Numeracy

Multiplication Table

Square Root	1	2	3	4	5	6	7	8	9	10	11	12
1	**1**	2	3	4	5	6	7	8	9	10	11	12
2	2	**4**	6	8	10	12	14	16	18	20	22	24
3	3	6	**9**	12	15	18	21	24	27	30	33	36
4	4	8	12	**16**	20	24	28	32	36	40	44	48
5	5	10	15	20	**25**	30	35	40	45	50	55	60
6	6	12	18	24	30	**36**	42	48	54	60	66	72
7	7	14	21	28	35	42	**49**	56	63	70	77	84
8	8	16	24	32	40	48	56	**64**	72	80	88	96
9	9	18	27	36	45	54	63	72	**81**	90	99	108
10	10	20	39	40	50	60	70	80	90	**100**	110	120
11	11	22	33	44	55	66	77	88	99	110	**121**	132
12	12	24	36	48	60	72	84	96	108	120	132	**144**

Prime Numbers

Numbers that can only be divided by themselves and one.

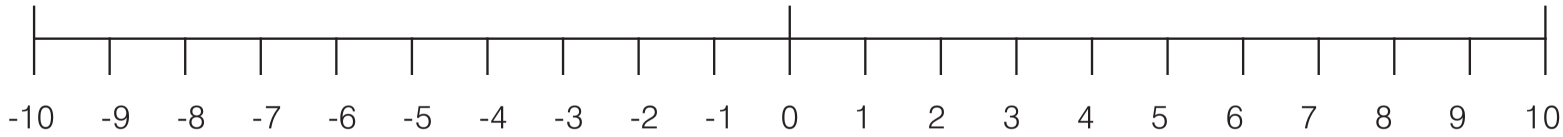
1	**2**	**3**	4	**5**	6	**7**	8	9	10
11	12	**13**	14	15	16	**17**	18	**19**	20
21	22	**23**	24	25	26	27	28	**29**	30
31	32	33	34	35	36	**37**	38	39	40
41	42	**43**	44	45	46	**47**	48	49	50
51	52	**53**	54	55	56	57	58	**59**	60
61	62	63	64	65	66	**67**	68	69	70
71	72	**73**	74	75	76	77	78	**79**	80
81	82	**83**	84	85	86	87	88	**89**	90
91	92	93	94	95	96	**97**	98	99	100

Fractions, Decimals and Percentages

Fraction	Decimal	Percentage	Example
1	1	100%	$\frac{4}{5}$
$\frac{4}{5}$	0.8	80%	
$\frac{3}{4}$	0.75	75%	$= (4 \div 5)$
$\frac{2}{3}$	0.666666... or $0.6^{\bullet}$	$66.6\%^{\bullet}$	$= \mathbf{0.8}$
$\frac{3}{5}$	0.6	60%	
$\frac{1}{2}$	0.5	50%	$= (0.8 \times 100\%)$
$\frac{2}{5}$	0.4	40%	$= \mathbf{80\%}$
$\frac{1}{3}$	0.333333... or $0.3^{\bullet}$	$33.3\%^{\bullet}$	
$\frac{1}{4}$	0.25	25%	

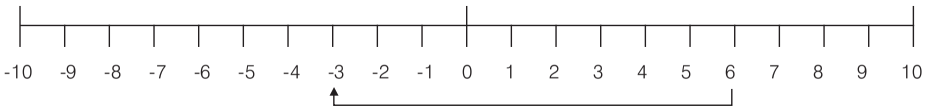
Positive and Negative Numbers

Positive and negative numbers can be shown on a number line



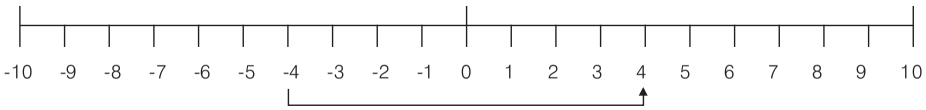
Example 1: 6 - 9 = -3

start at 6 and move 9 spaces left



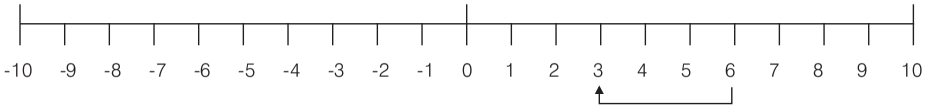
Example 2: -4 + 8 = 4

start at -4 and move 8 spaces right



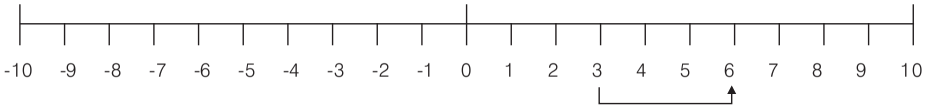
Example 3: 6 + (-3) = 3 (adding -3 is the same as subtracting 3)

start at 6 and move 3 spaces left



Example 4: 3 - (-3) = 6 (subtracting -3 is the same as adding 3)

start at 3 and move 3 spaces right



Conversions

Metric Conversions

Length	Capacity	Mass
1cm = 10mm	1cl = 10ml	1 gram = 1000ml
1m = 100cm	1 litre = 100cl	1kg = 1000g
1km = 1000m	1 litre = 1000ml	

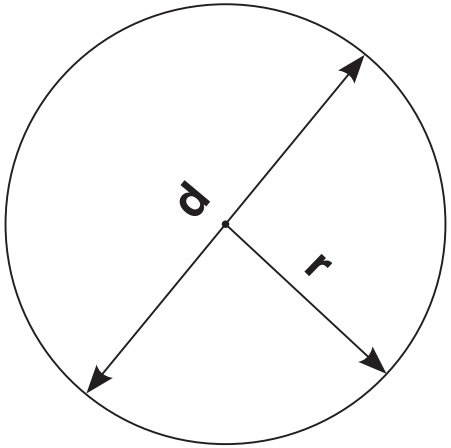
Imperial Conversions

Length	Capacity	Mass
12 inches = 1 foot	8 pints - 1 gallon	16 ounces = 1 pound
3 feet = 1 yard		14 pounds = 1stone

Approximate imperial and metric conversion

Imperial	Metric
5 miles	8 kilometres
1 inch	2.54cm
2.2 pounds	1 kilogram
7 pints	4 litres

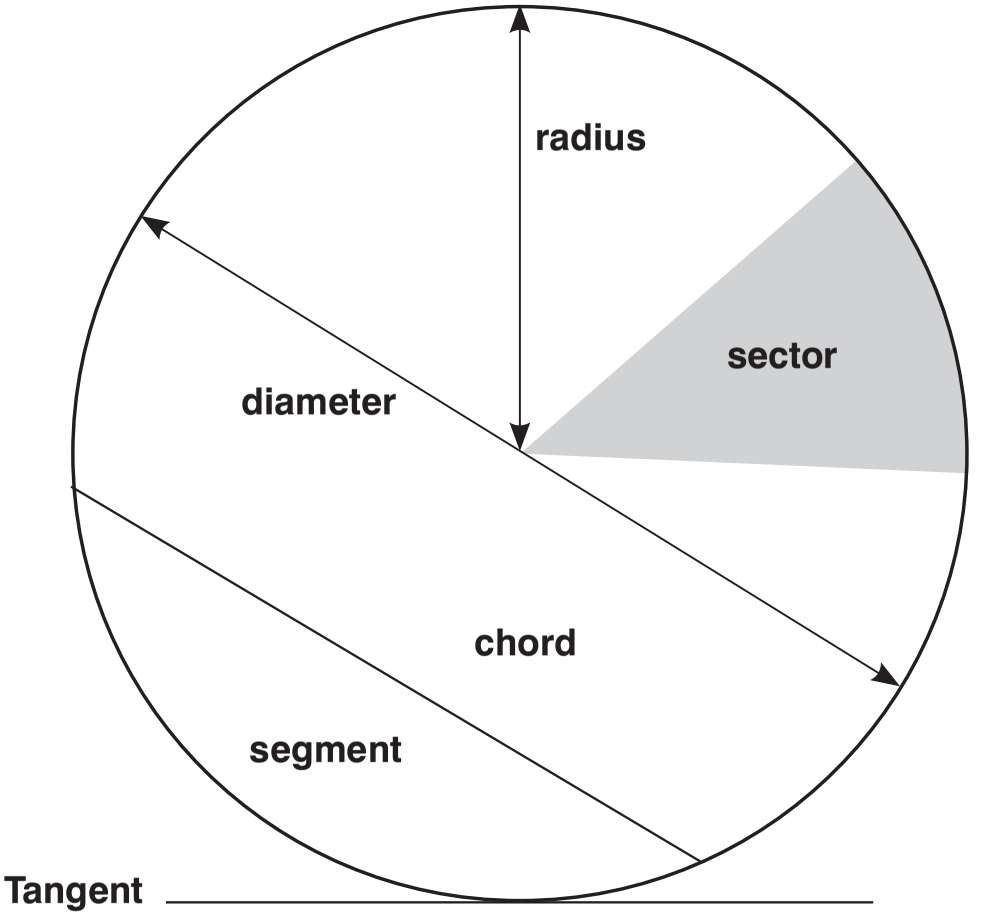
Circles / Circle Properties



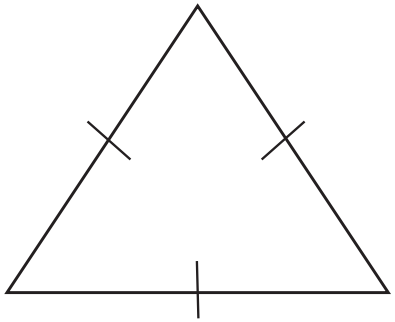
d = diameter
r = radius

Circumference = π x d
= 2 x π x r

Area = π x r^2

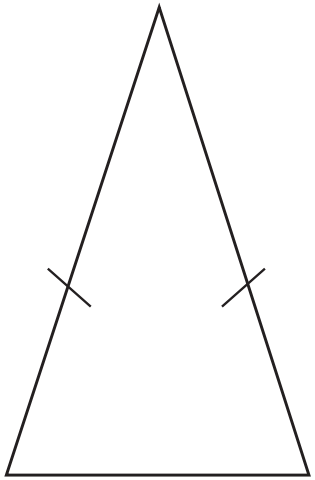


Triangles



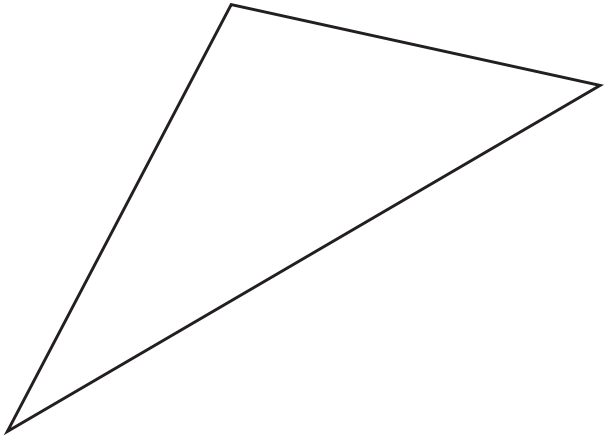
Equilateral Triangle

- All sides equal
- All angles equal (60˚)



Isosceles Triangle

- Two sides equal
- Two angles equal



Scalene Triangle

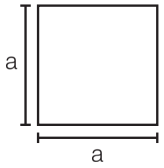
- All sides different
- All angles different

Quadrilaterals

Square

- all sides equal
- opposite sides parallel
- all angles 90°

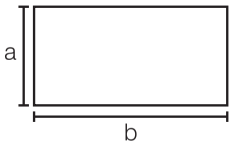
Area = a^2



Rectangle

- opposite sides equal and parallel
- all angles 90°

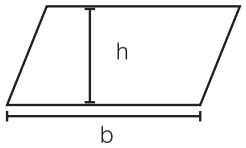
Area = a x b



Parallelogram

- opposite sides equal and parallel
- all angles equal

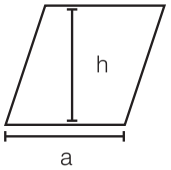
Area = b x h



Rhombus

- all sides equal
- opposite sides parallel

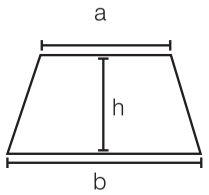
Area = a x h



Trapezium

- one pair of sides parallel

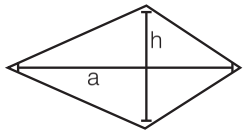
Area = $\frac{1}{2}$ (a+b) x h



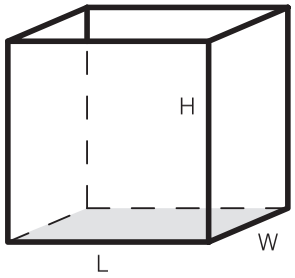
Kite

- two pairs of adjacentsides are equal

Area = $\frac{1}{2}$ (a x h)



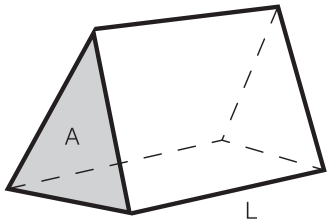
Volumes (V) & Surface Areas (A)



Cuboid

V = L x H x W

A = found from adding together the surface areas of all six sides.

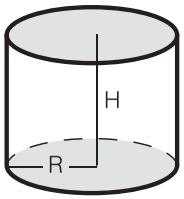


(A) area of cross section

Prism

V = area of cross section x length (= A x L)

A = found from adding together the areas of all the sides

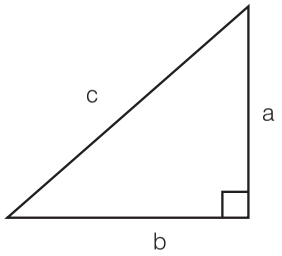


Cylinder

$V = \pi r^2 h$

A = area of ends + curved side = ($2\pi r^2 + 2\pi rh$)

Pythagoras' Theorem



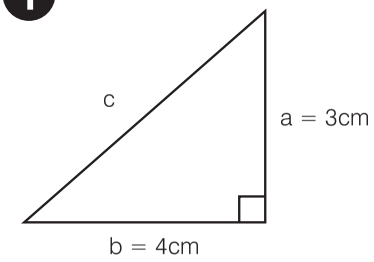
In a right-angled triangle:

$$\mathbf{c^2 = a^2 + b^2}$$

Side A is the longest side, which is called the **hypotenuse**

Examples: Find the missing side in these triangles

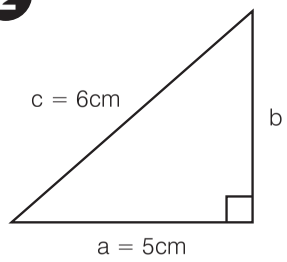
1



$$\begin{aligned} c^2 &= b^2 + a^2 \\ &= 4^2 + 3^2 \\ &= 16 + 9 \\ &= 25 \end{aligned}$$

$$c = \sqrt{25} = 5\text{cm}$$

2

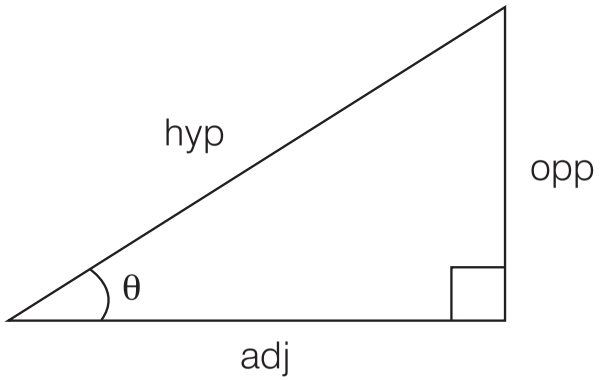


$$\begin{aligned} c^2 &= b^2 + a^2 \\ 6^2 &= b^2 + 5^2 \\ 36 &= b^2 + 25 \\ b^2 &= 36 - 25 = 11 \end{aligned}$$

$$b = \sqrt{11} = 3.32\text{cm (2dp)}$$

This is the special 3 - 4 - 5 triangle

Trigonometry



hyp = hypotenuse (longest side)

opp = opposite (side opposite the angle θ)

adj = adjacent (side adjacent to the angle θ)

$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \qquad \cos\theta = \frac{\text{adj}}{\text{hyp}} \qquad \tan\theta = \frac{\text{opp}}{\text{adj}}$$

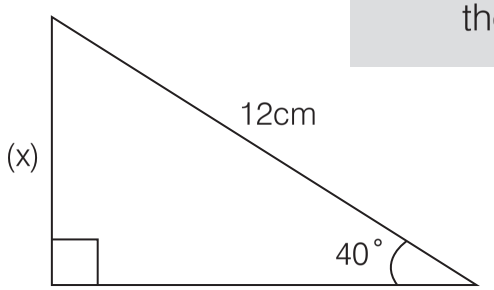
Remember

SOH CAH TOA

Trigonometry - Examples

Find the length marked (x)

We know the **angle** θ and the **hypotenuse**. We need to find the **opposite** side.



θ = 40°
hyp = 12cm
x = opp = ?

use: $\sin\theta = \frac{opp}{hyp}$

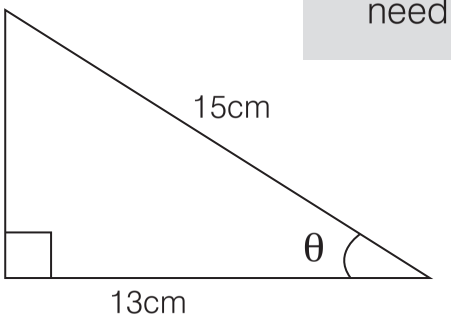
$\sin 40^\circ = \frac{opp}{12}$

$opp = 12 \times \sin 40^\circ$

$x = opp = 7.71cm$ (2dp)

Find the angle θ

We know the **hypotenuse** and the **adjacent** side. We need to find the **angle** θ



θ = ?
hyp = 15cm
adj = 13cm

use: $\cos\theta = \frac{adj}{hyp}$

$\cos\theta = \frac{13}{15} = 0.8666$

$\theta = \cos^{-1}0.8666 = 29.93^\circ$ (2dp)

Percentages, Fractions and Decimals

A percentage is a fraction with a denominator of 100 e.g. $13\% = \frac{13}{100}$

Changing percentages to fractions

Write the percentage as a fraction and cancel any common factors

e.g. $25\% = \frac{\cancel{25}}{\cancel{100}} = \frac{1}{4}$ $50\% = \frac{\cancel{50}}{\cancel{100}} = \frac{1}{2}$ $55\% = \frac{\cancel{55}}{\cancel{100}} = \frac{11}{20}$

Changing fractions to percentages

Multiply the fraction by 100%

e.g. $\frac{1}{2} = \frac{1}{2} \times 100\% = \frac{1 \times 100}{2}\% = 50\%$

e.g. $\frac{3}{5} = \frac{3}{5} \times 100\% = \frac{3 \times 100}{5}\% = 3 \times 20\% = 60\%$

Percentages, Fractions and Decimals continued

Changing percentages to decimals

Write the percentage as a fraction and divide the numerator by the denominator

e.g. $60\% = \frac{60}{100} = 60 \div 100 = 0.6$

e.g. $14\% = \frac{14}{100} = 14 \div 100 = 0.14$

Changing decimals to percentages

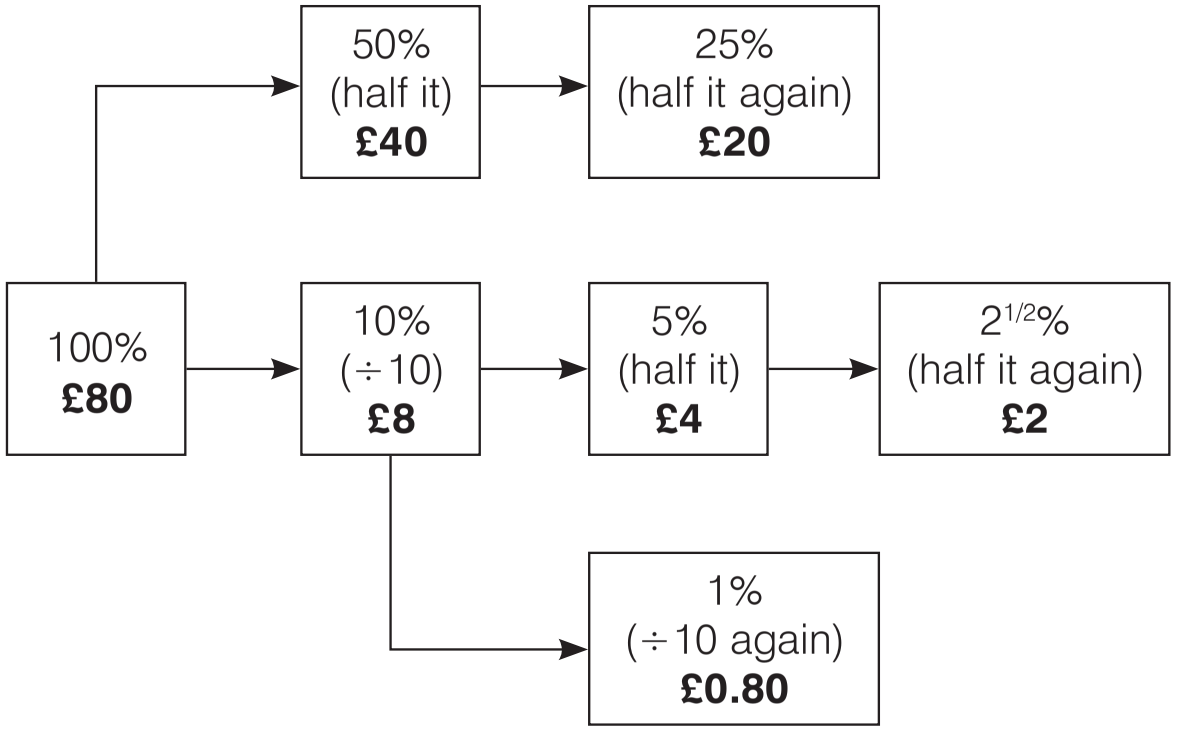
Multiply the decimal by 100%

e.g. $0.15 = 0.15 \times 100\% = 15\%$

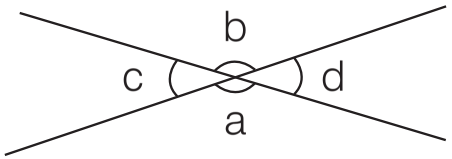
Percentages

A simple ‘splitting’ method to help you work out percentages.

e.g. to find 37% of £80		
25%	=	£20
10%	=	£8
1%	=	£0.80
1%	=	£0.80
37%	=	£29.60

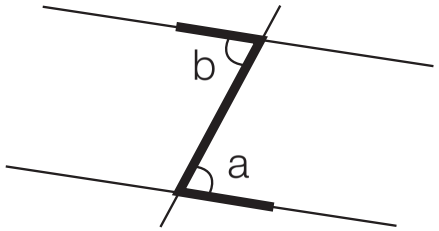


Angles - Equal Angles



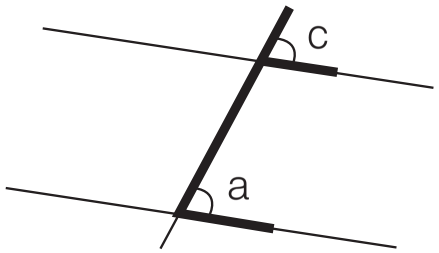
Vertically opposite angles are **equal** when two lines cross

angle **a** = angle **b** and angle **c** = angle **d**



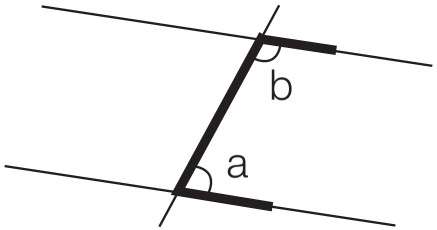
When a line crosses two parallel lines:

- **alternate angles** are equal. angle **a** = angle **b**



- **corresponding angles** are equal. angle **a** = angle **c**

Angles - 180° Angles

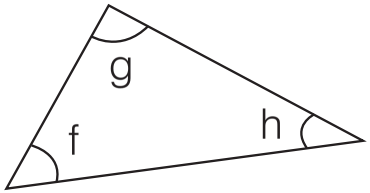


When a line crosses two parallel lines the sum of the interior angles is 180°

angle **a** + angle **b** = 180°

The sum of the angles on a straight line is 180°

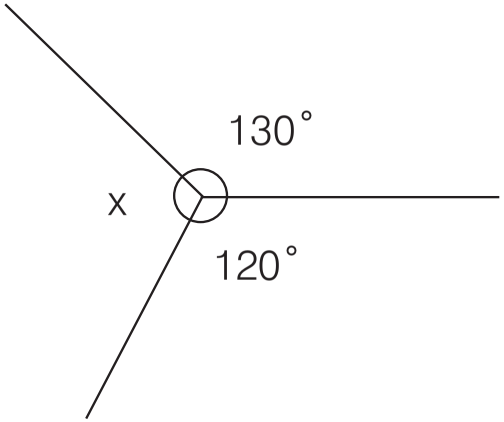
angle **c** + angle **d** + angle **e** = 180°



The sum of the angles inside a triangle is 180°

angle **f** + angle **g** + angle **h** = 180°

Angles - 360° Angles



The sum of all angles around a point is 360°

Use subtraction to find the missing angle.

360° - 130° - 120° = x