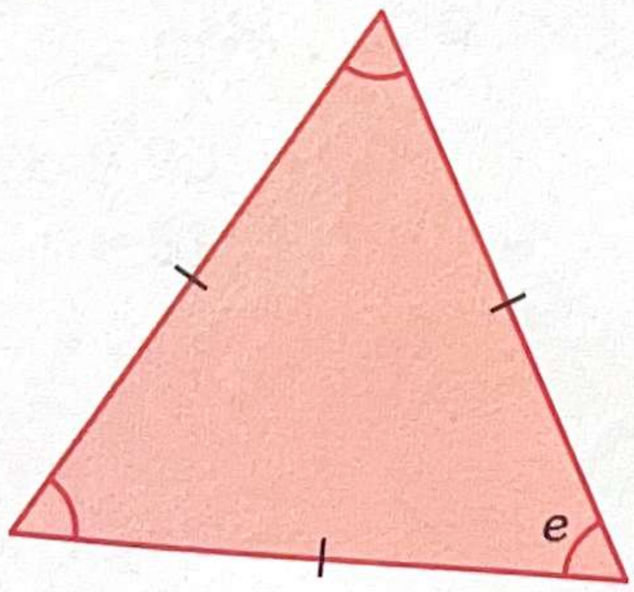
$\angle a =$ ____

(b)



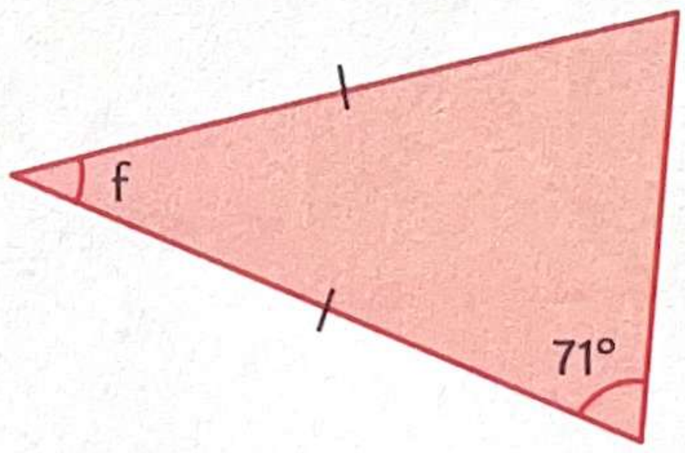
$\angle b =$ ____

(c)



$\angle e =$ ____

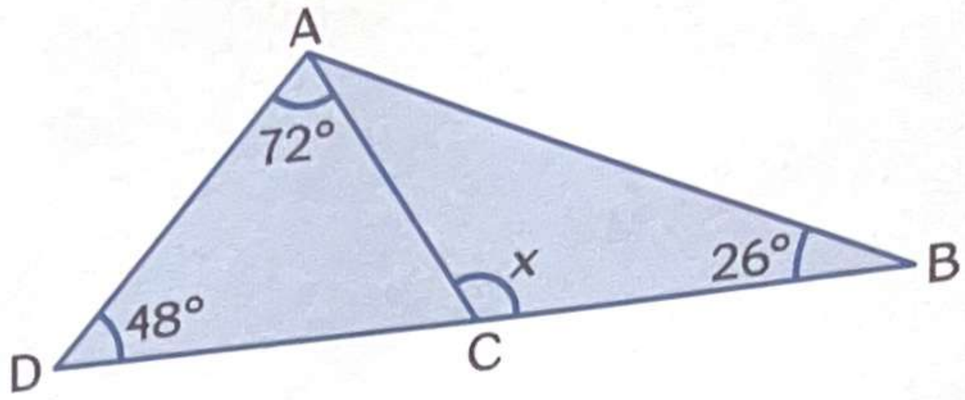
(d)



$\angle f =$ ____

Finding Unknown Angles

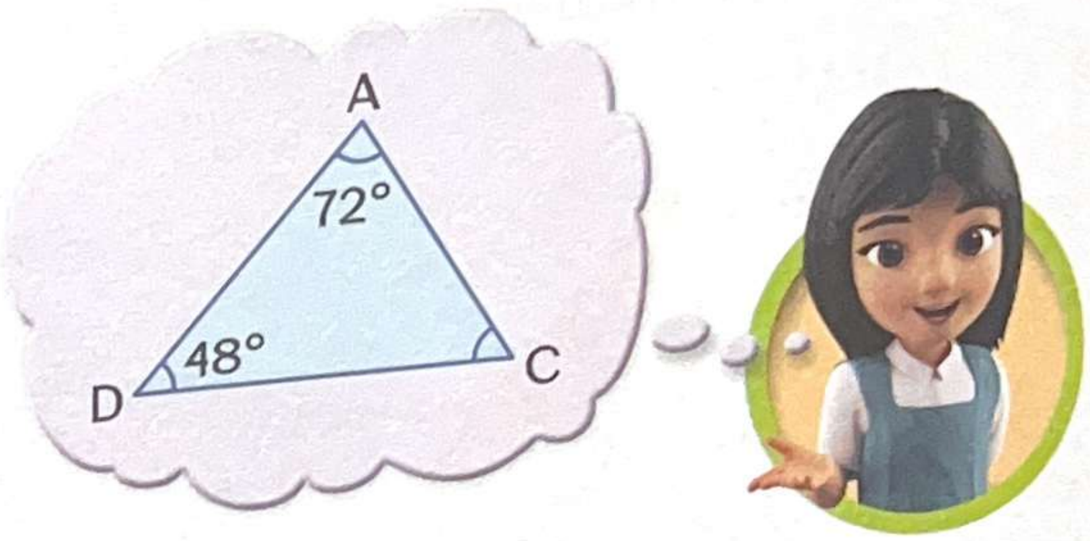
In the figure, BCD is a straight line. $\angle DAC = 72°$, $\angle ADC = 48°$ and $\angle ABC = 26°$. Find $\angle x$.



Method 1

$\angle ACD = 180° - 48° - 72°$
$= 60°$

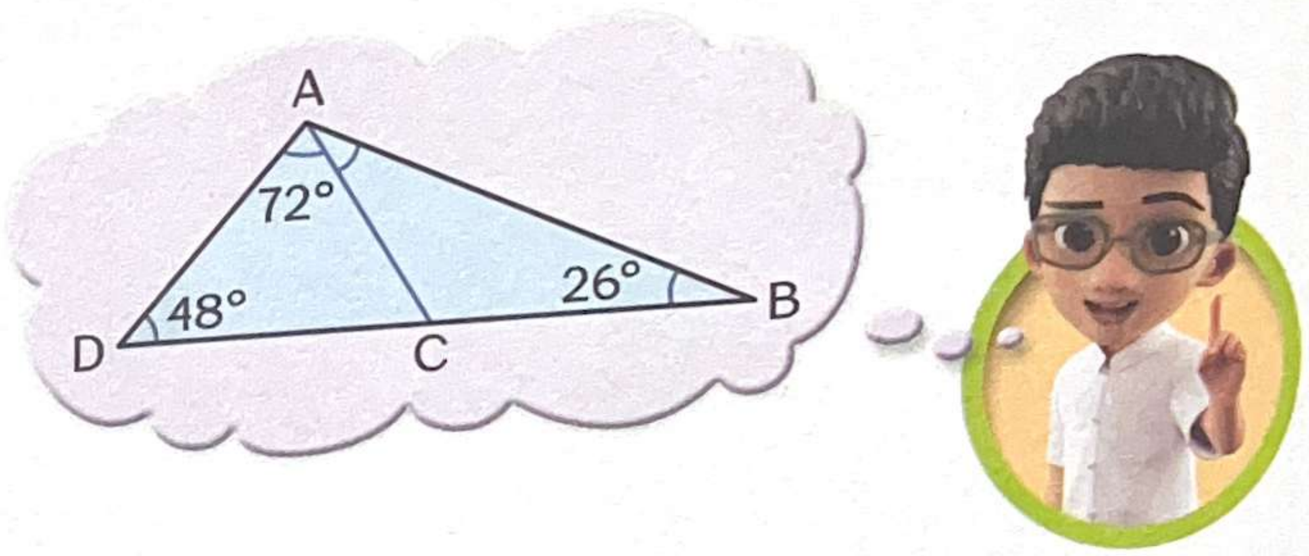
$\angle x = 180° - 60°$
$= \mathbf{120°}$

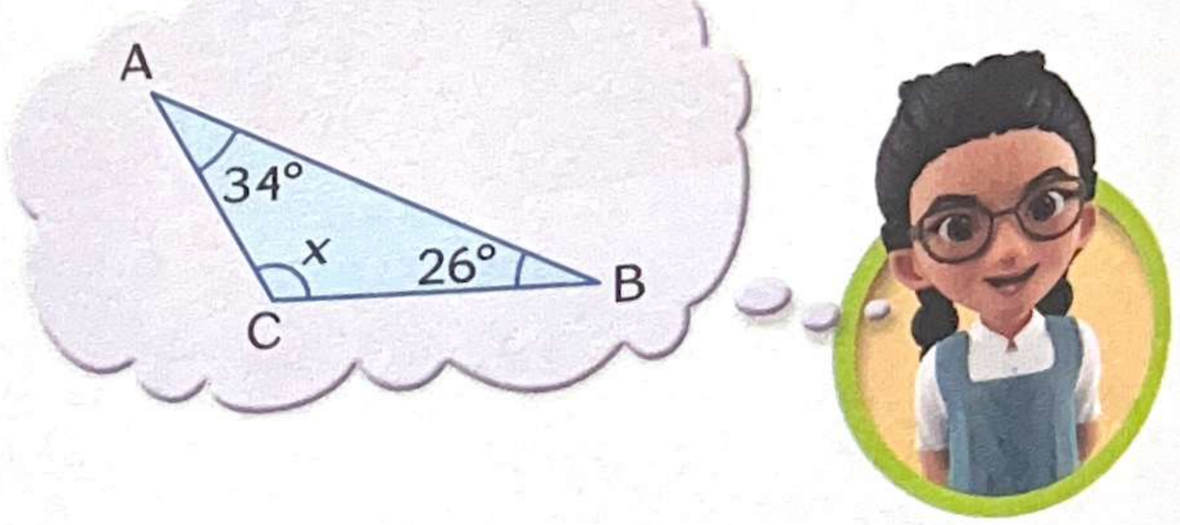


Method 2

$\angle CAB = 180° - 48° - 26° - 72°$
$= 34°$

$\angle x = 180° - 26° - 34°$
$= \mathbf{120°}$

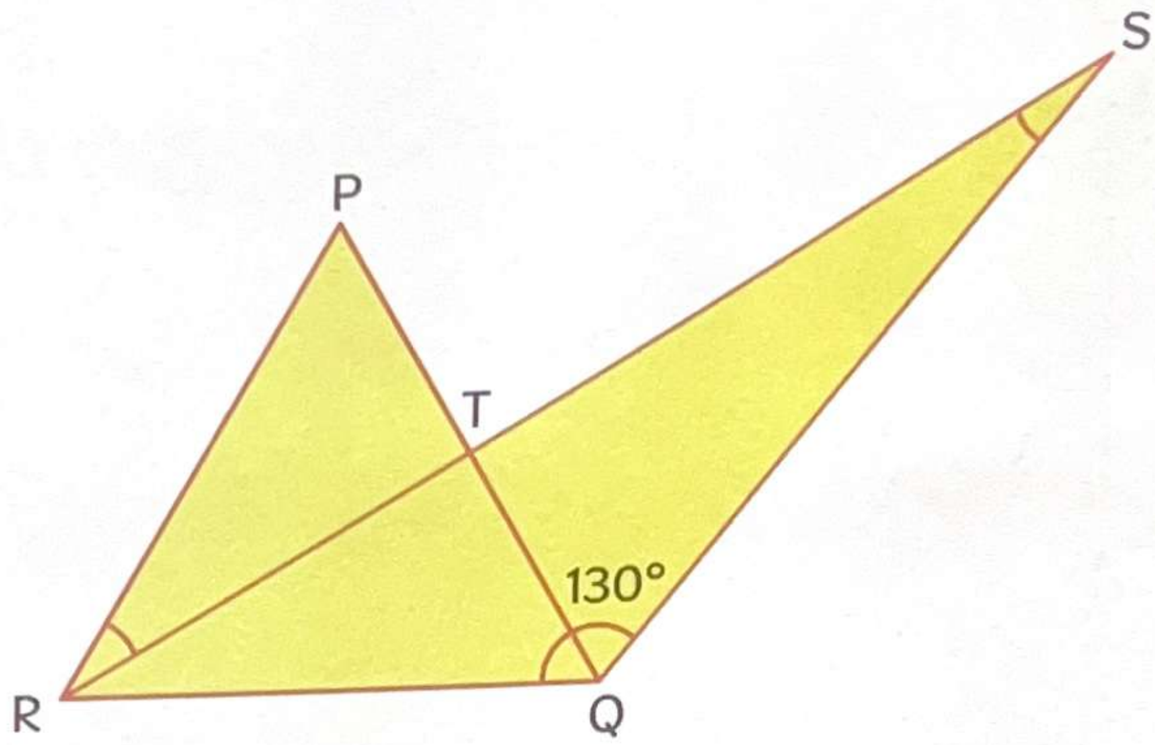




PQR is an equilateral triangle and QRS is a triangle.
$\angle PRT = \angle TRQ$. $\angle SQR = 130°$.

(a) Find $\angle PRT$.

(b) Find $\angle RSQ$.

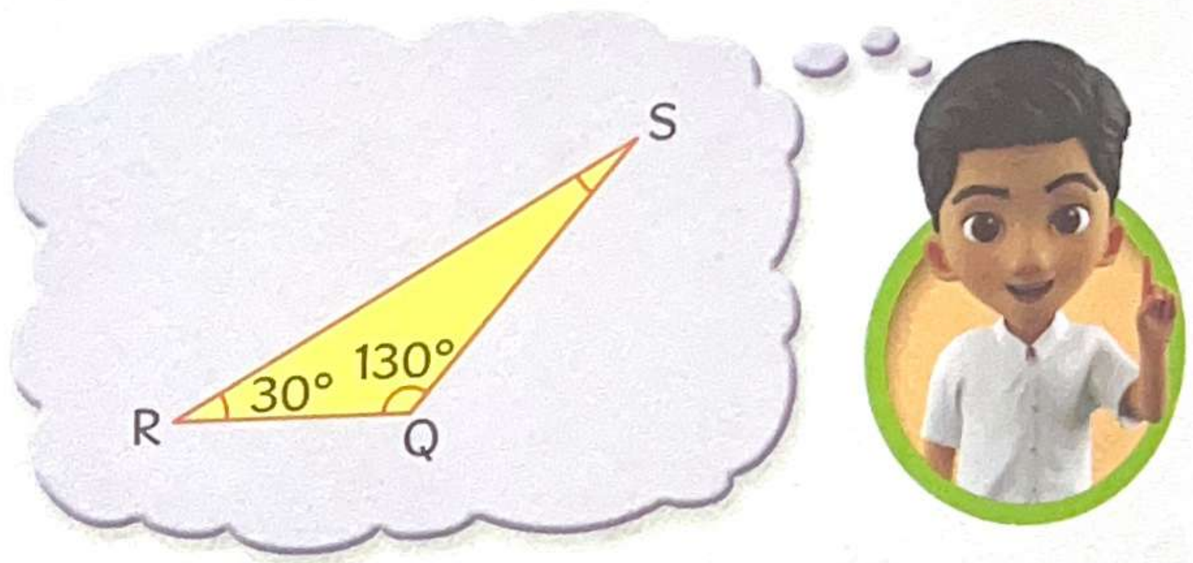


(a) $\angle PRT = 60° \div 2$
$= \mathbf{30°}$

(b) **Method 1**

$\angle TRQ = \angle PRT = 30°$

$\angle RSQ = 180° - 130° - 30°$
$= \mathbf{20°}$



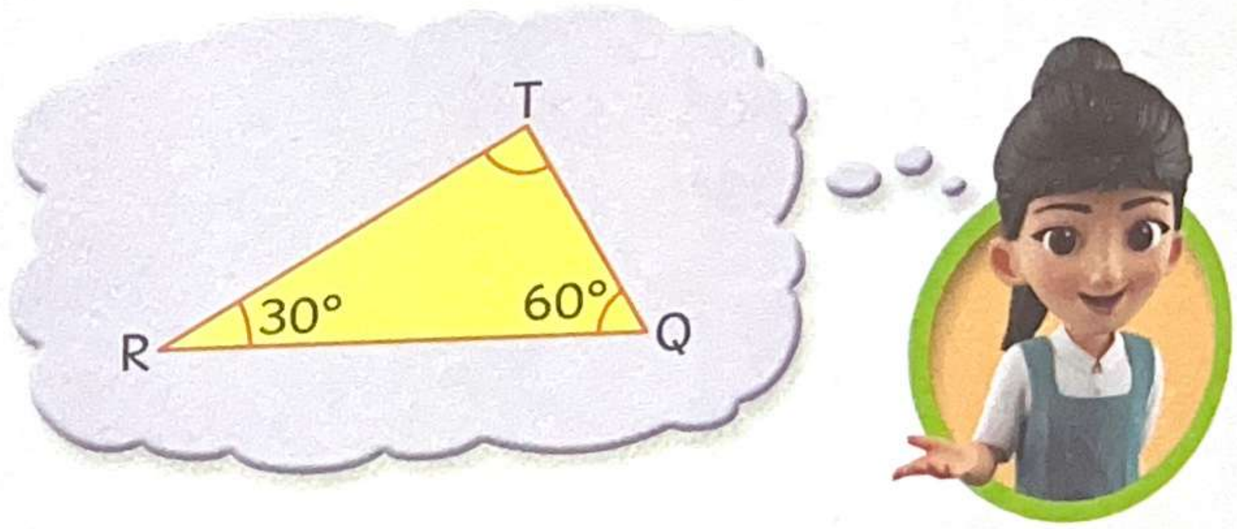
Method 2

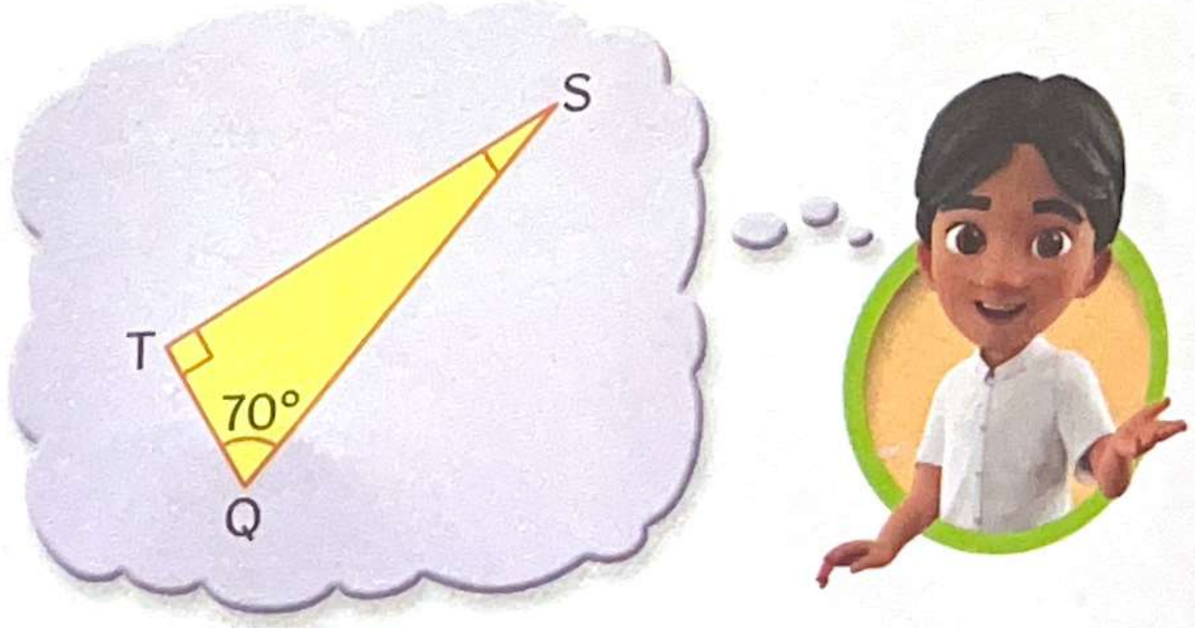
$\angle RTQ = 180° - 30° - 60°$
$= 90°$

$\angle QTS = 180° - 90°$
$= 90°$

$\angle TQS = 130° - 60°$
$= 70°$

$\angle RSQ = \angle TSQ$
$= 180° - 90° - 70°$
$= \mathbf{20°}$



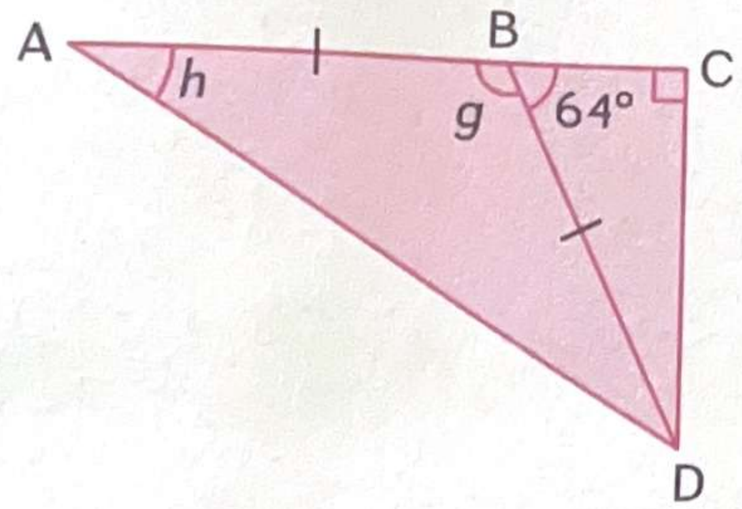


Let's Try! 3

(a) ABC is a straight line. ABD is an isosceles triangle. $\angle DBC = 64°$.

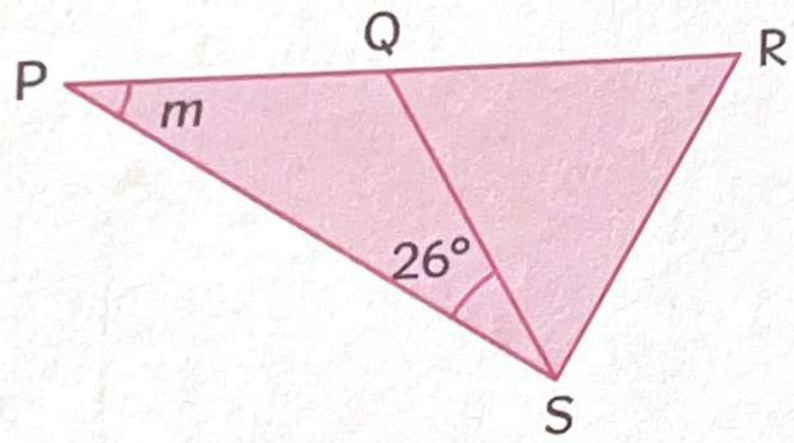
(i) Find $\angle g$. ____

(ii) Find $\angle h$. ____



(b) PQR is a straight line. QRS is an equilateral triangle. $\angle QSP = 26°$.

Find $\angle m$. ____



(c) PRS is an isosceles triangle. PST is a right-angled triangle.
$\angle PRS = 50°$. $\angle TPS = 12°$.

(i) Find $\angle RPS$. ____

(ii) Find $\angle RST$. ____