

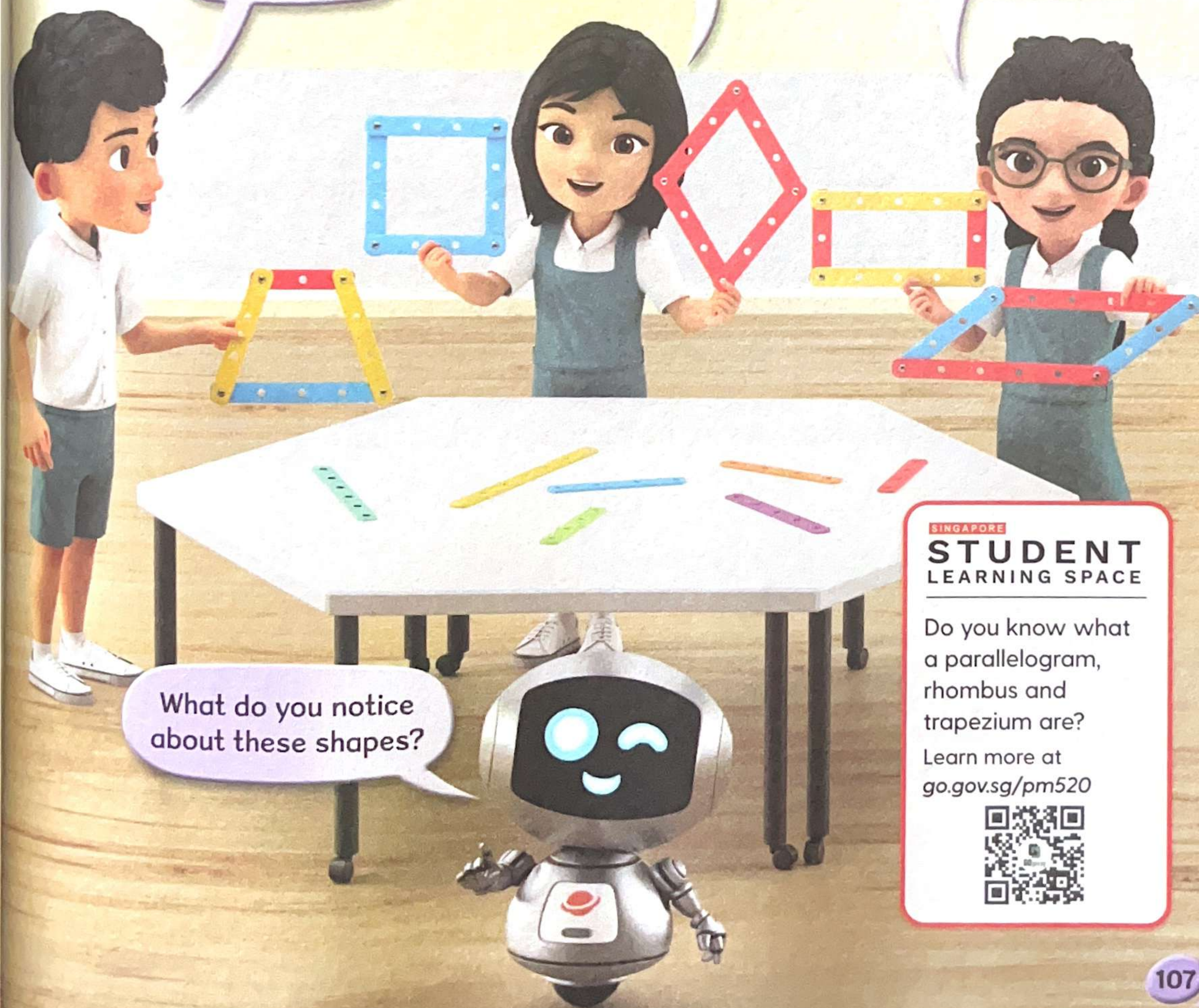
Properties of Parallelogram, Rhombus and Trapezium



My shape has a pair of parallel sides.

We used geostrips to make some shapes.

The opposite angles of my shapes are equal.



What do you notice about these shapes?

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Do you know what a parallelogram, rhombus and trapezium are?

Learn more at
go.gov.sg/pm520

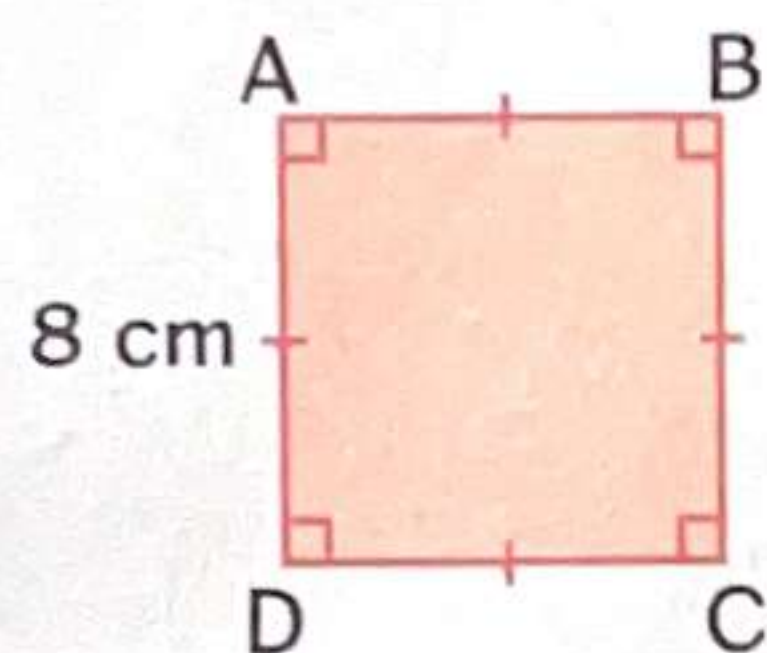


Properties of Parallelogram



Recall

- 1 ABCD is a **square**.

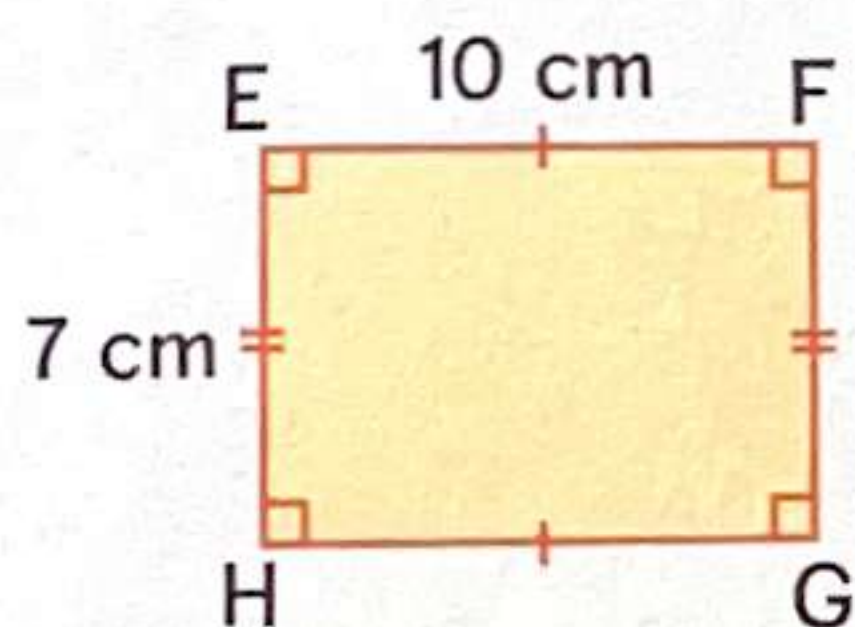


A square has

- (a) ☐ right angles.
- (b) ☐ equal sides.
- (c) ☐ pairs of opposite sides that are parallel.

In Square ABCD, the length of DC is cm.

- 2 EFGH is a **rectangle**.

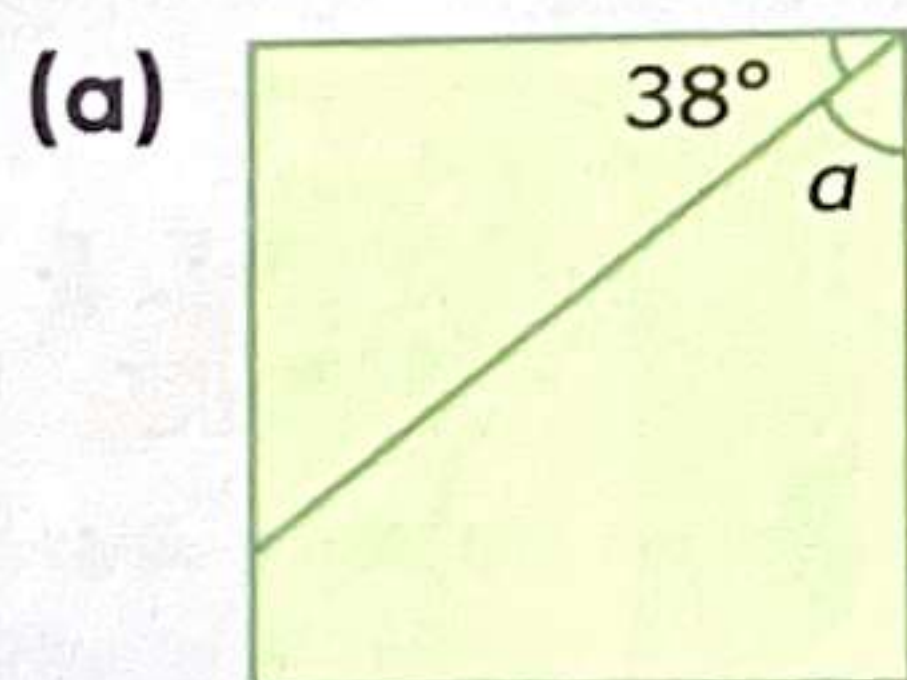


A rectangle has

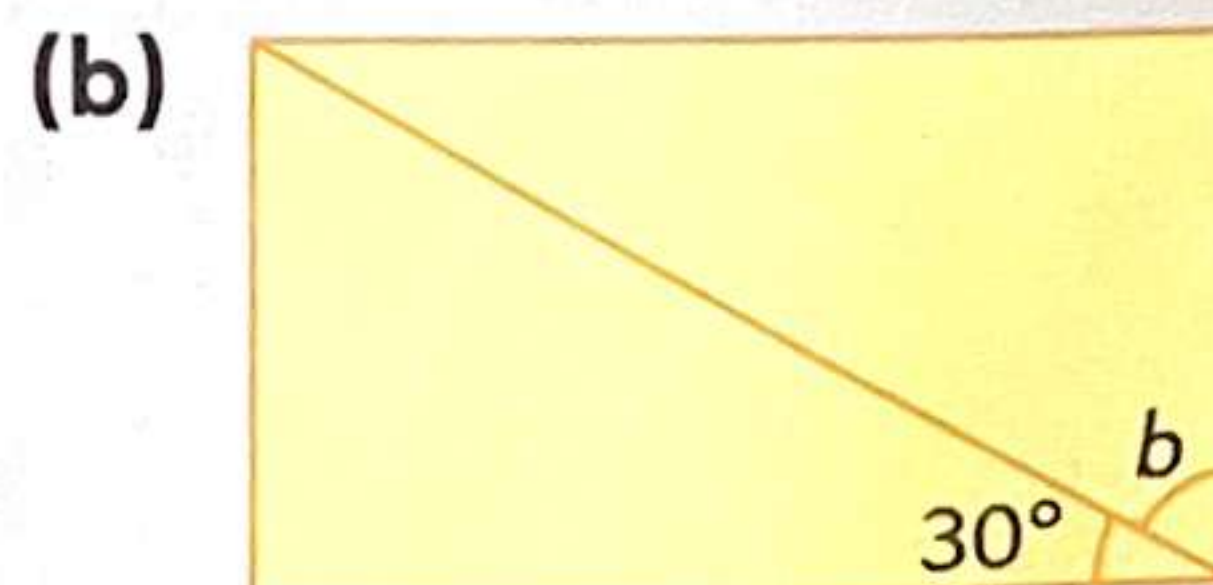
- (a) ☐ right angles.
- (b) ☐ pairs of opposite sides that are parallel.

In Rectangle EFGH, its length HG is cm and its breadth FG is cm.

- 3 Find the unknown angles in the rectangle and square.



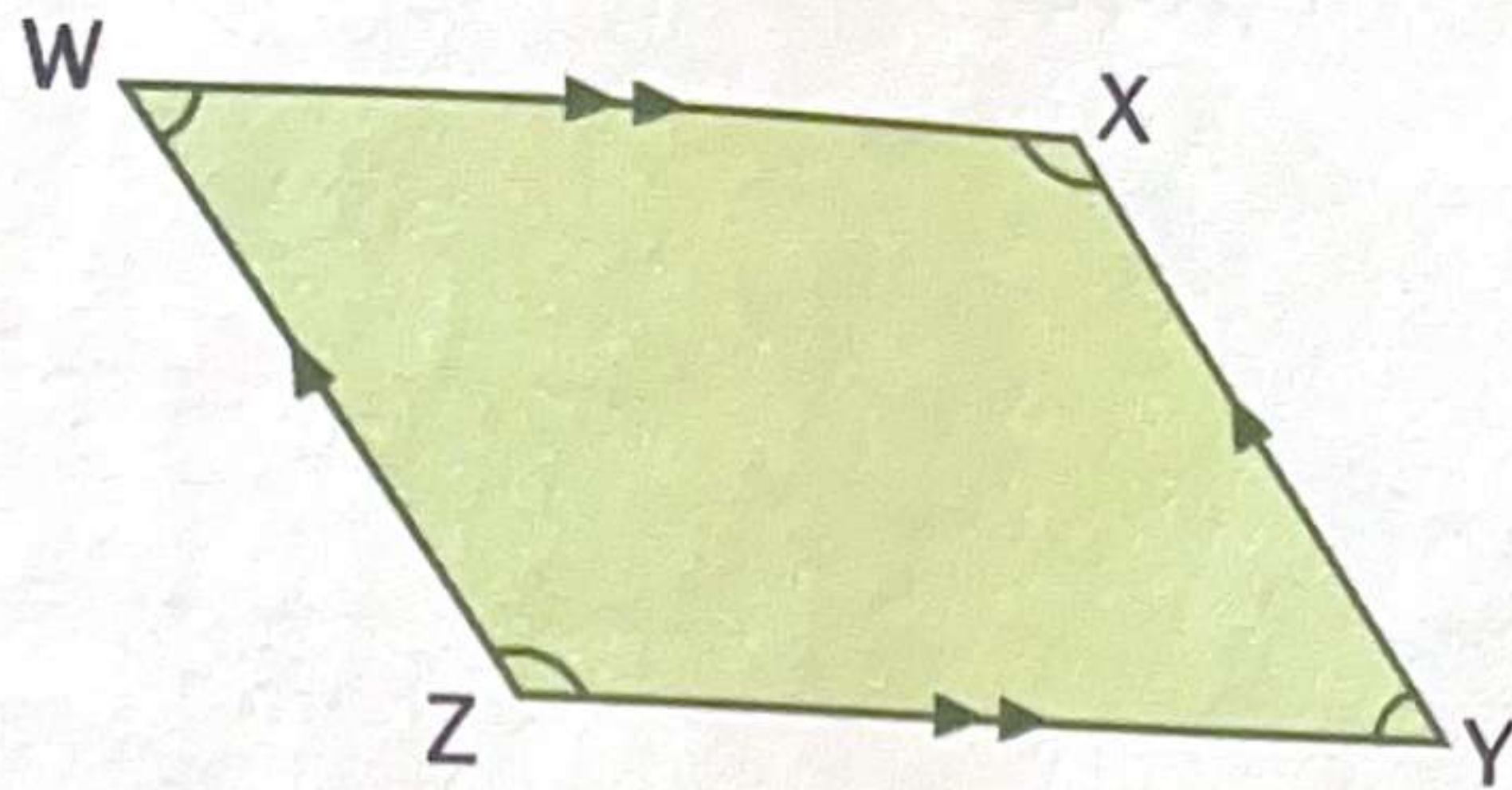
$\angle a =$



$\angle b =$

WXYZ is a parallelogram.

Identify the sides and angles of the parallelogram.



(a) $WX =$

(b) $WZ =$

(c) $WX \parallel$

(d) $WZ \parallel$

(e) $\angle ZWX = \angle$

(f) $\angle WXY = \angle$

(g) $\angle ZWX + \angle$ $= 180^\circ$

(h) $\angle ZWX + \angle$ $= 180^\circ$

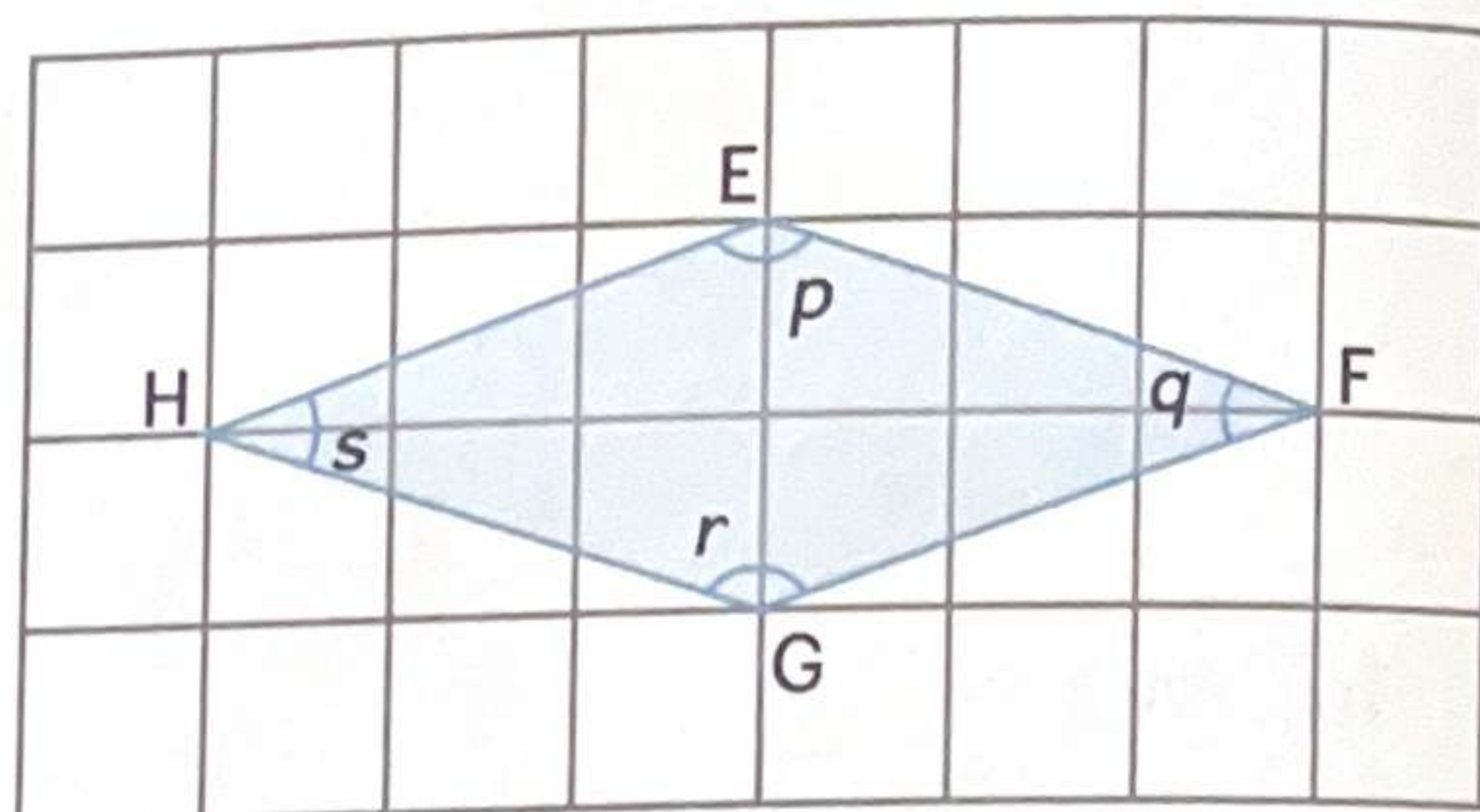
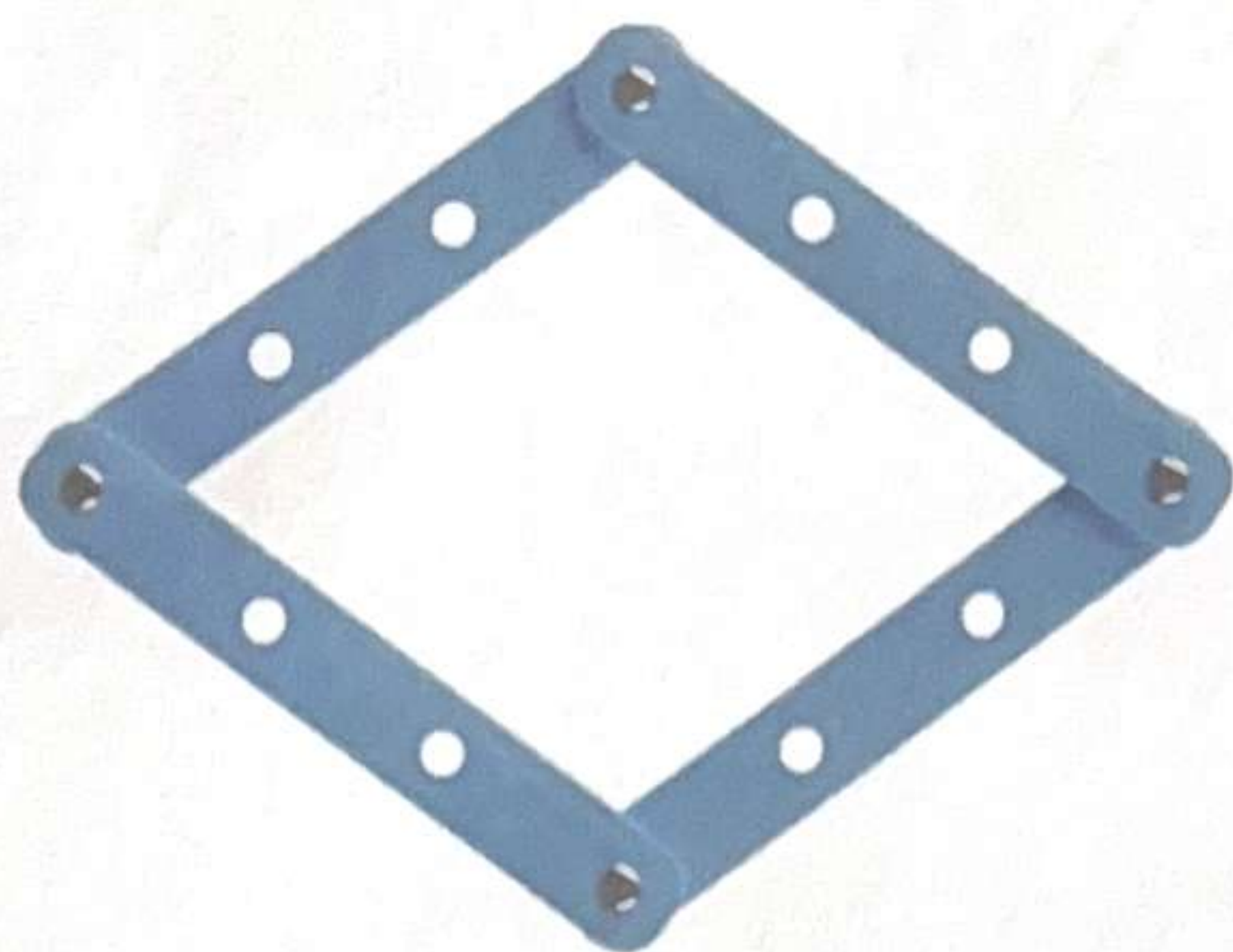
(i) $\angle XYZ + \angle$ $= 180^\circ$

(j) $\angle WZY + \angle$ $= 180^\circ$

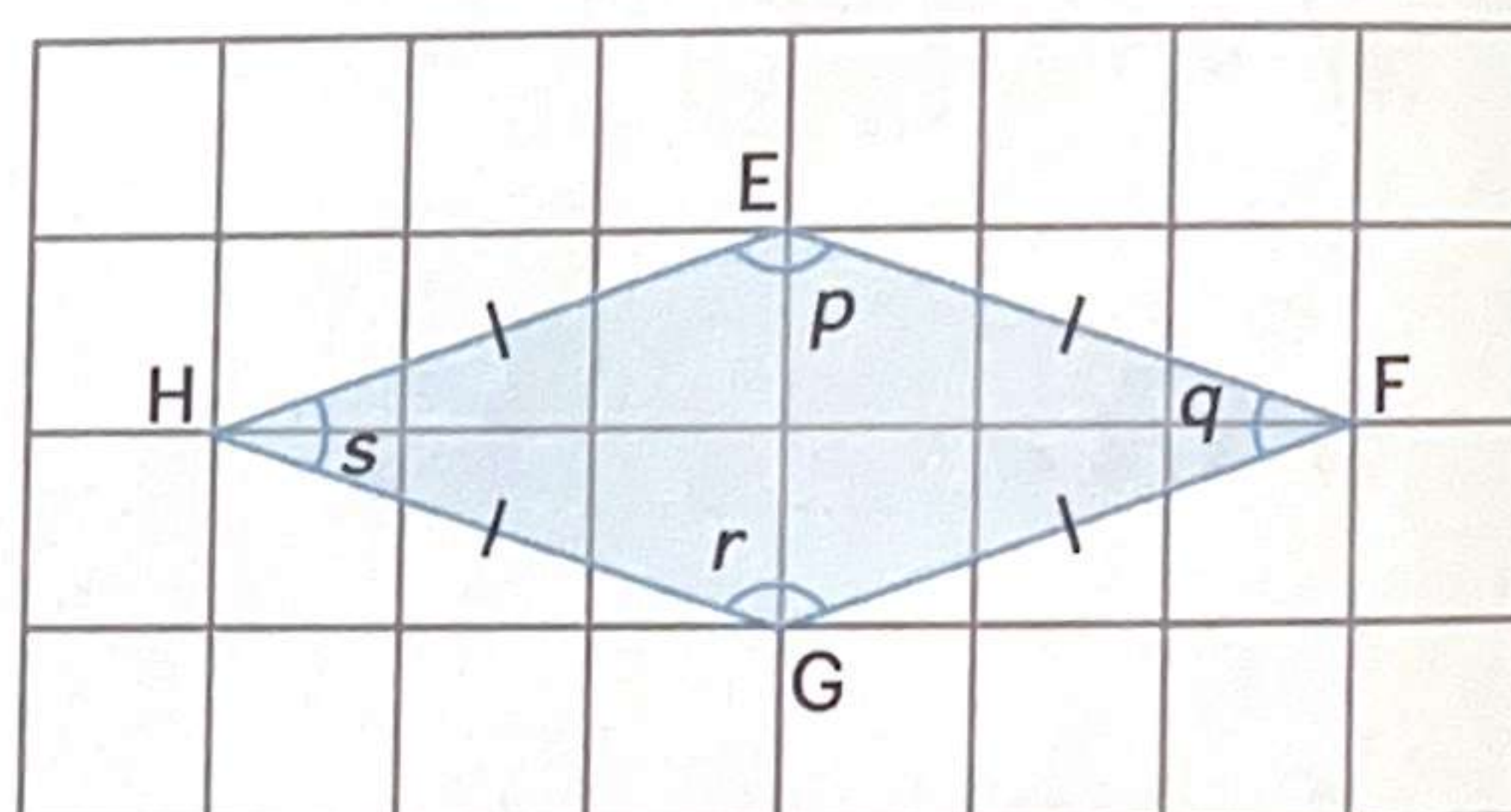


Properties of Rhombus

A **rhombus** is a parallelogram with four equal sides, two pairs of opposite sides that are parallel and opposite angles that are equal.



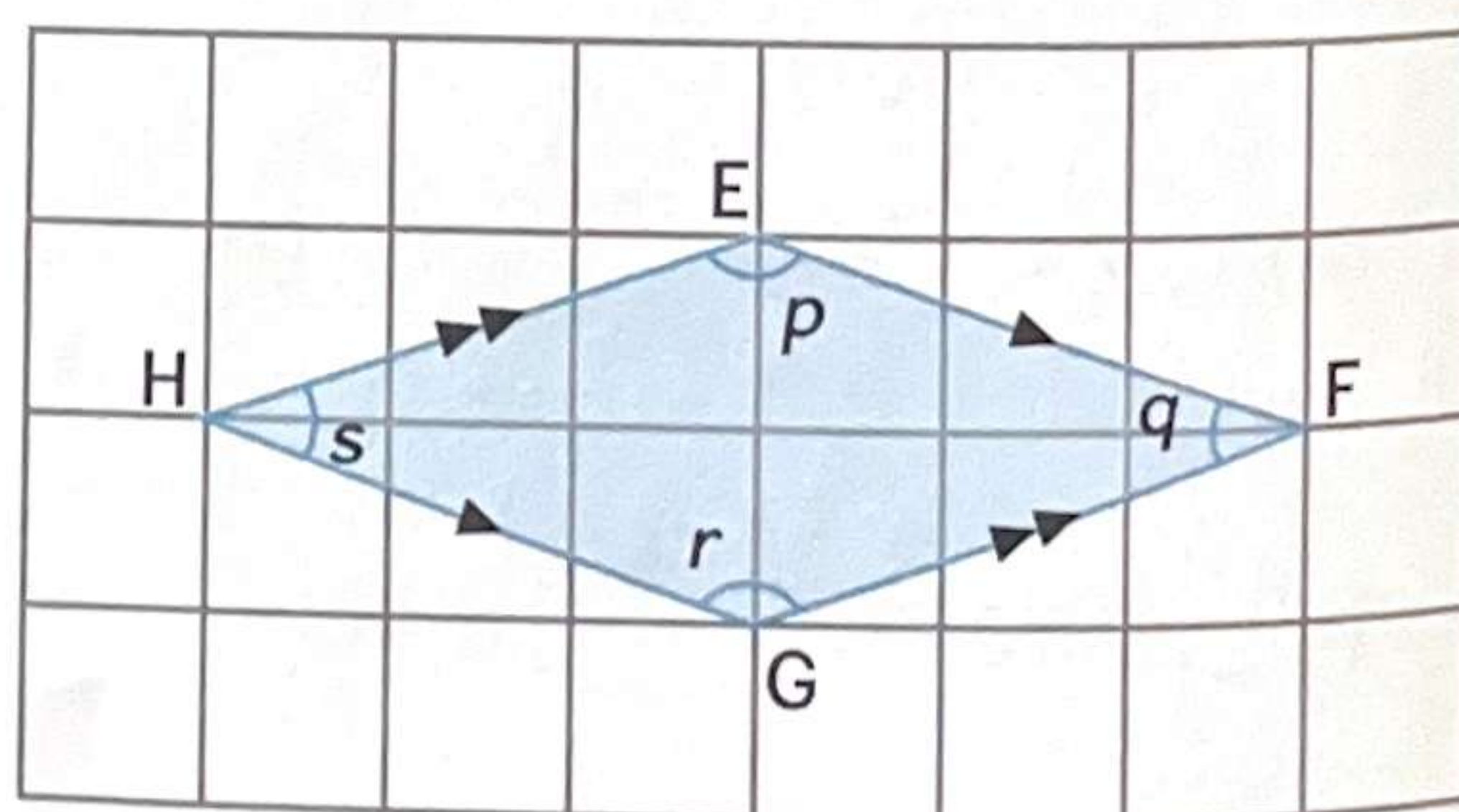
$$EF = FG = GH = EH$$



A rhombus has **4 equal sides**.

$$EF \parallel HG$$

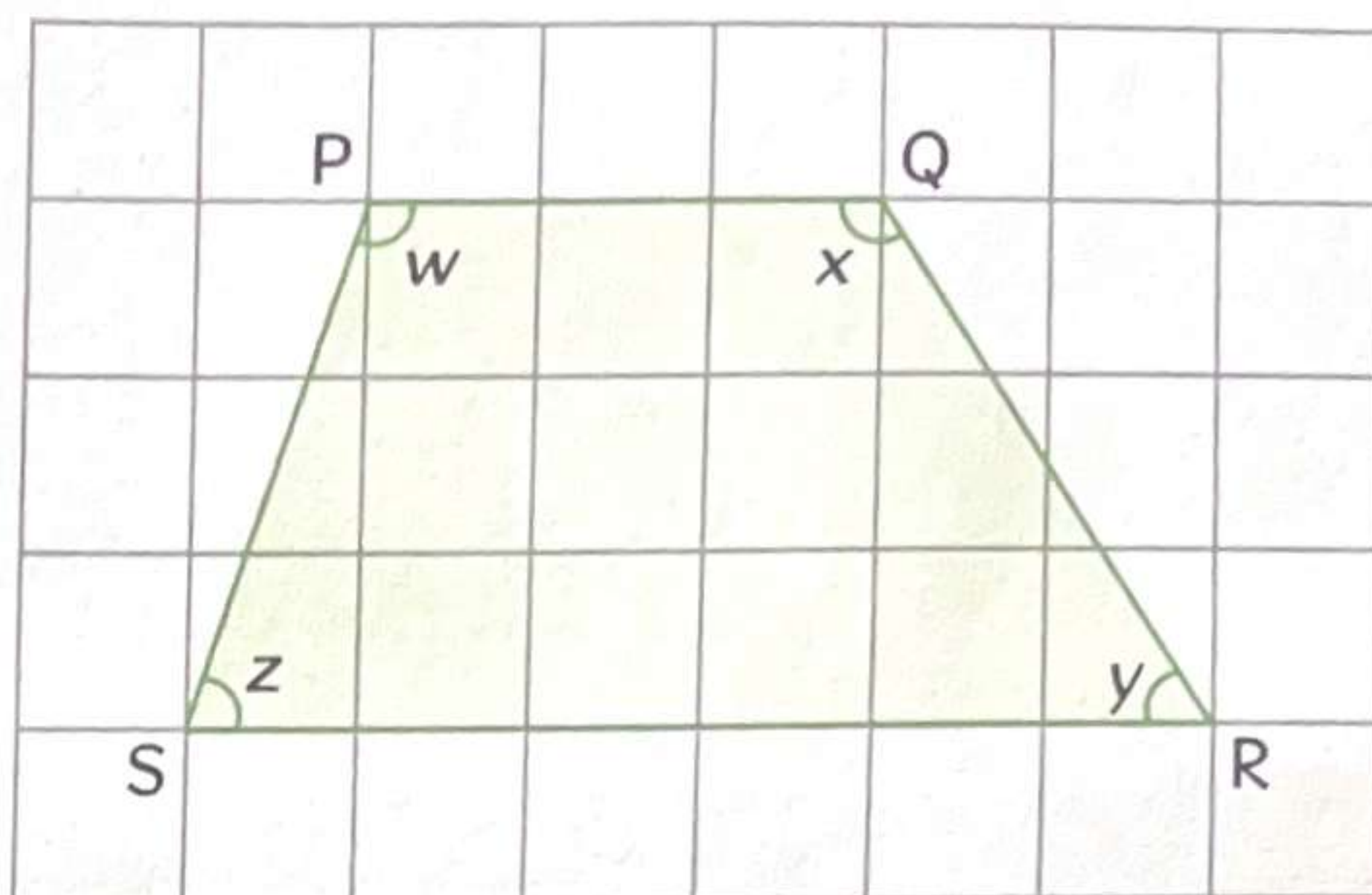
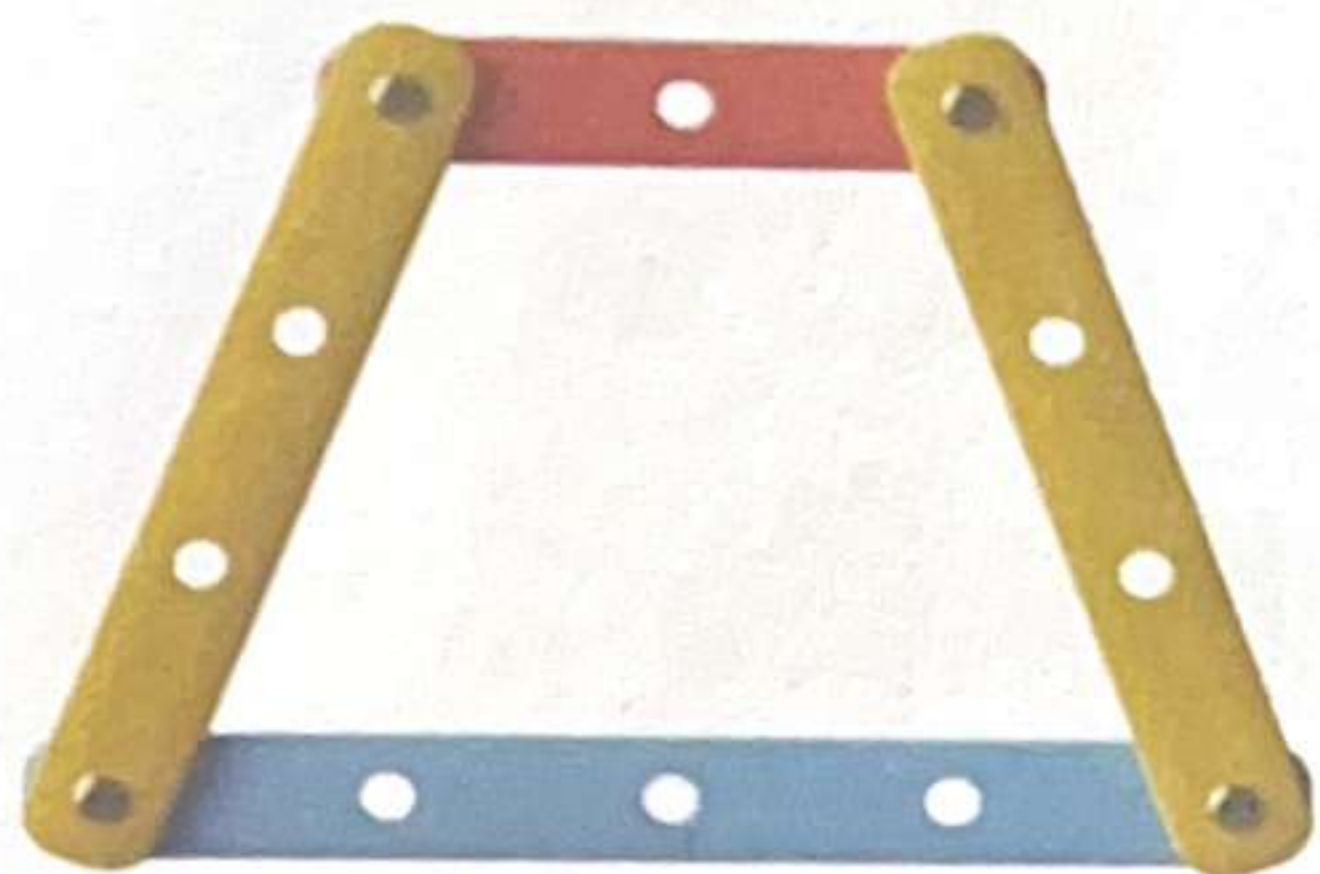
$$HE \parallel GF$$



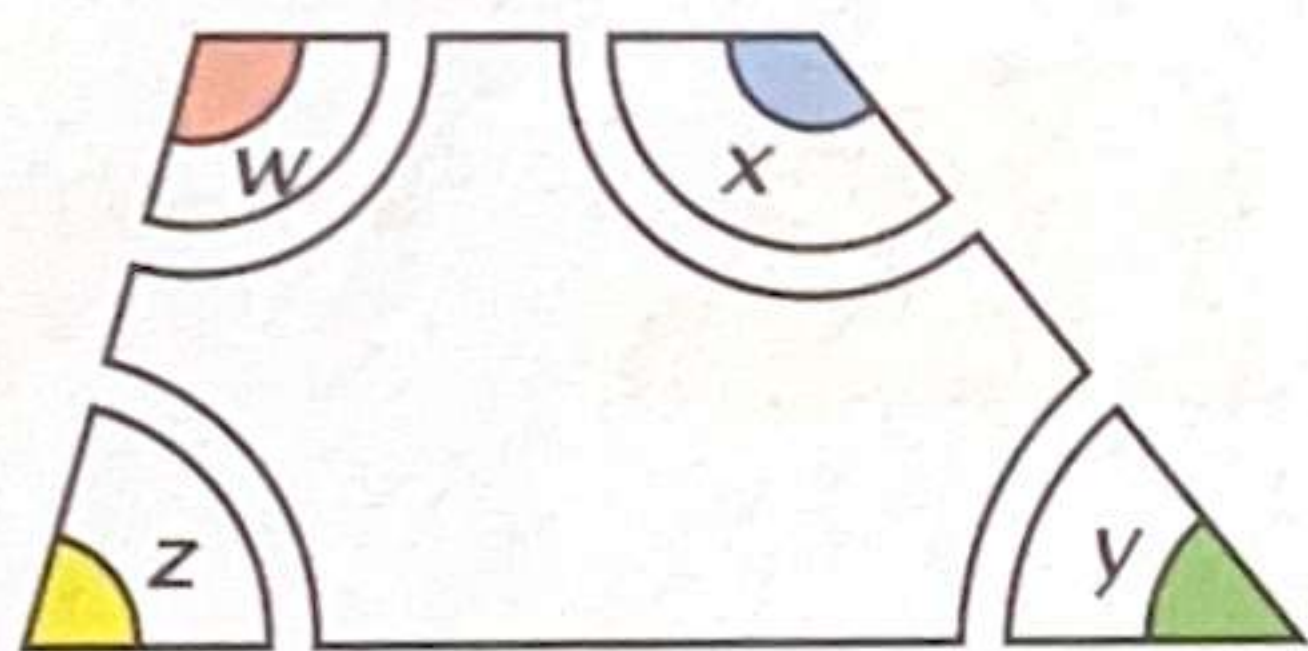
The **2 pairs of opposite sides** of a rhombus are **parallel**.

Properties of Trapezium

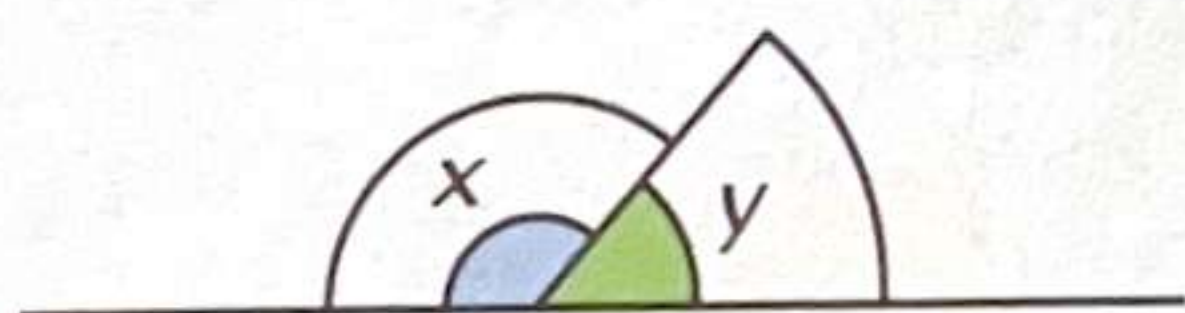
A **trapezium** is a quadrilateral with one pair of parallel sides.



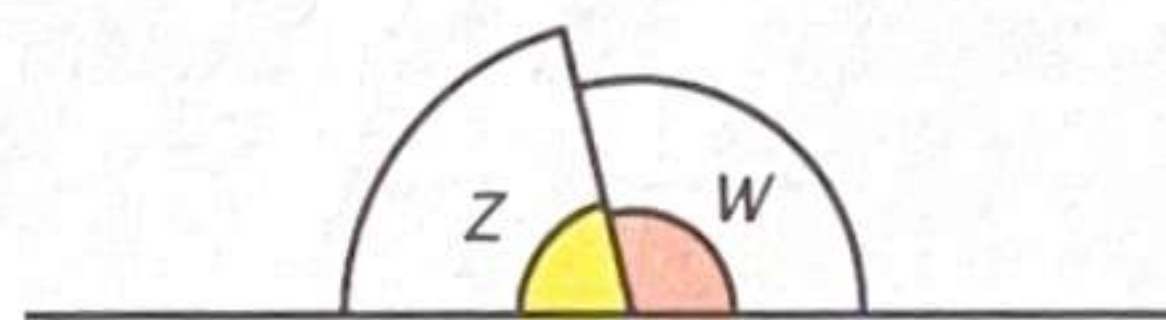
Cut the angles from a trapezium cutout at $\angle w$, $\angle x$, $\angle y$ and $\angle z$.



Arrange $\angle x$ and $\angle y$ on a straight line. Do the same for $\angle z$ and $\angle w$.

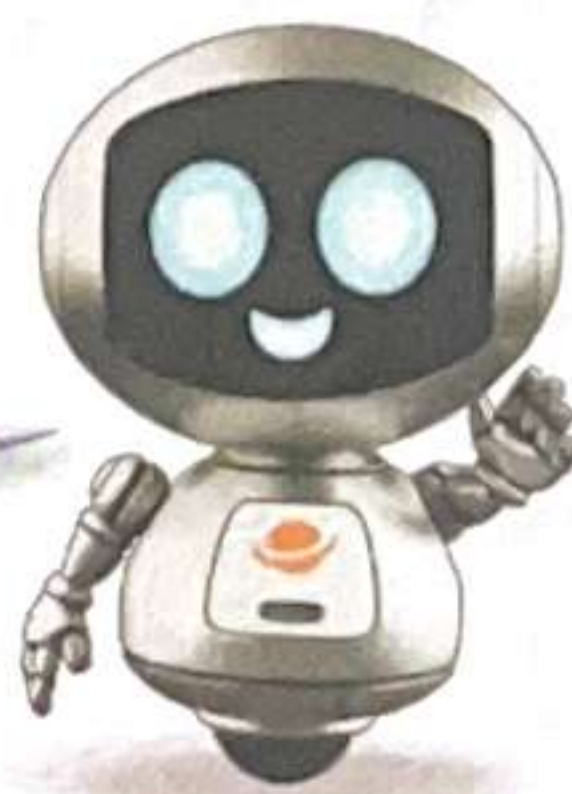


$$\angle x + \angle y = 180^\circ$$



$$\angle z + \angle w = 180^\circ$$

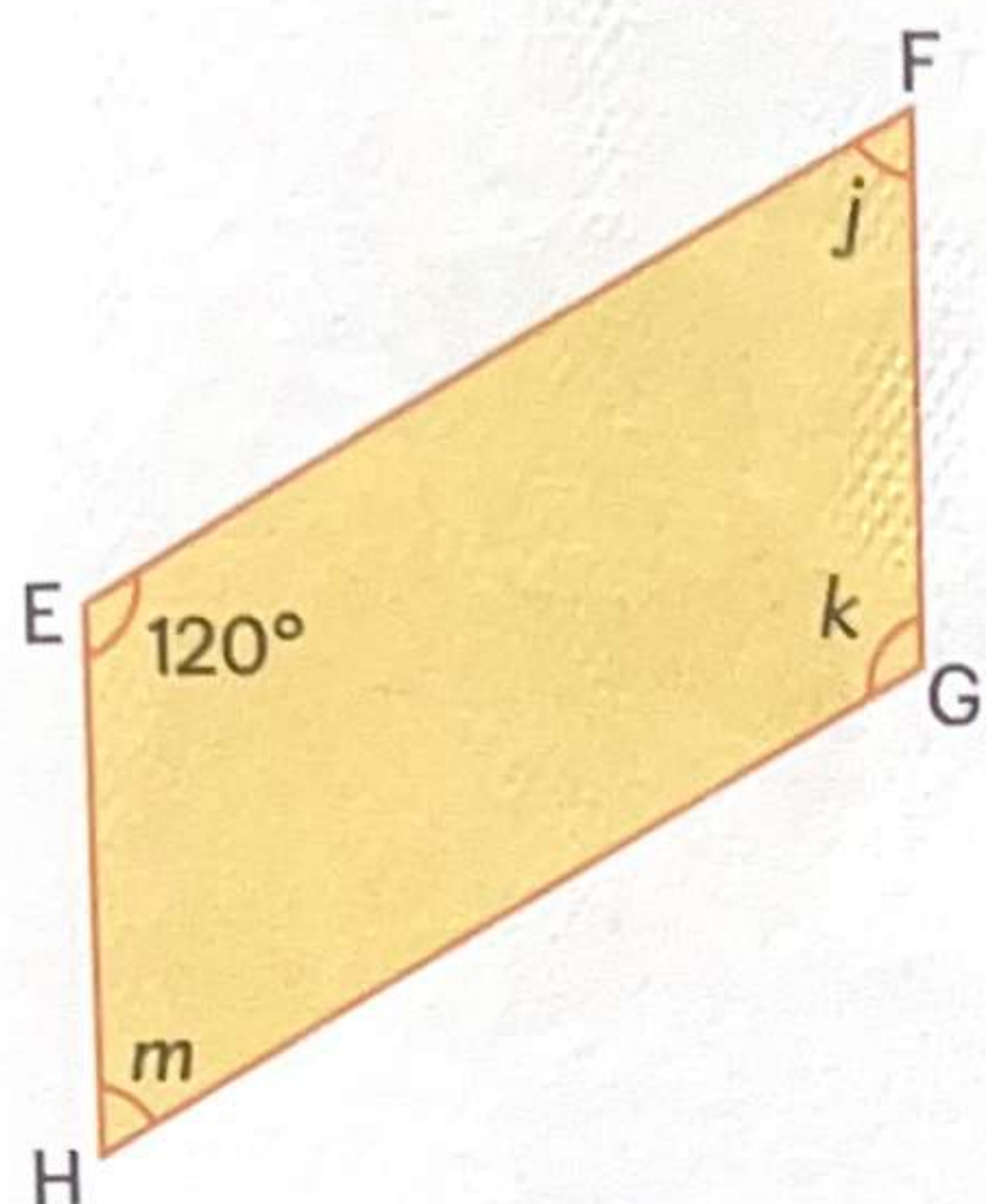
Is $\angle w + \angle x = 180^\circ$?
Is $\angle z + \angle y = 180^\circ$?



The **sum of angles** between the **pair of parallel sides** of a trapezium is **180°** .

Finding Unknown Angles

EFGH is a parallelogram. $\angle HEF = 120^\circ$.
Find $\angle j$, $\angle k$ and $\angle m$.



$$\angle k = 120^\circ$$

$$\begin{aligned}\angle m &= 180^\circ - 120^\circ \\ &= 60^\circ\end{aligned}$$

$$\begin{aligned}\angle j &= \angle m \\ &= 60^\circ\end{aligned}$$

The opposite angles of a parallelogram are equal.

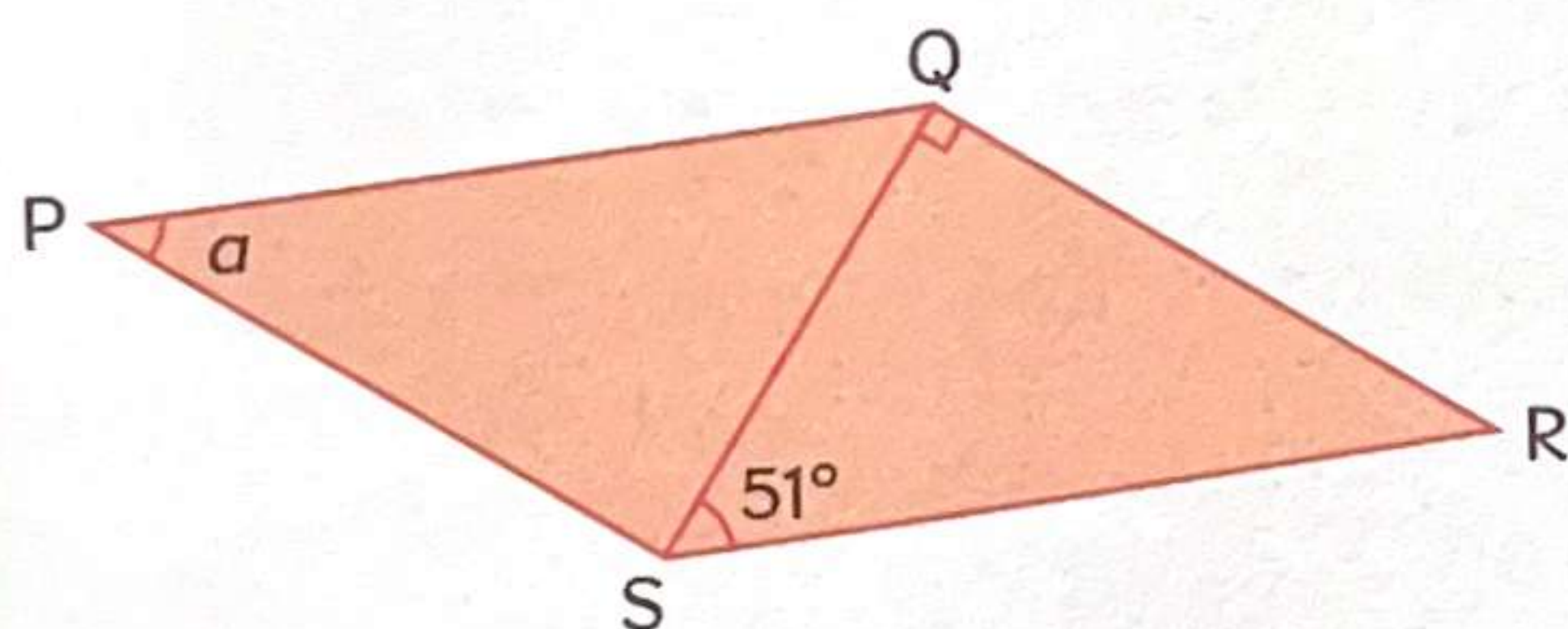
$$\angle j = \angle m \text{ and } \angle HEF = \angle k.$$



The sum of angles between each pair of parallel sides is 180° .



PQRS is a parallelogram. $\angle QSR = 51^\circ$. Find $\angle a$.



$$\begin{aligned}\angle QRS &= 180^\circ - 90^\circ - 51^\circ \\ &= 39^\circ\end{aligned}$$

$$\begin{aligned}\angle a &= \angle QRS \\ &= 39^\circ\end{aligned}$$

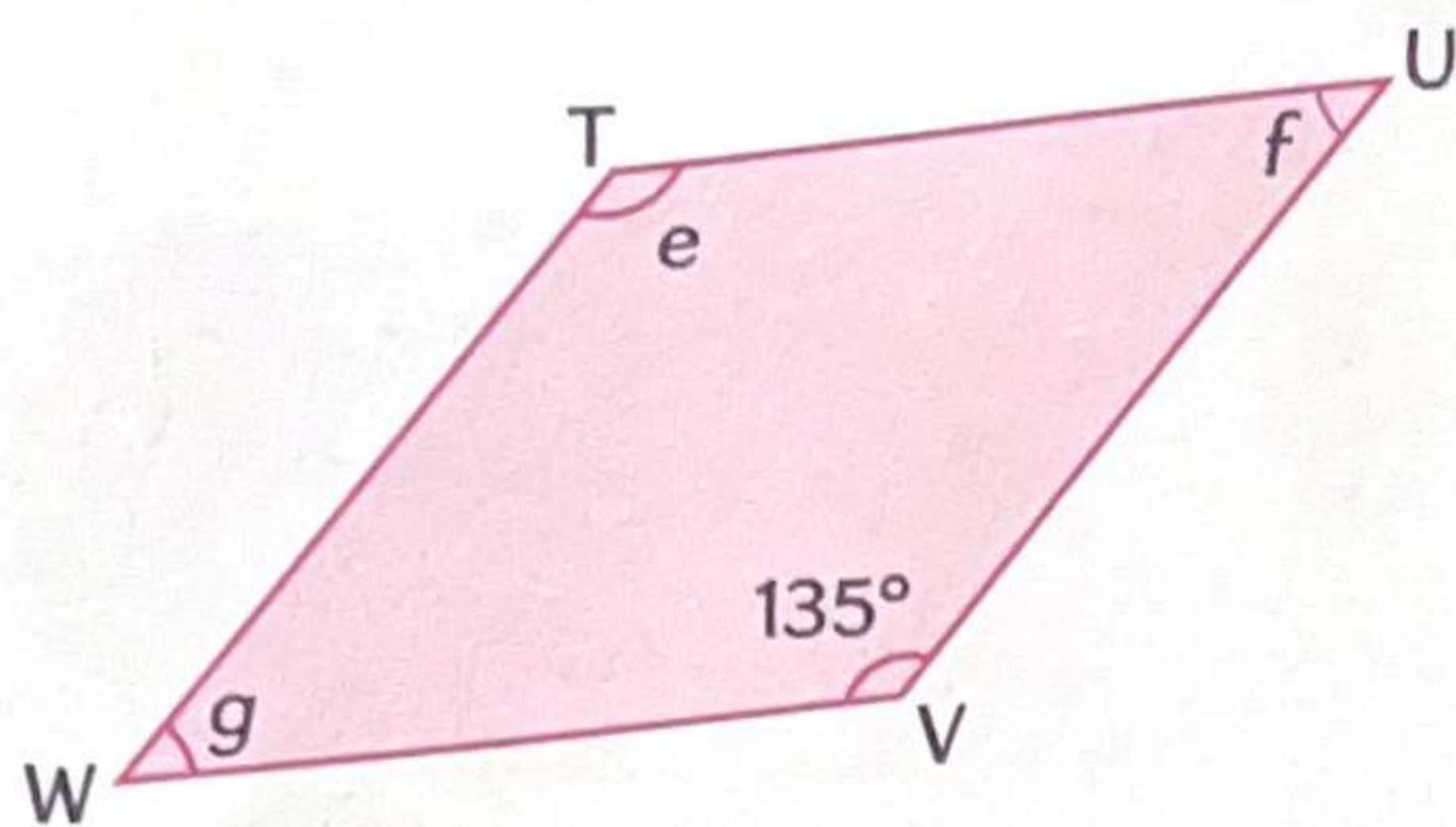
The sum of angles in a triangle is 180° .



The opposite angles of a parallelogram are equal.



TUVW is a rhombus. $\angle UVW = 135^\circ$. Find $\angle e$, $\angle f$ and $\angle g$.



The opposite angles of a rhombus are equal.

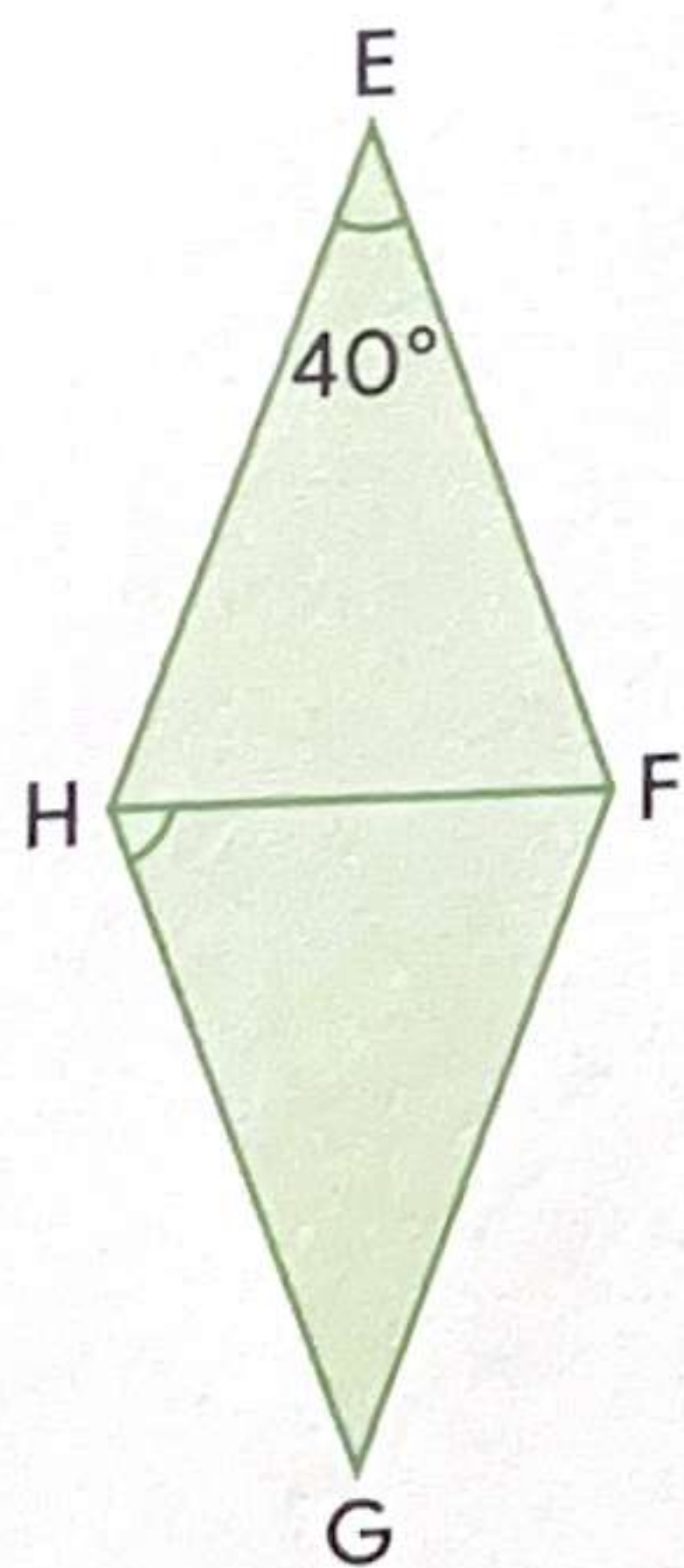


$$\begin{aligned}\angle e &= \angle UVW \\ &= 135^\circ\end{aligned}$$

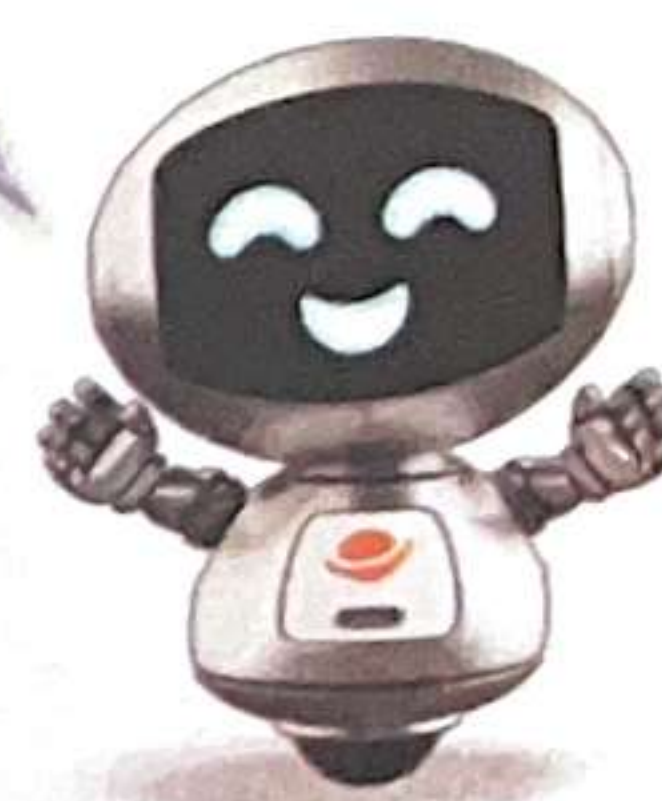
$$\begin{aligned}\angle f &= 180^\circ - 135^\circ \\ &= 45^\circ\end{aligned}$$

$$\begin{aligned}\angle g &= \angle f \\ &= 45^\circ\end{aligned}$$

EFGH is a rhombus. $\angle HEF = 40^\circ$. Find $\angle GHF$.



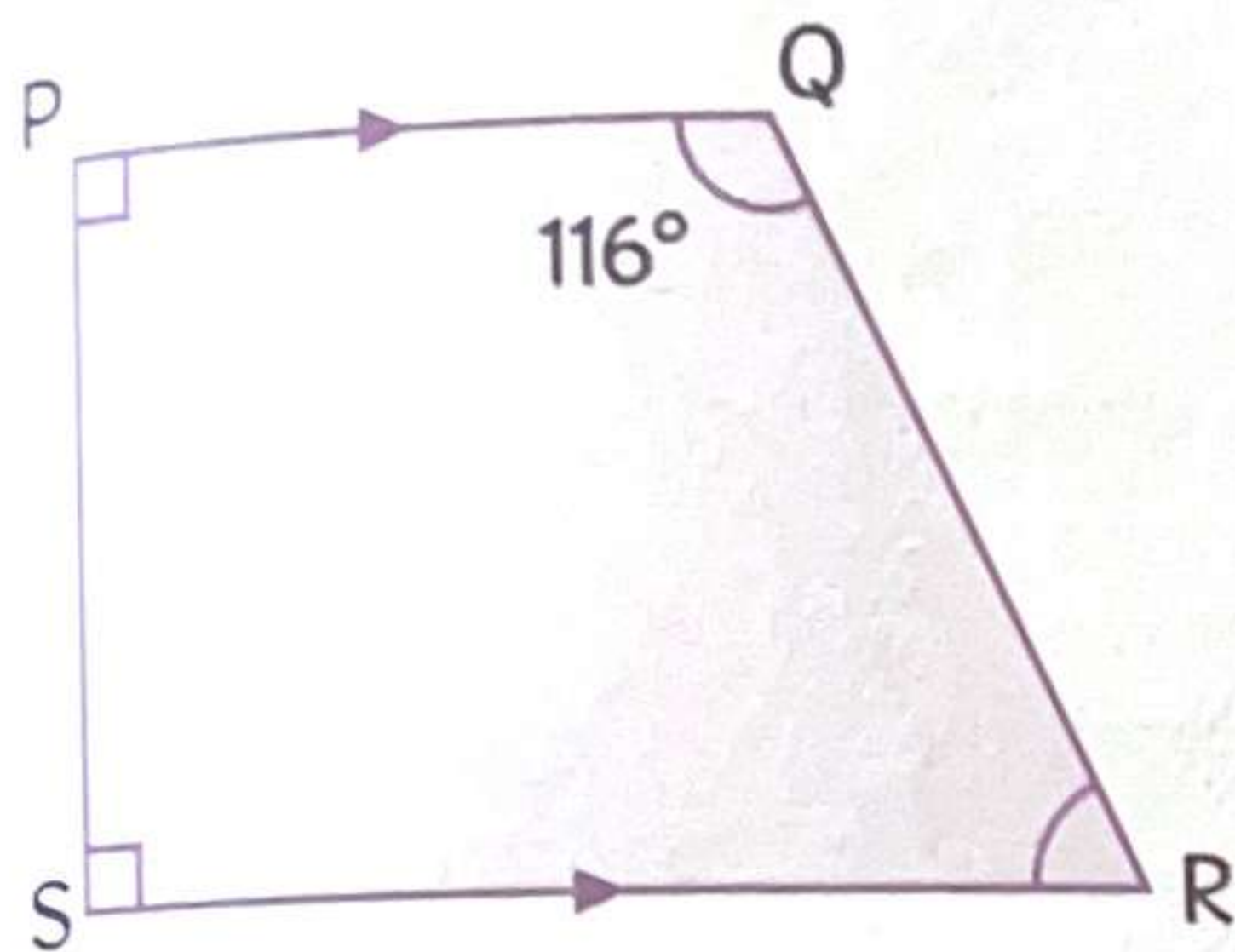
Which property of the rhombus do we need to apply?



$$\begin{aligned}\angle FGH &= \angle HEF \\ &= 40^\circ\end{aligned}$$

$$\begin{aligned}180^\circ - 40^\circ &= 140^\circ \\ \angle GHF &= 140^\circ \div 2 \\ &= 70^\circ\end{aligned}$$

PQRS is a trapezium. $PQ \parallel RS$. Find $\angle QRS$.

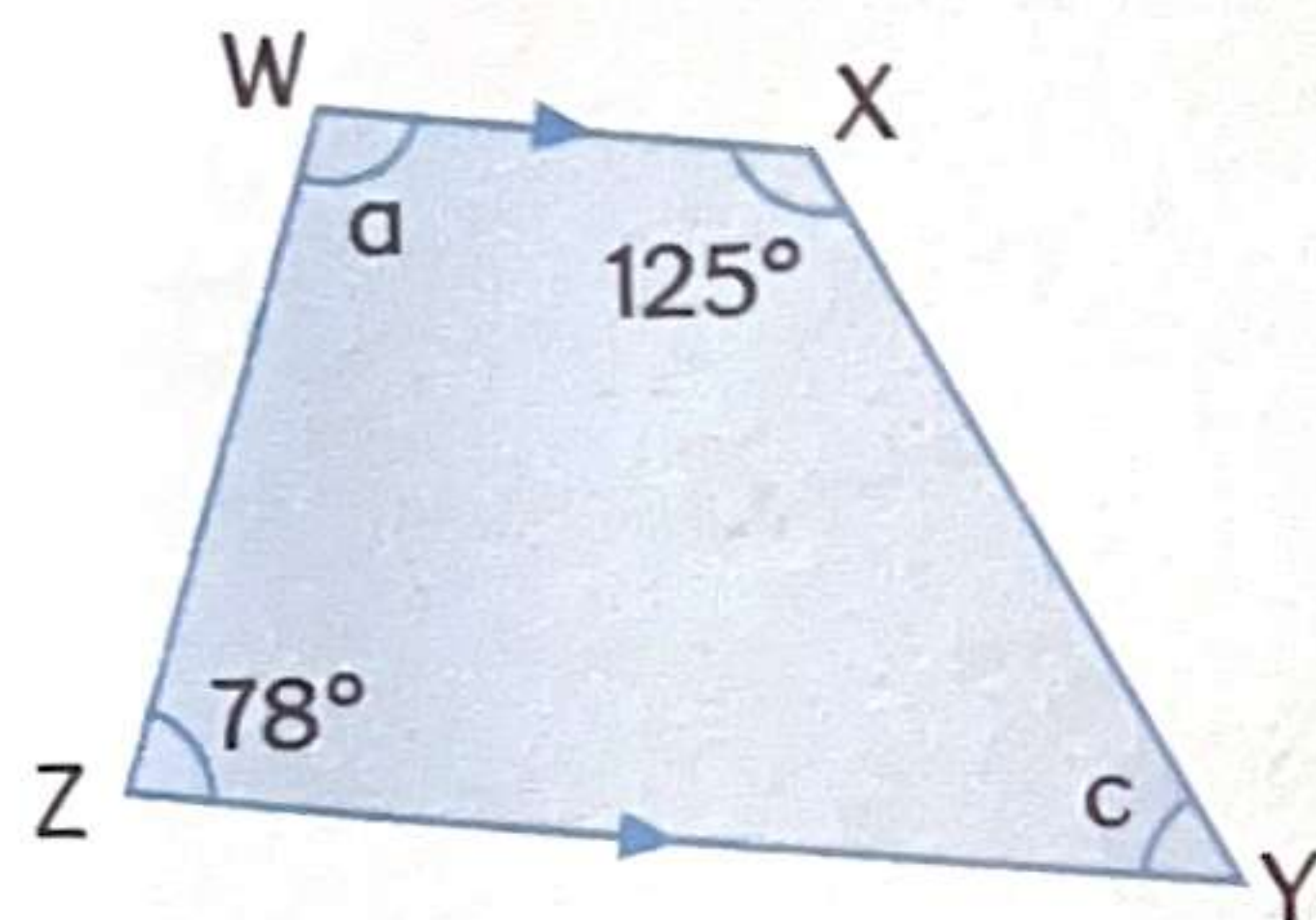


$$\begin{aligned}\angle QRS &= 180^\circ - 116^\circ \\ &= \mathbf{64^\circ}\end{aligned}$$

The sum of angles between the pair of parallel sides is 180° .



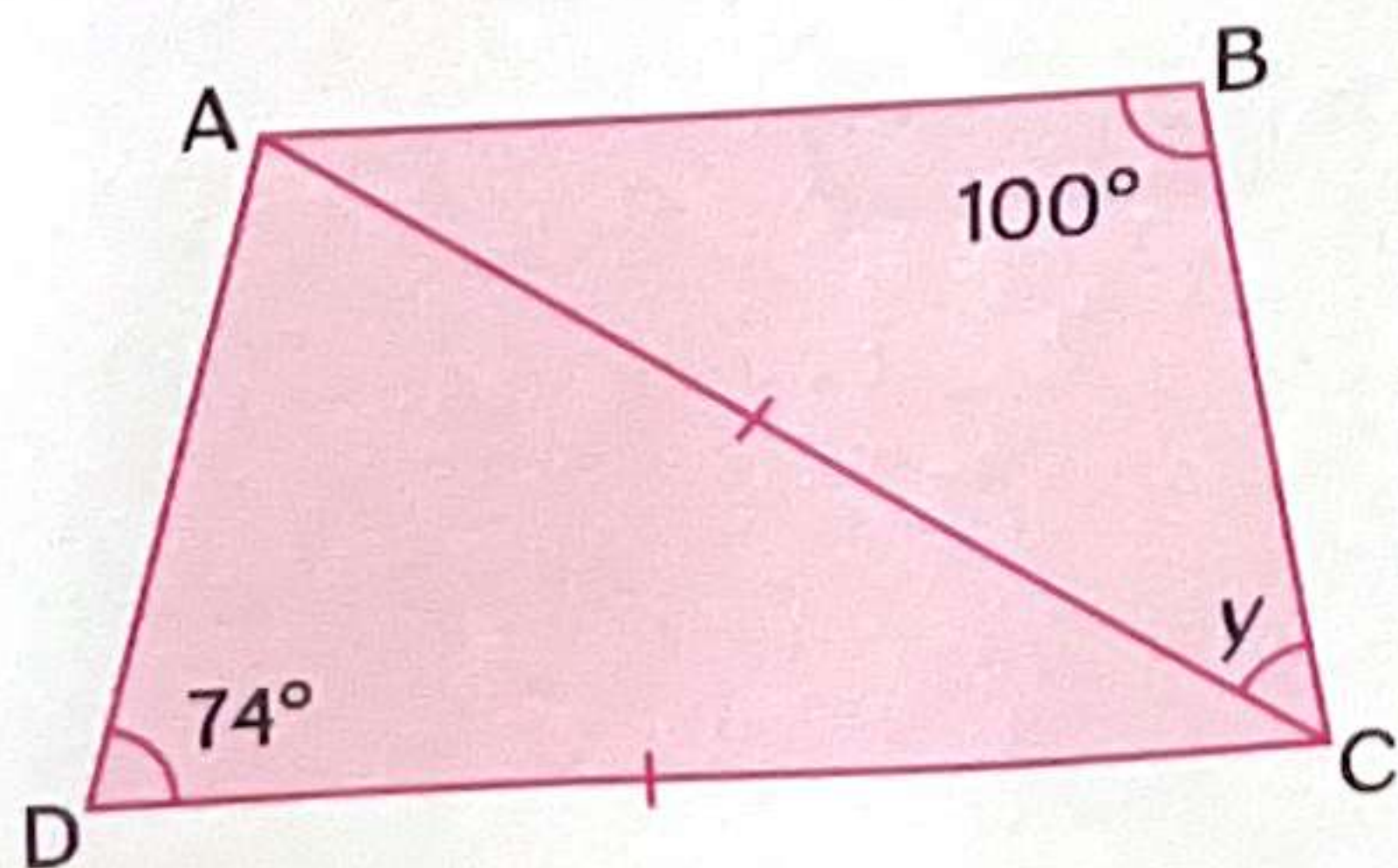
WXYZ is a trapezium. Find $\angle a$ and $\angle c$.



$$\begin{aligned}\angle a &= 180^\circ - 78^\circ \\ &= \mathbf{102^\circ}\end{aligned}$$

$$\begin{aligned}\angle c &= 180^\circ - 125^\circ \\ &= \mathbf{55^\circ}\end{aligned}$$

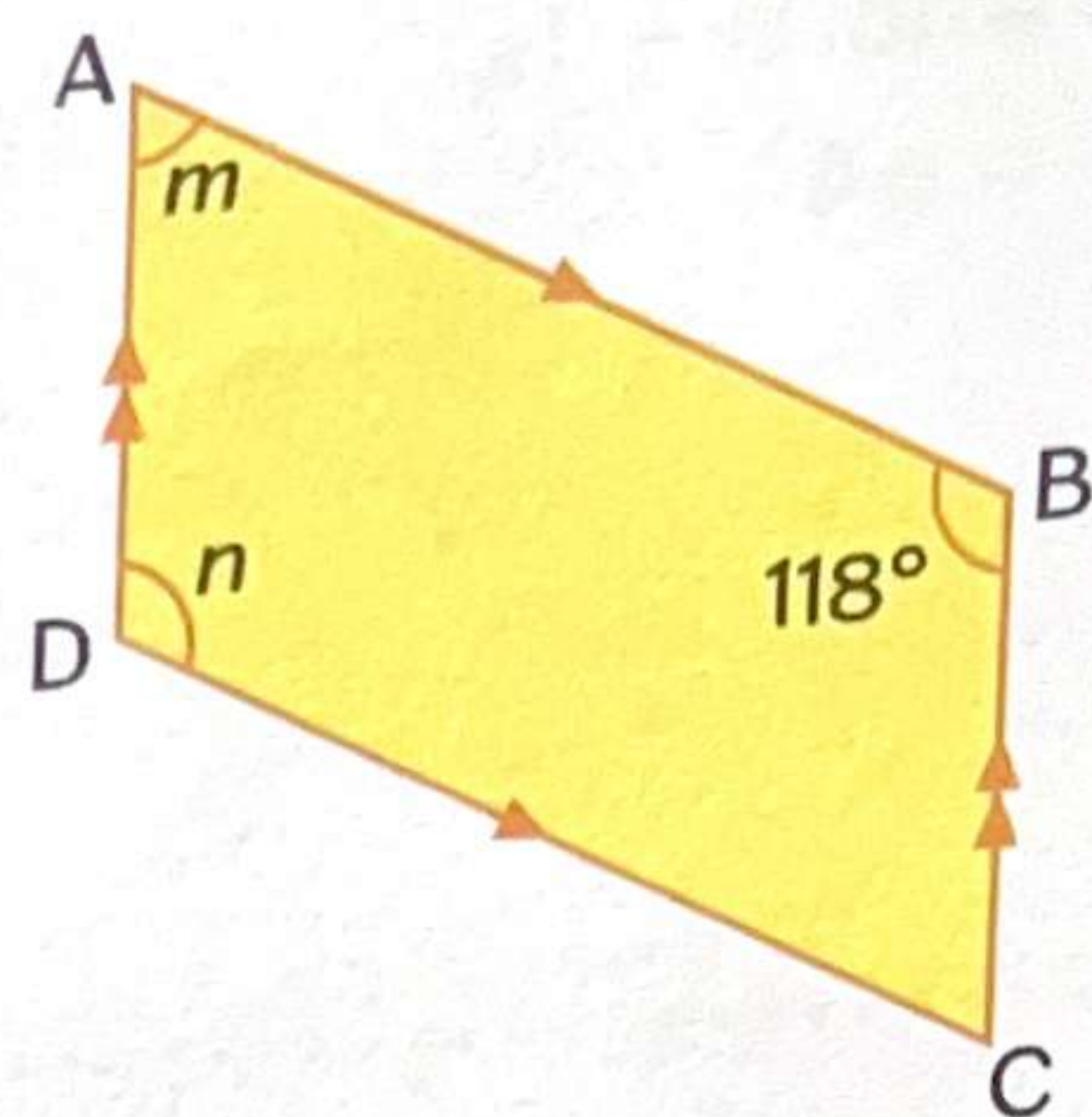
ABCD is a trapezium. ACD is an isosceles triangle. $\angle CDA = 74^\circ$. $\angle ABC = 100^\circ$. $AB \parallel DC$. Find $\angle y$.



$$\begin{aligned}\angle ACD &= 180^\circ - 74^\circ - 74^\circ \\ &= \mathbf{32^\circ}\end{aligned}$$

$$\begin{aligned}\angle y &= 180^\circ - 100^\circ - 32^\circ \\ &= \mathbf{48^\circ}\end{aligned}$$

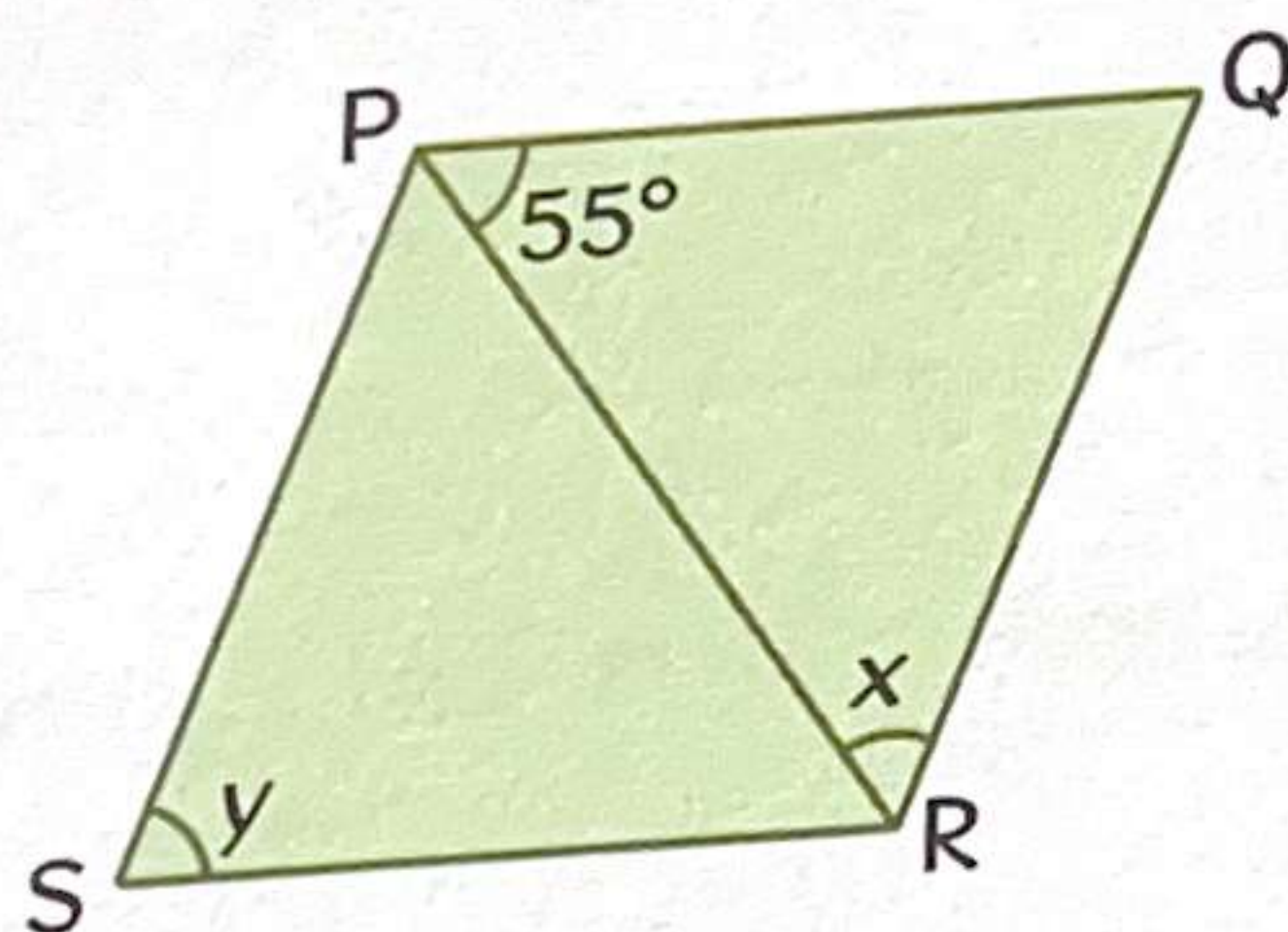
- (a) ABCD is a parallelogram. $\angle ABC = 118^\circ$.
Find $\angle m$ and $\angle n$.



$\angle m =$

$\angle n =$

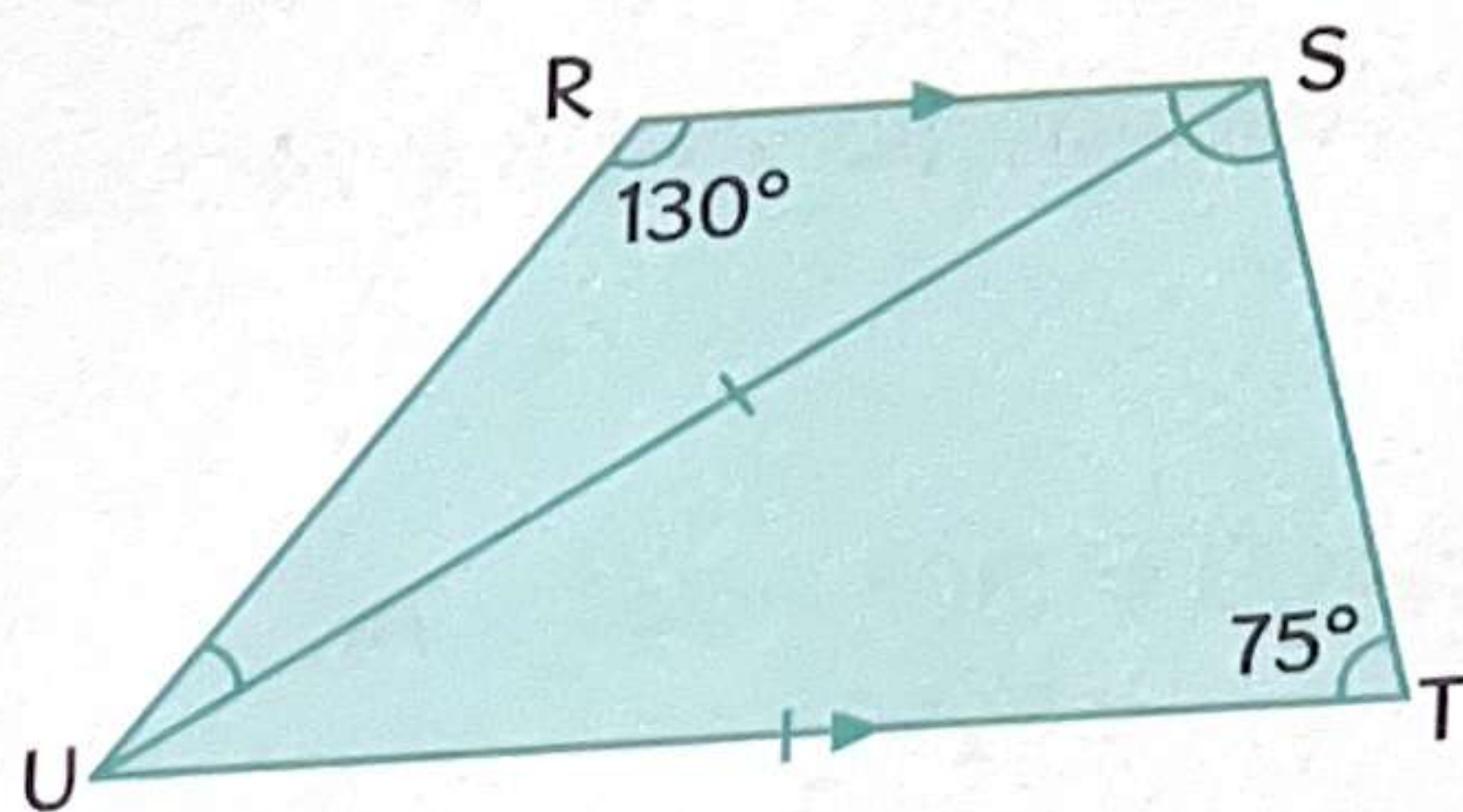
- (b) PQRS is a rhombus. $\angle RPQ = 55^\circ$.
Find $\angle x$ and $\angle y$.



$\angle x =$

$\angle y =$

- (c) RSTU is a trapezium. SUT is an isosceles triangle.
Find $\angle RST$ and $\angle SUR$.



$\angle RST =$

$\angle SUR =$