# 10 Angles


There are 3 marked angles on the straight line. The sum of the marked angles is 180°.

What is this tool that I am holding?

Yellow Box Junction

Bridge

ONE WAY

What are the types of angles we can find in this yellow box junction?

SINGAPORE
**STUDENT LEARNING SPACE**

Do you know what angle properties are?

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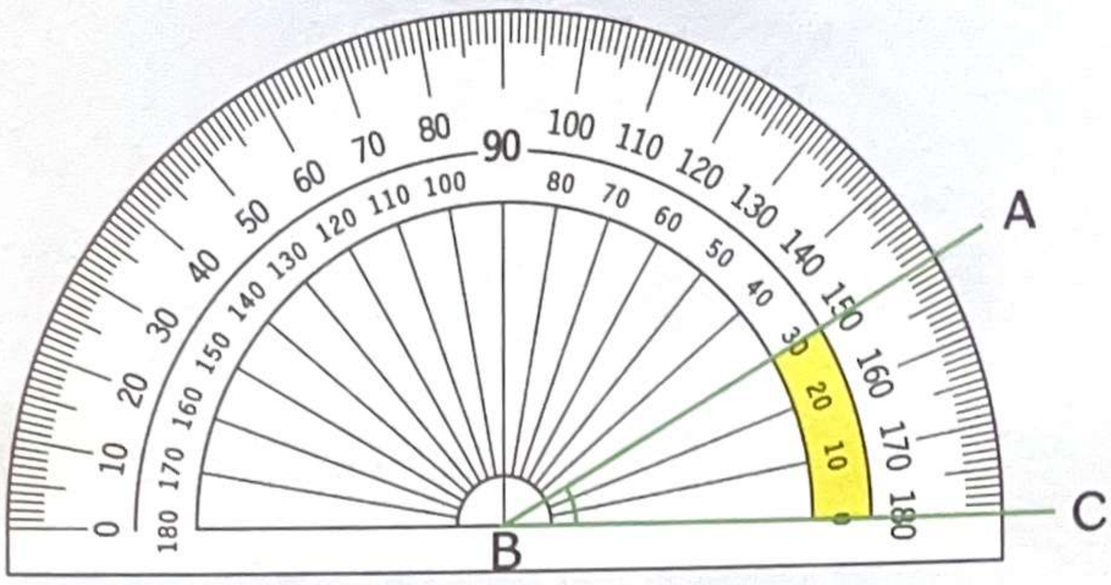
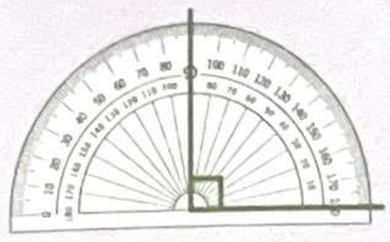
# Angles on a Straight Line

## Recall

**1**



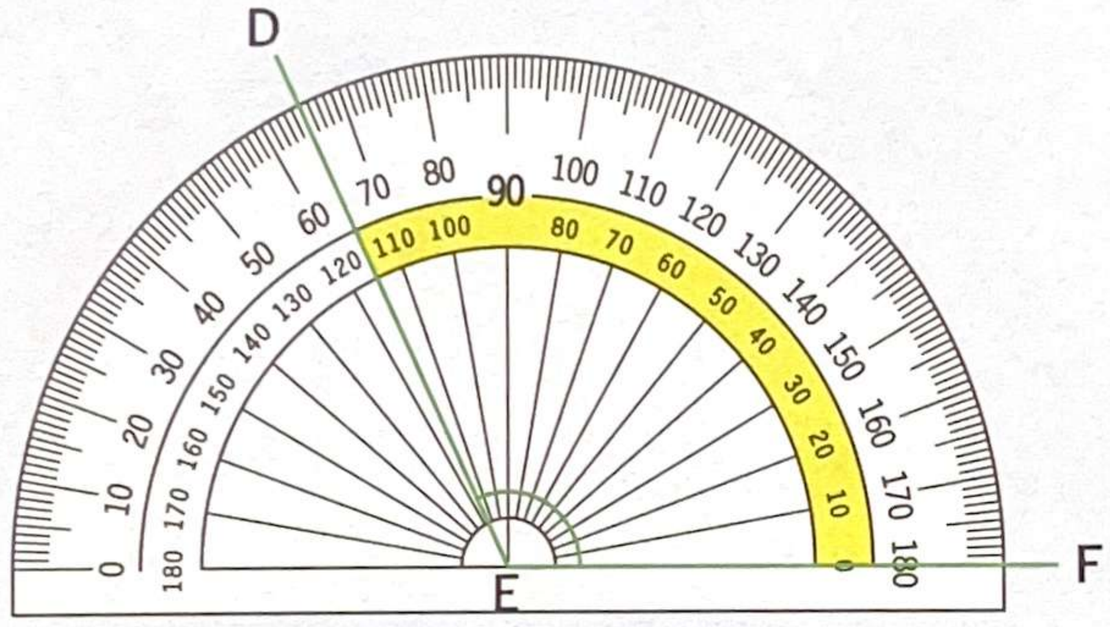



Right angle = 90°.

(a) $\angle ABC =$ ☐°

(b) $\angle ABC$ is less than ☐°. It is an ☐ angle.

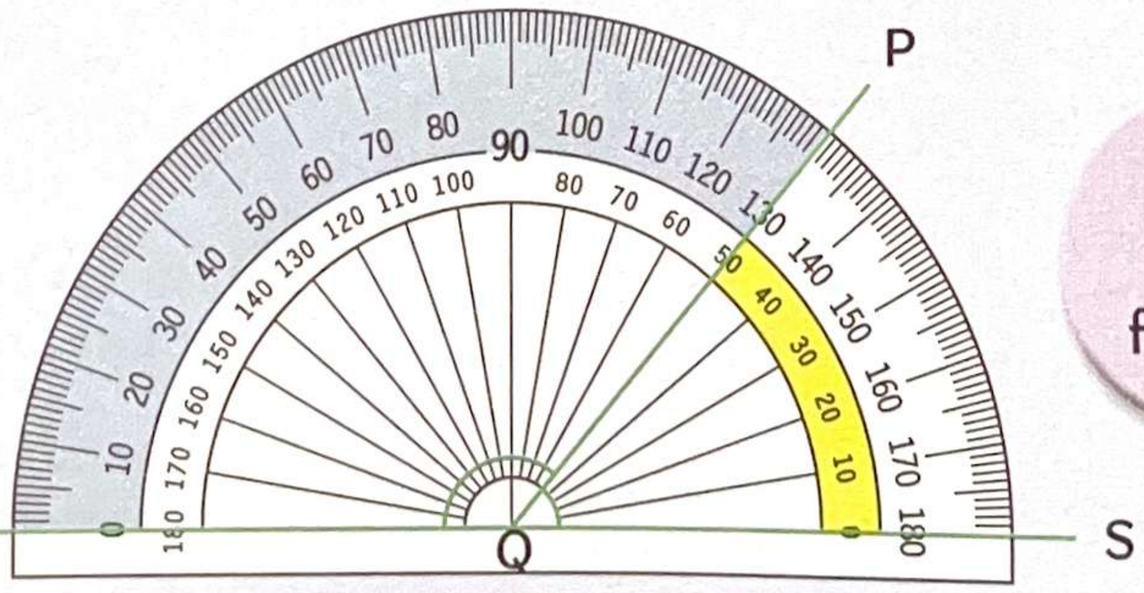
**2**




(a) $\angle DEF =$ ☐°

(b) $\angle DEF$ is more than ☐°. It is an ☐ angle.

**3**




(a) $\angle PQR =$ ☐°

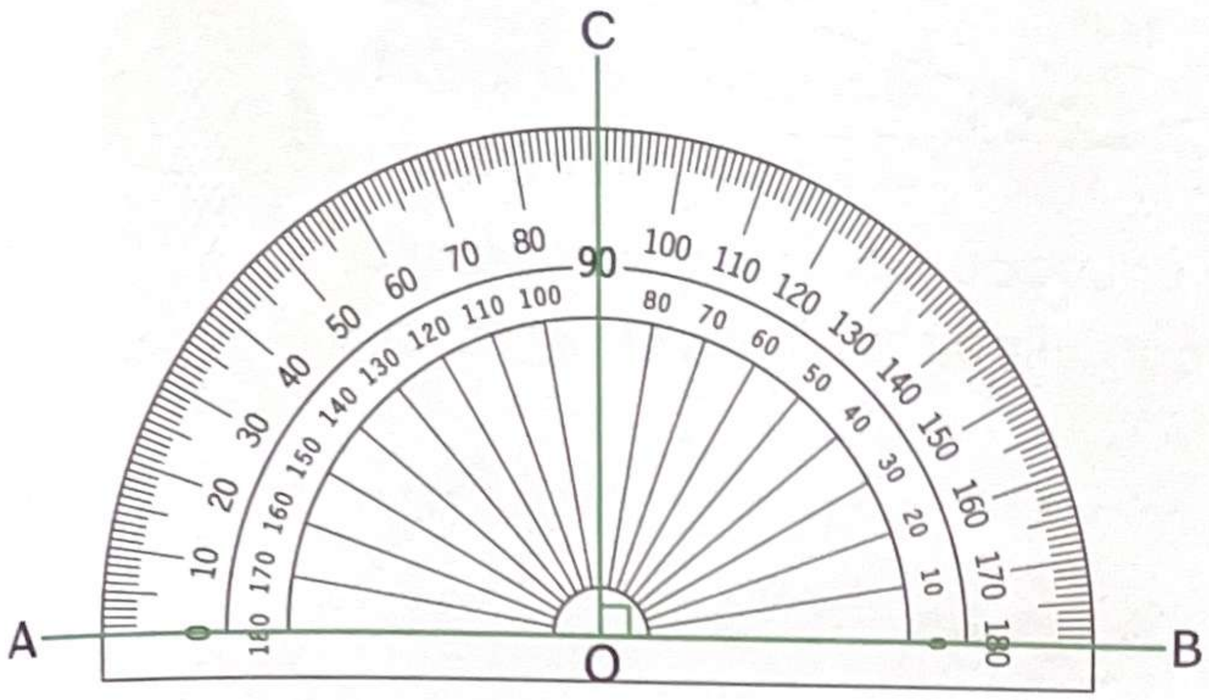
(b) $\angle PQS =$ ☐°

We read angles using a protractor, starting from 0° at the base line.



Go to PB 5B Practice 1

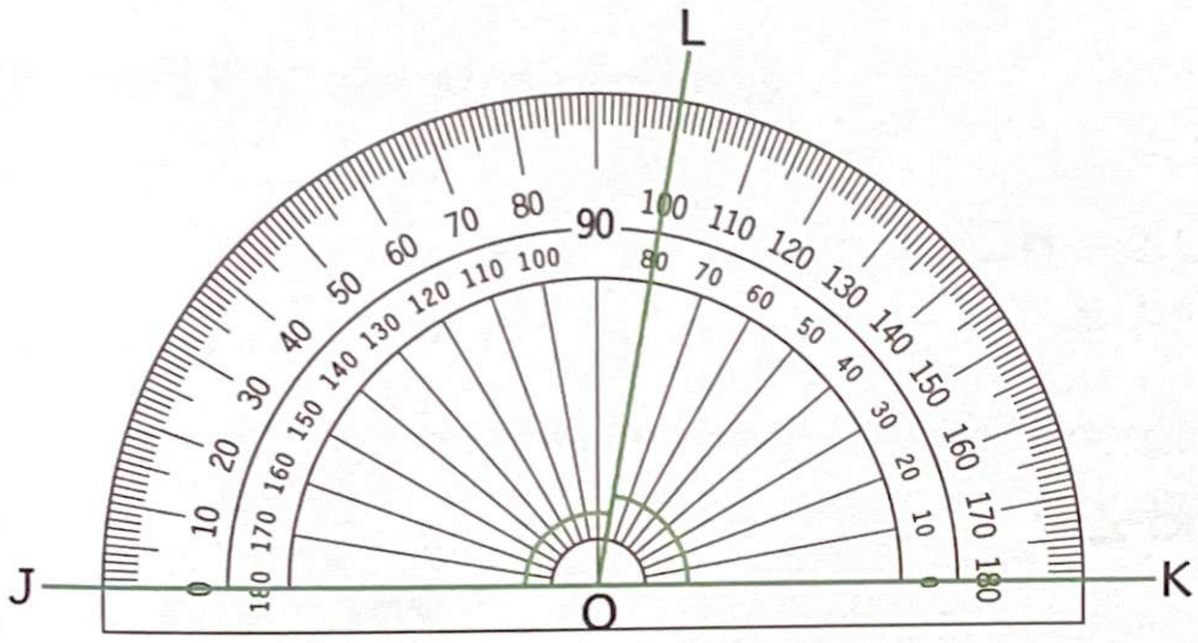
AOB is a **straight line**.




$\angle AOC = 90°$
$\angle BOC = 90°$

$\angle AOC + \angle BOC = 90° + 90°$
$= 180°$

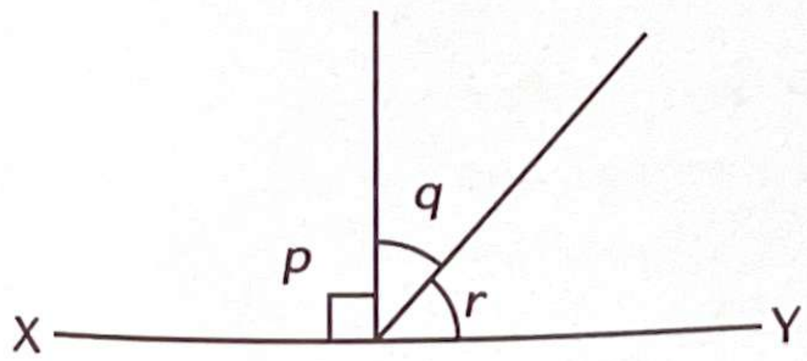
JOK is a straight line.




$\angle JOL = 100°$
$\angle KOL = 80°$

$\angle JOL + \angle KOL = 100° + 80°$
$= 180°$

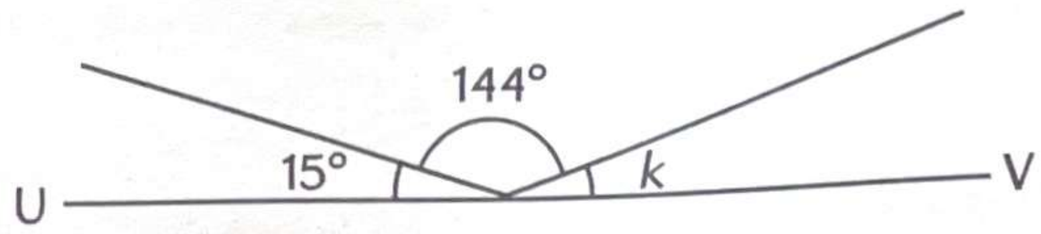
XY is a straight line. $\angle p = 90°$, $\angle q = 42°$ and $\angle r = 48°$.




$\angle p + \angle q + \angle r = 90° + 42° + 48°$
$= 180°$

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

In the figure, UV is a straight line. Find angle $k$.

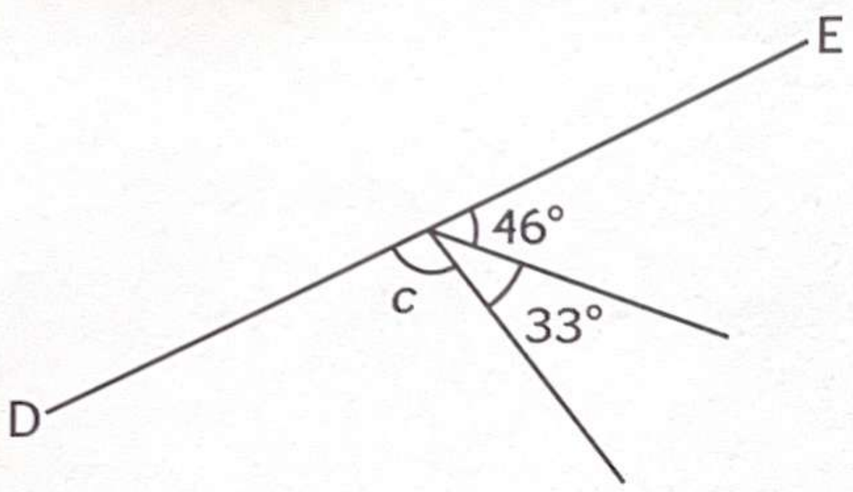




$\angle k = 180° - 15° - 144°$

$= \mathbf{21°}$

In the figure, DE is a straight line. Find $\angle c$.

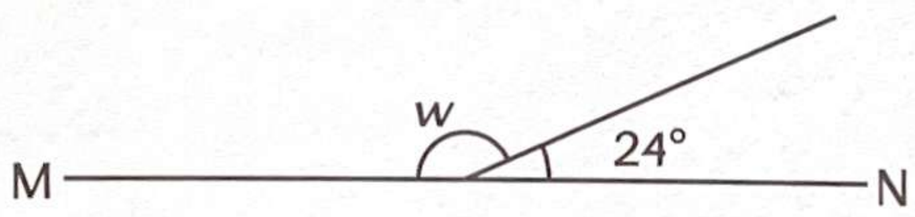



$\angle c = 180° - 33° - 46°$

$= \mathbf{101°}$

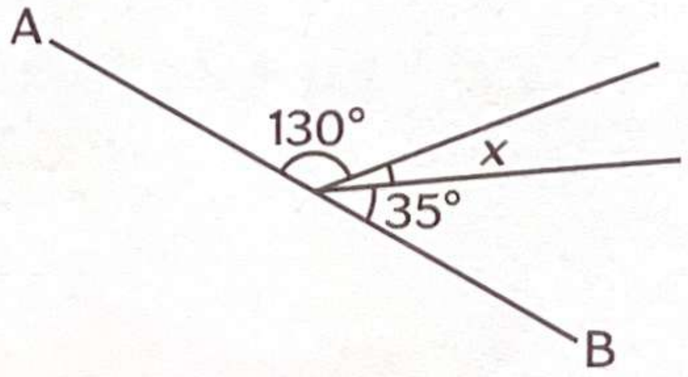
## Let's Try! 1

**(a)** MN is a straight line. Find $\angle w$.




$\angle w =$ _____

**(b)** AB is a straight line. Find $\angle x$.




$\angle x =$ _____

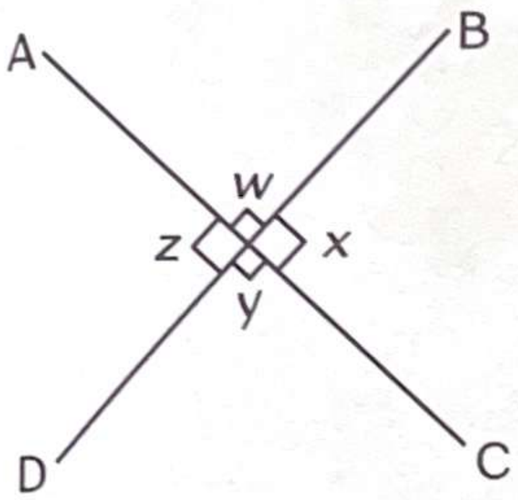


Go to PB 5B Practice 2

# Vertically Opposite Angles

In the figure, AC is **perpendicular to** BD.
These two straight lines **intersect** each other.

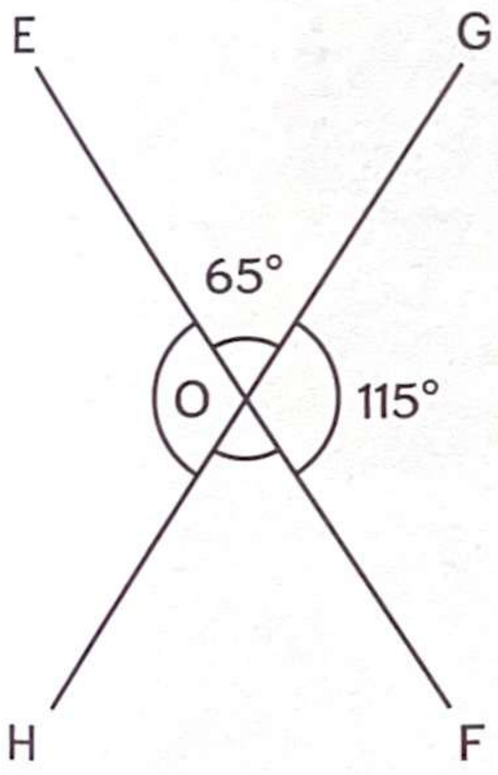
$\angle w$ and $\angle y$ is a pair of vertically opposite angles.
$\angle x$ and $\angle z$ is another pair of vertically opposite angles.




$\angle w = \angle y = 90°$

$\angle x = \angle z = 90°$

EF and GH are straight lines.




$\angle EOH = \angle GOF$
$= 115°$

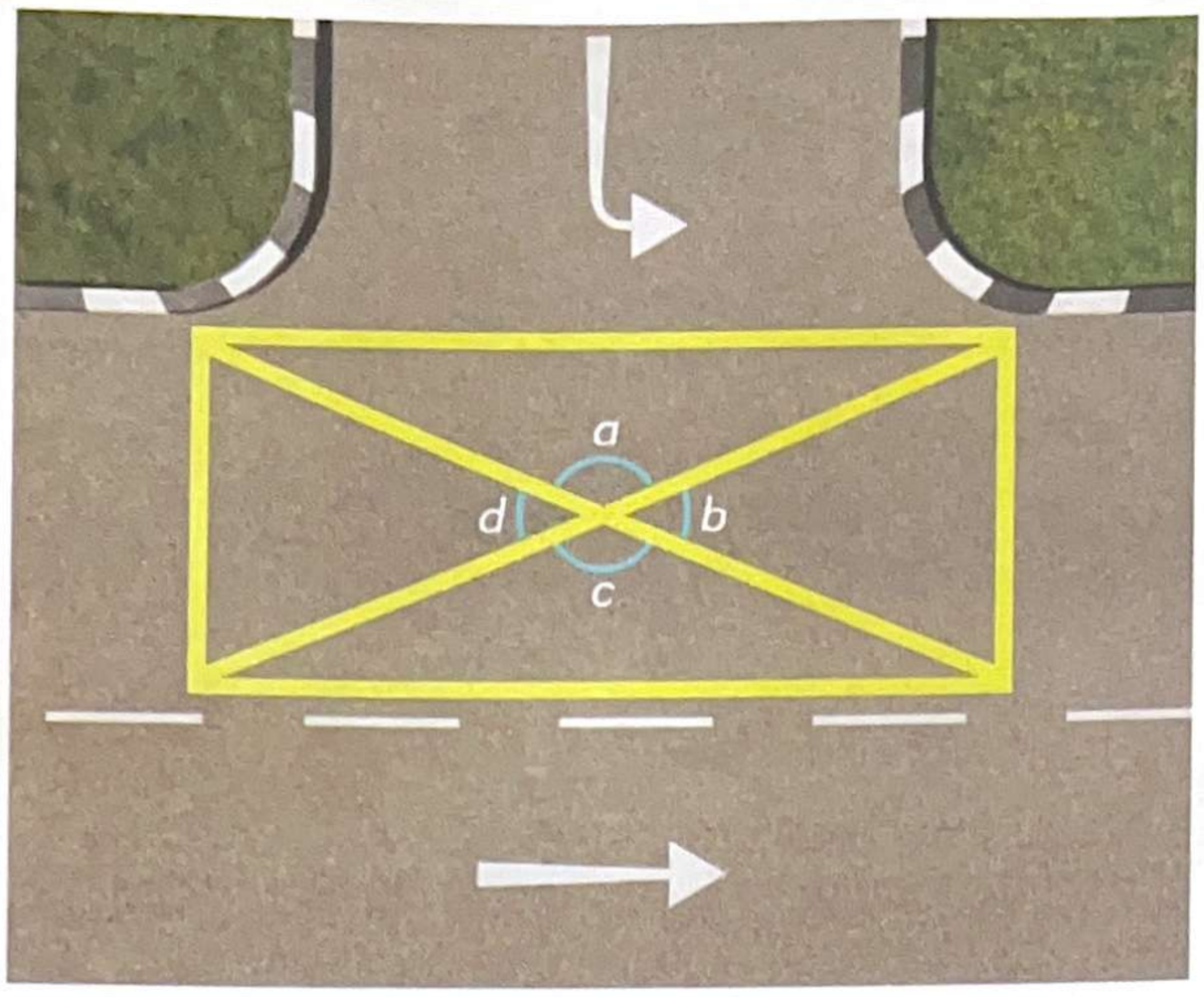
$\angle HOF = \angle EOG$
$= 65°$

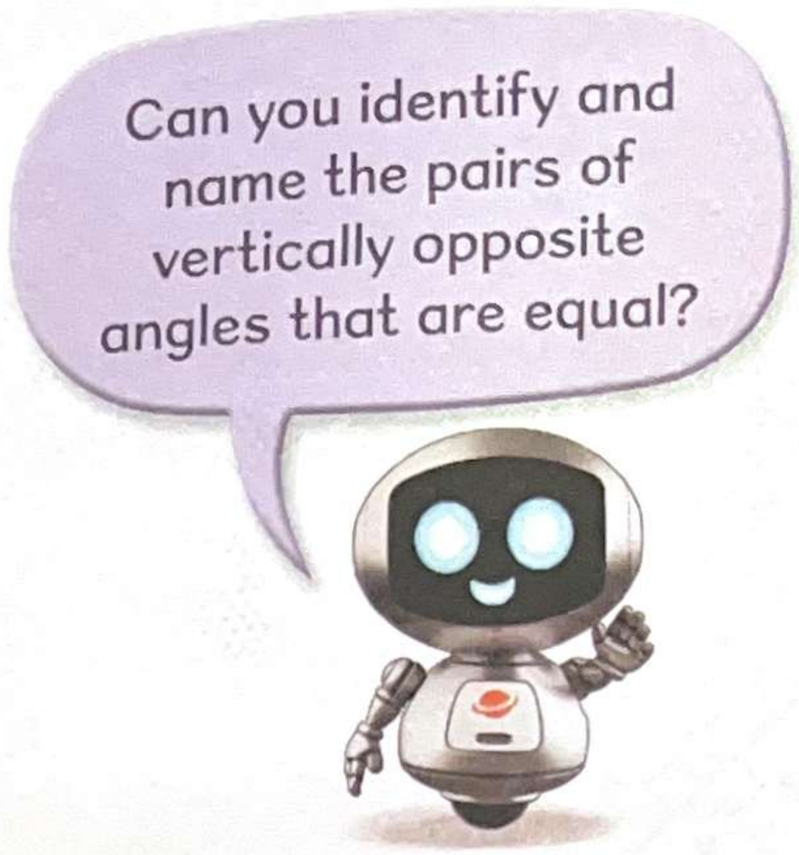
$\angle GOF$ and $\angle EOH$ is a pair of vertically opposite angles.

$\angle HOF$ and $\angle EOG$ is another pair of vertically opposite angles.

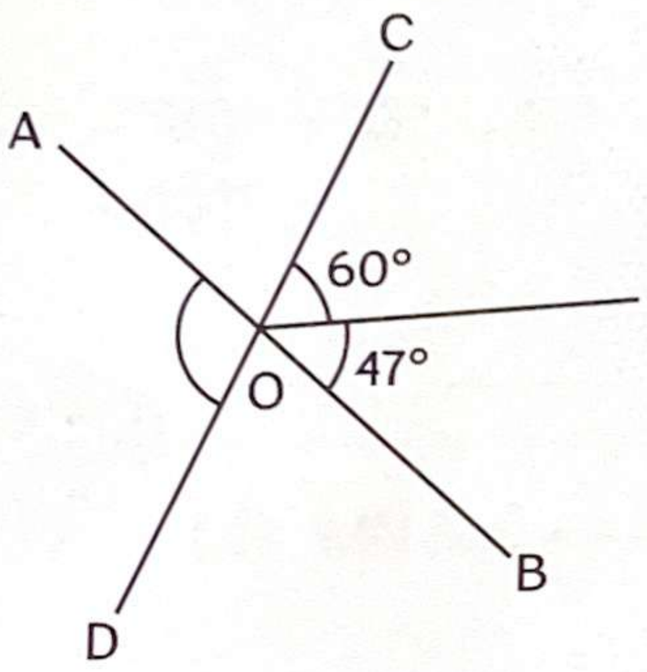
**When two straight lines intersect, they form two pairs of vertically opposite angles.**
**Vertically opposite angles are equal.**

The yellow box junction is commonly seen on the roads in Singapore.



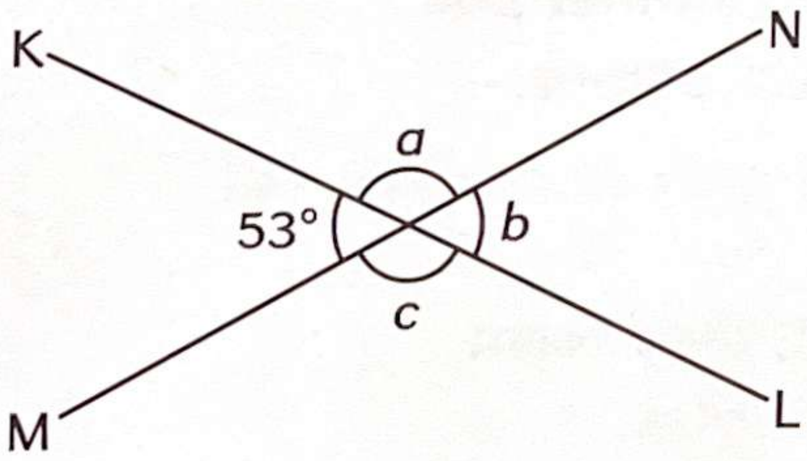




AB and CD are straight lines. Find ∠AOD.




∠AOD = ∠COB
= 60° + 47°
= **107°**

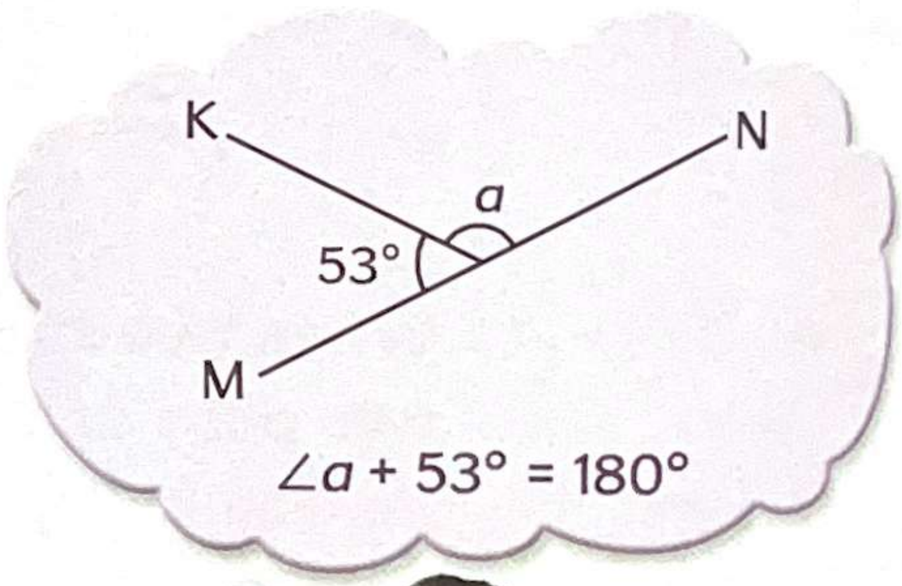

KL and MN are straight lines. Find the unknown angles.




∠*a* = 180° − 53°
= **127°**

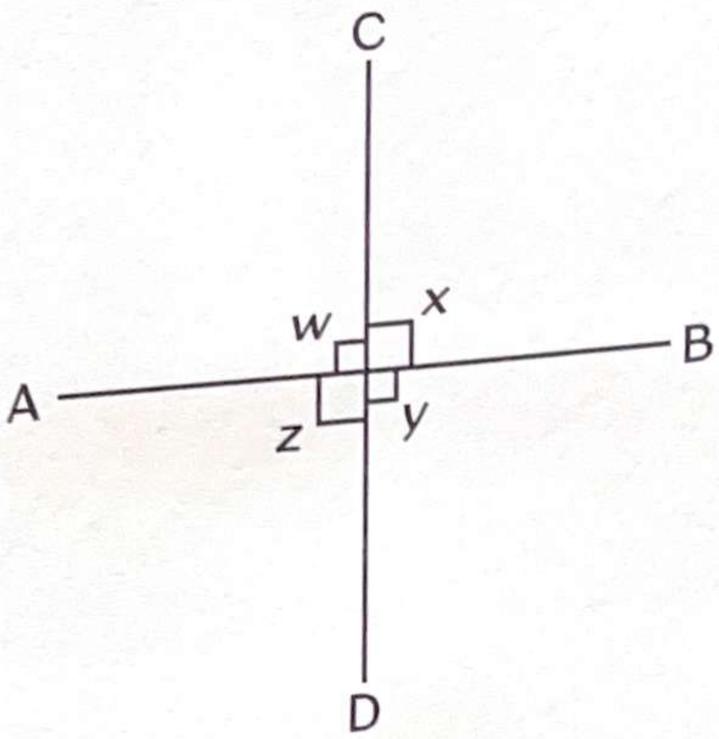
∠*b* = **53°**

∠*c* = ∠*a*
= **127°**




# Angles at a Point

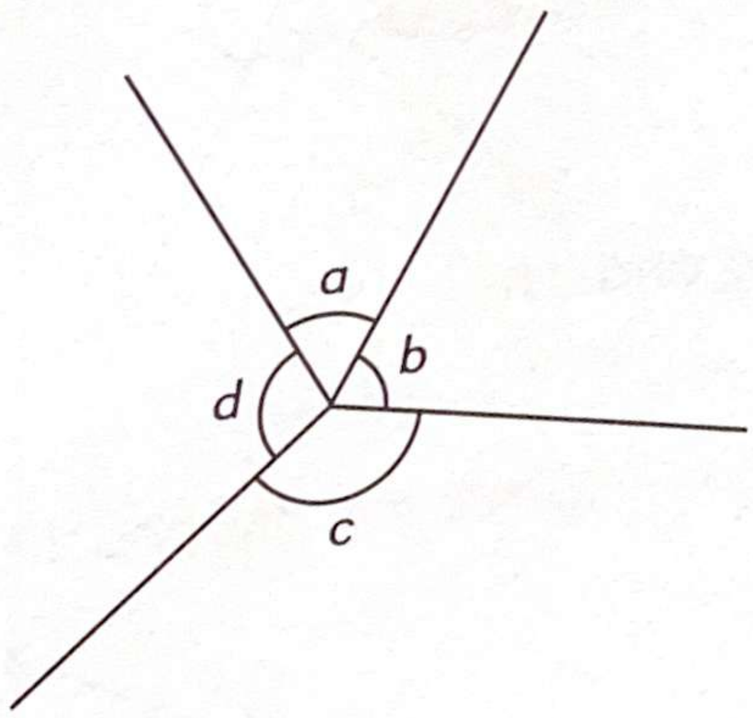
In the figure, AB is perpendicular to CD.
$\angle w$, $\angle x$, $\angle y$ and $\angle z$ are four angles at a point.




$$\angle w = \angle x = \angle y = \angle z$$

$$\angle w + \angle x + \angle y + \angle z = 90° + 90° + 90° + 90°$$
$$= 360°$$

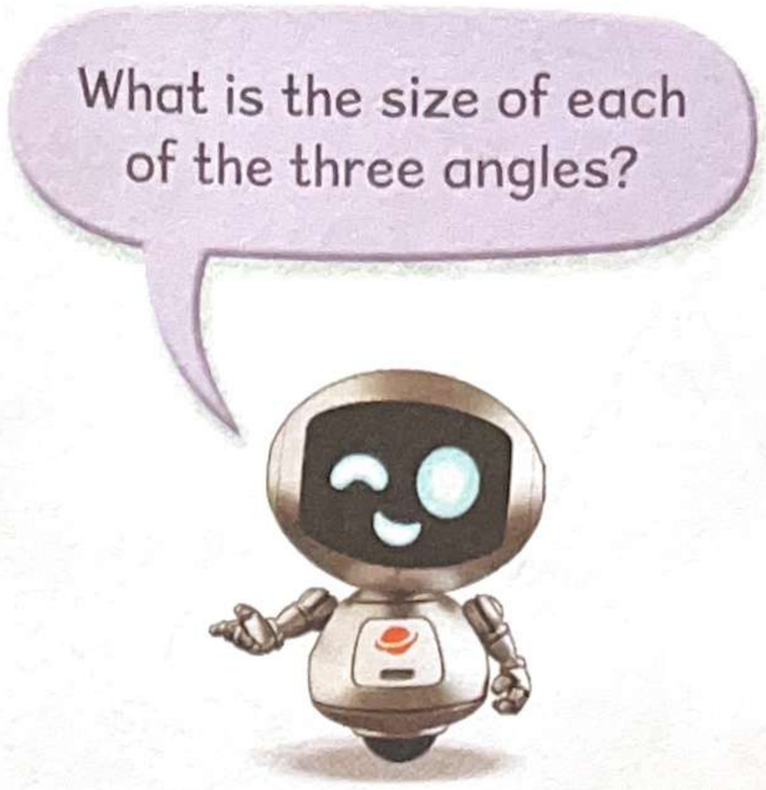
$\angle a$, $\angle b$, $\angle c$ and $\angle d$ are angles at a point.
$\angle a = 60°$, $\angle b = 70°$, $\angle c = 130°$ and $\angle d = 100°$.



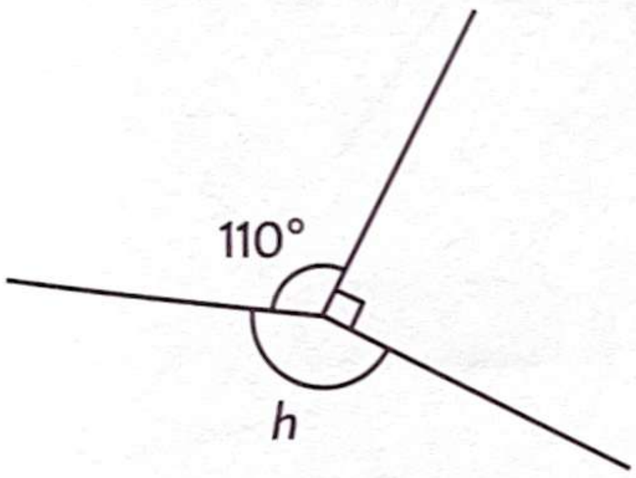

$$\angle a + \angle b + \angle c + \angle d = 60° + 70° + 130° + 100°$$
$$= 360°$$

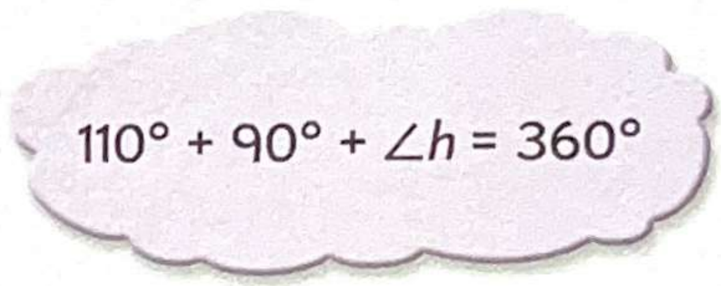
**The sum of angles at a point is 360°.**

The three angles formed by the blades of the turbine are the same.



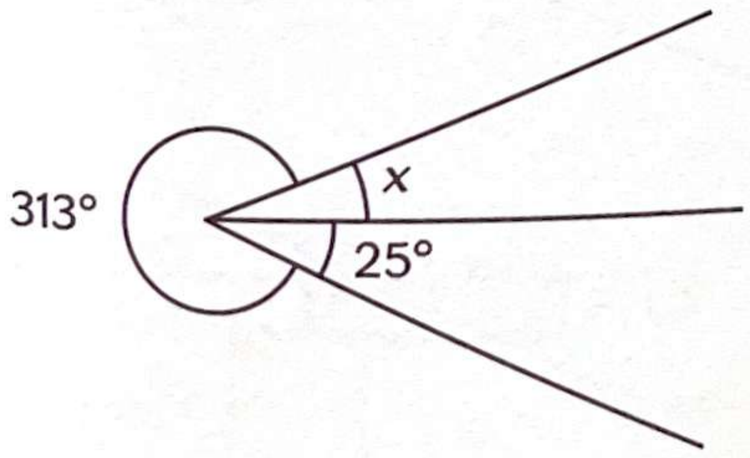

Find $\angle h$.



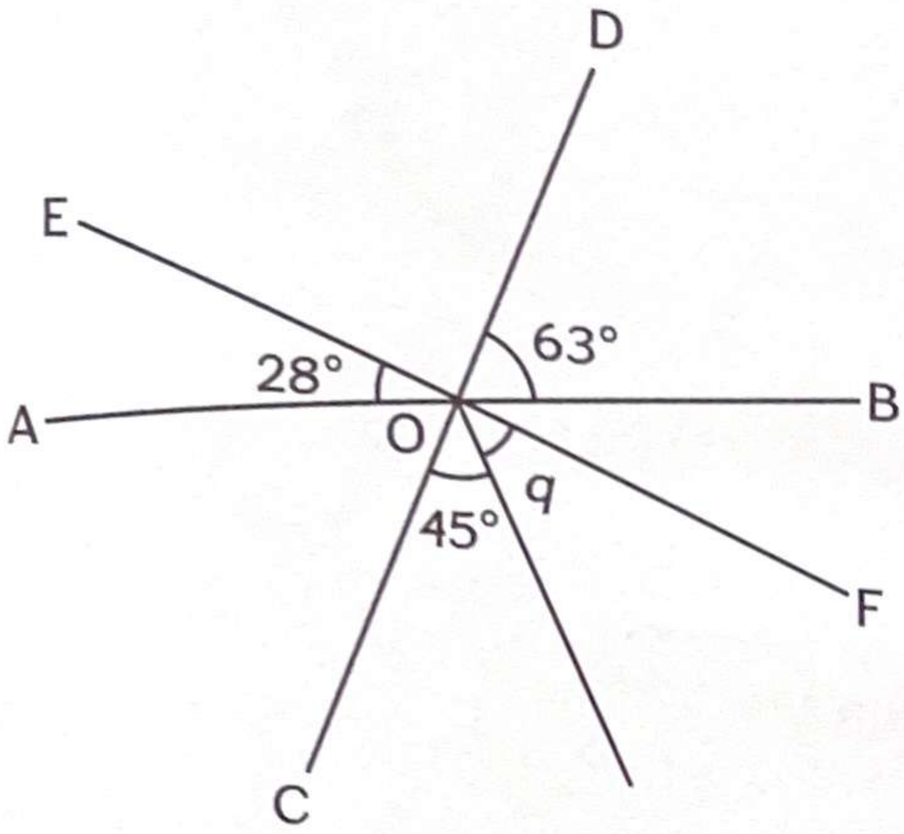

$\angle h = 360° - 110° - 90°$
$= \mathbf{160°}$

Find $\angle x$.



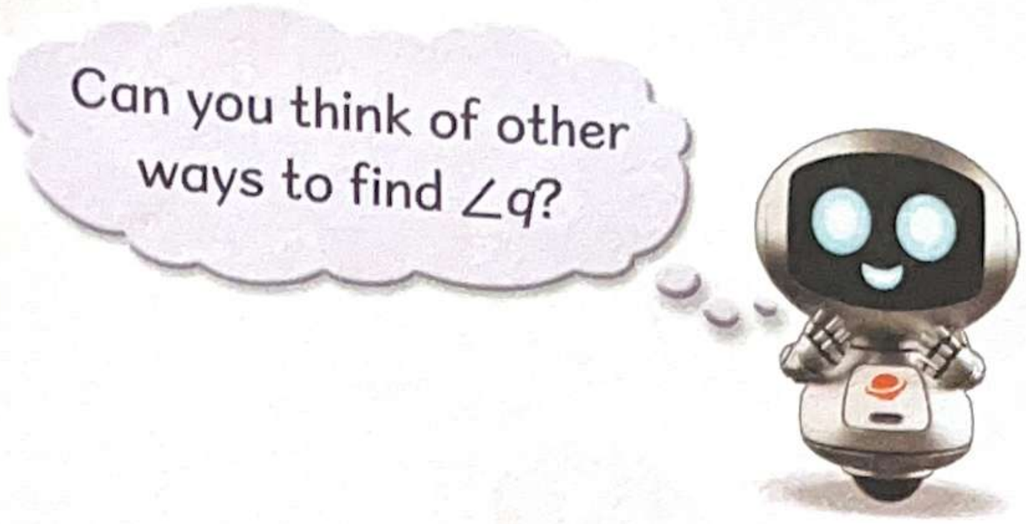

$\angle x = 360° - 313° - 25°$
$= \mathbf{22°}$

AOB, COD and EOF are straight lines. Find $\angle q$.

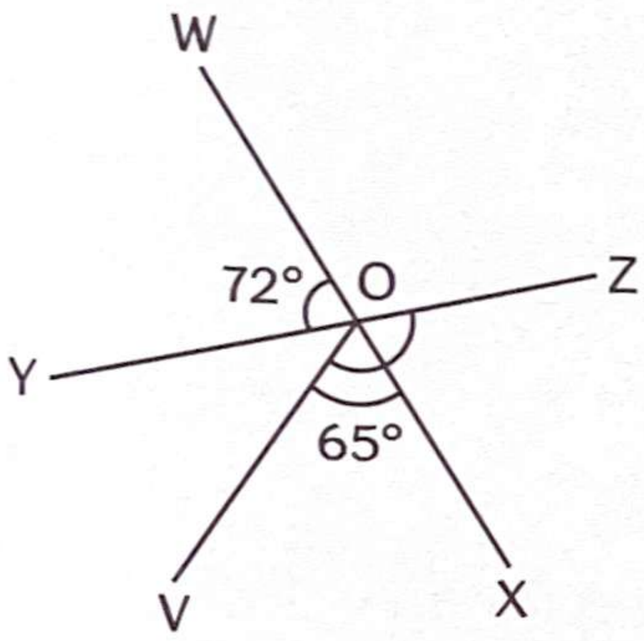



$\angle BOF = \angle AOE$
$= 28°$

$\angle q = 180° - 63° - 28° - 45°$
$= \mathbf{44°}$



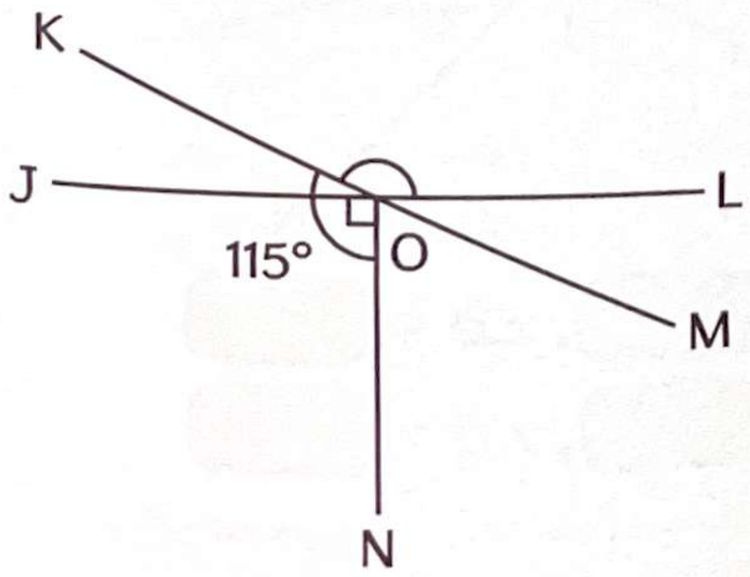

WX and YZ are straight lines. Find $\angle VOZ$.




$\angle ZOX = \angle WOY$
$= 72°$

$\angle VOZ = 65° + 72°$
$= \mathbf{137°}$

JL and KM are straight lines. $\angle KON = 115°$.
Find $\angle KOL$.




**Method 1**

$\angle NOL = 180° - 90°$
$= 90°$

$\angle KOL = 360° - 90° - 115°$
$= \mathbf{155°}$

**Method 2**

$\angle KOJ = 115° - 90°$
$= 25°$

$\angle KOL = 180° - 25°$
$= \mathbf{155°}$