

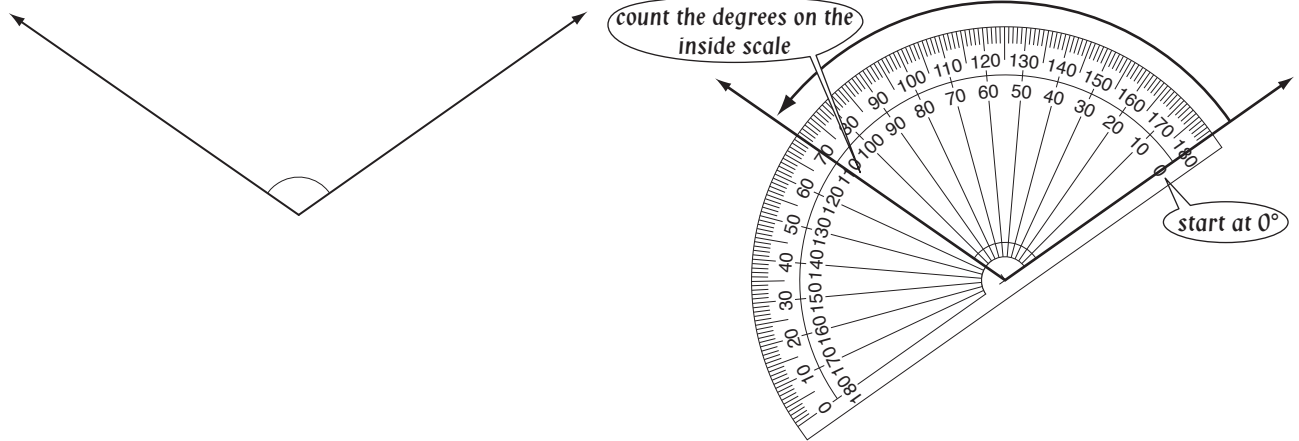
27. [Shapes]

Skill 27.1 Measuring angles using a protractor (1).

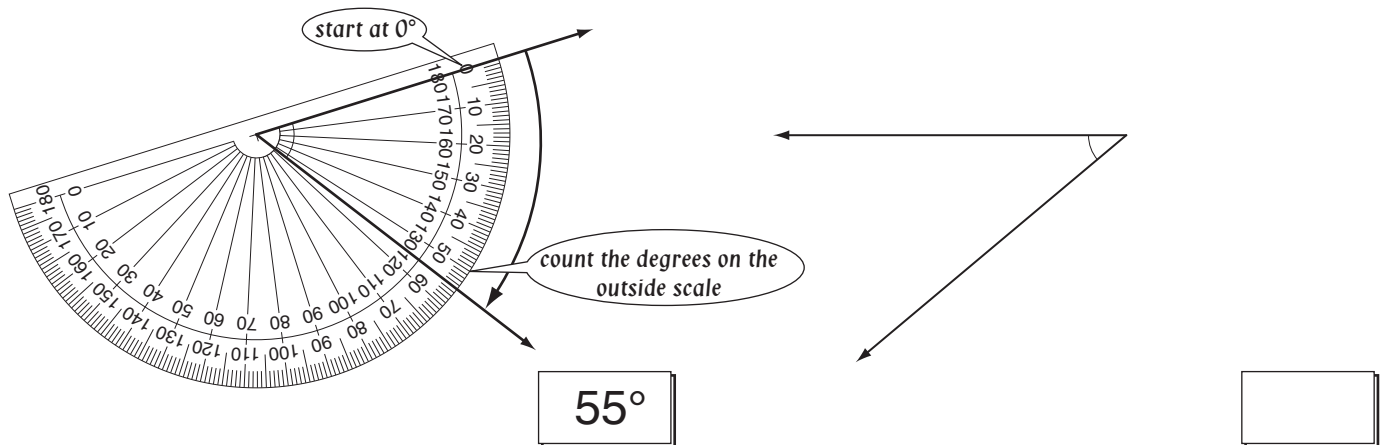
MM4.2 1 1 2 2 3 3 4 4
MM5.1 1 1 2 2 3 3 4 4

- Place the centre of the protractor at the vertex (corner) of the angle.
- Align one of the lines forming the angle to pass through 0° on either the inside or outside scale.
- Read the measurement where the other line of the angle crosses the scale on the protractor.

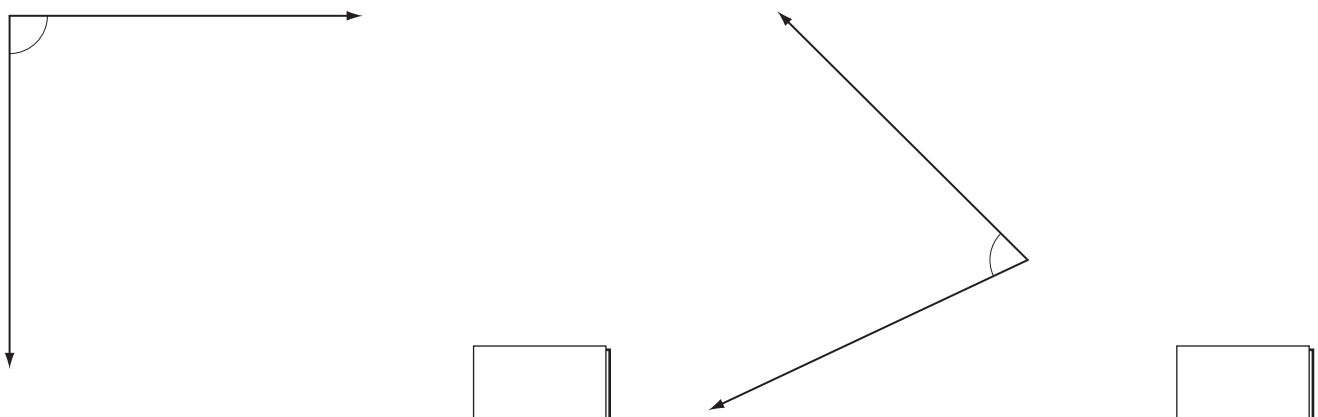
Q. Use a protractor to measure this angle. **A.** 110°



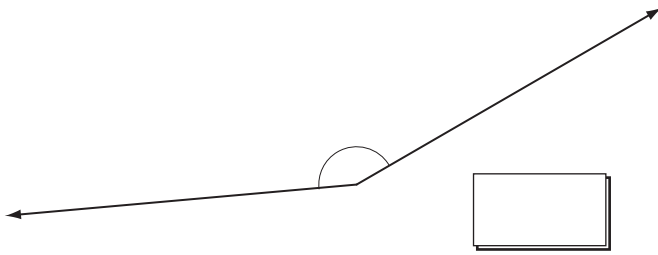
a) Use a protractor to measure this angle. **b)** Use a protractor to measure this angle.



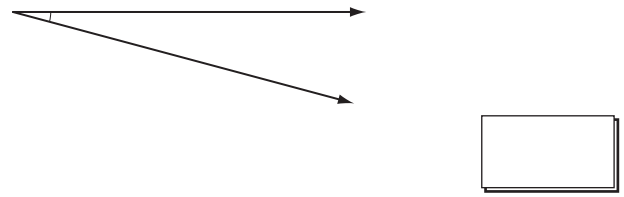
c) Use a protractor to measure this angle. **d)** Use a protractor to measure this angle.



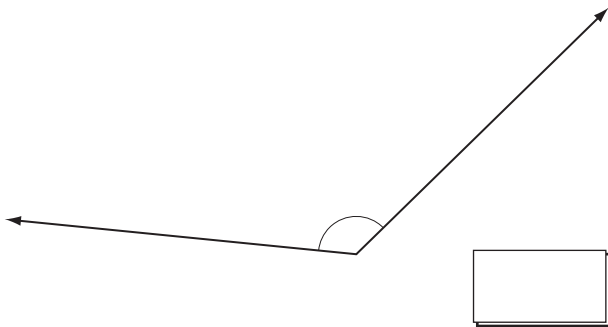
e) Use a protractor to measure this angle.



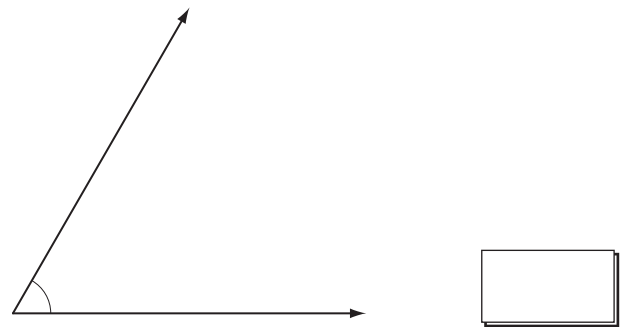
f) Use a protractor to measure this angle.



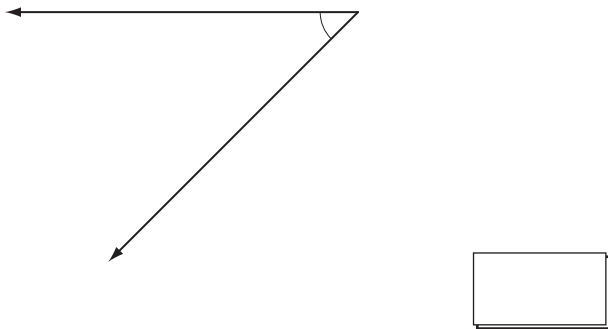
g) Use a protractor to measure this angle.



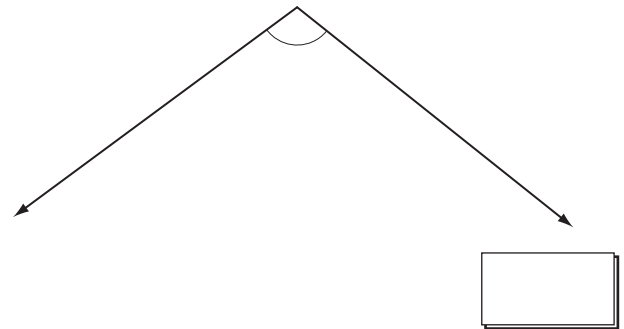
h) Use a protractor to measure this angle.



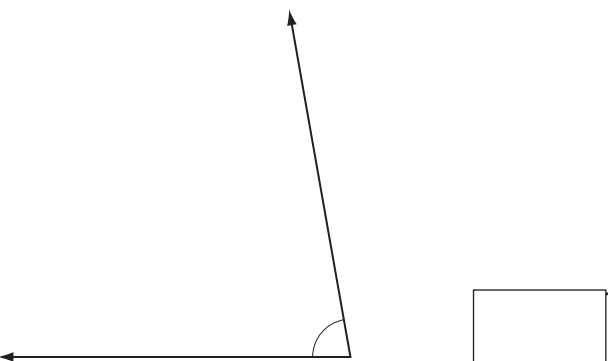
i) Use a protractor to measure this angle.



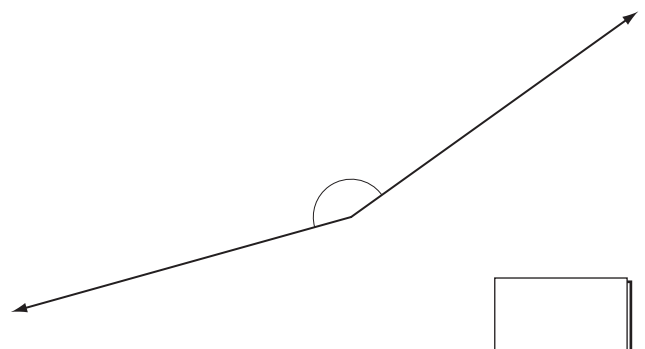
j) Use a protractor to measure this angle.



k) Use a protractor to measure this angle.

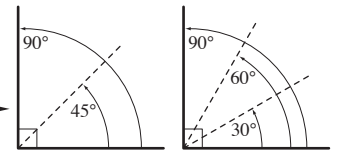


l) Use a protractor to measure this angle.



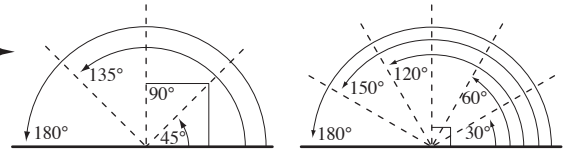
To estimate the size of an acute angle

- Draw a right angle (90°) overlapping one line of the given angle.
- Divide the right angle into smaller divisions, e.g. halves or thirds.

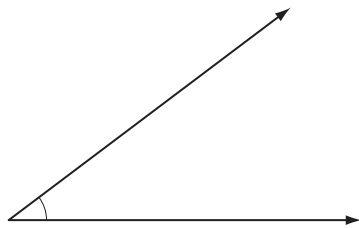


To estimate the size of an obtuse angle

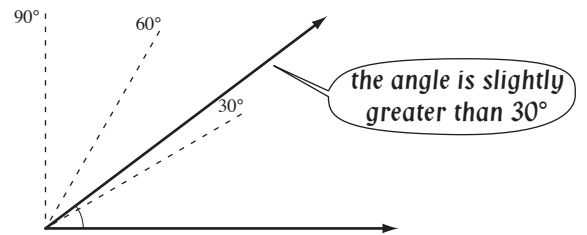
- Draw a straight angle (180°) overlapping one line of the given angle.
- Divide the straight angle into smaller divisions, e.g. quarters or sixths.



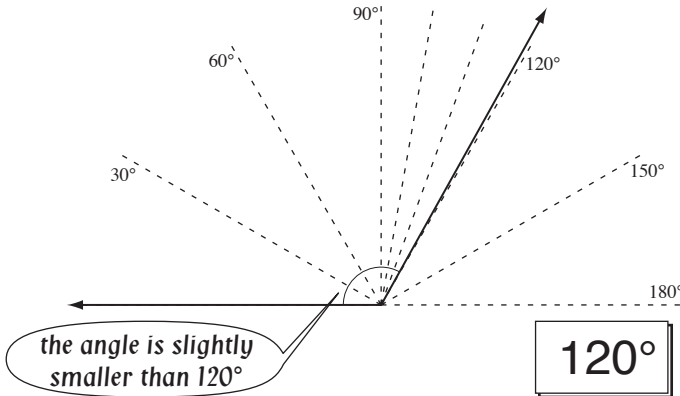
Q. Without measuring, would you estimate that the size of this angle is closer to 35° or to 50° ?



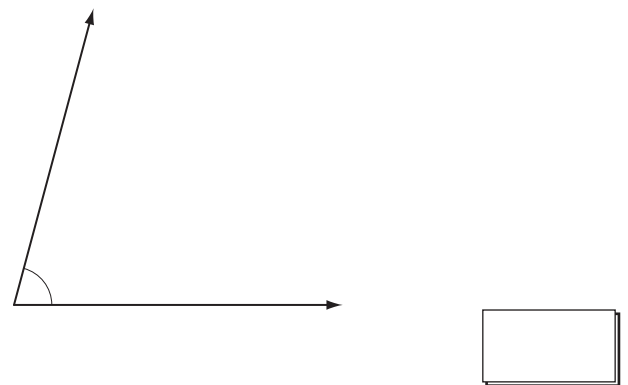
A. 35°



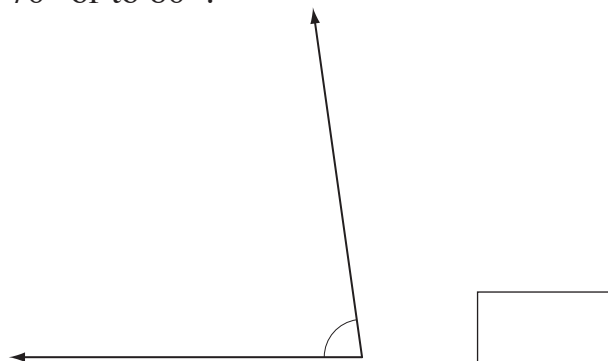
a) Without measuring, would you estimate that the size of this angle is closer to 110° or to 120° ?



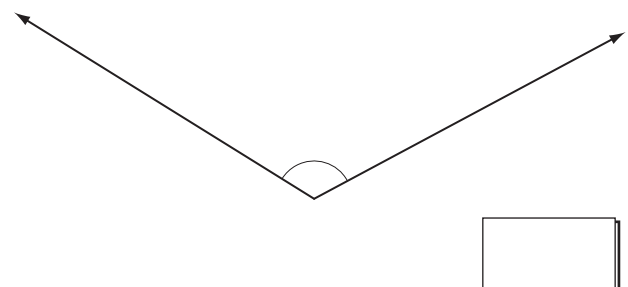
b) Without measuring, would you estimate that the size of this angle is closer to 75° or to 90° ?



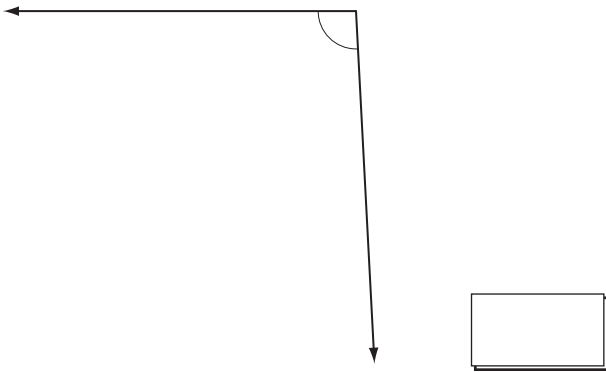
c) Without measuring, would you estimate that the size of this angle is closer to 70° or to 80° ?



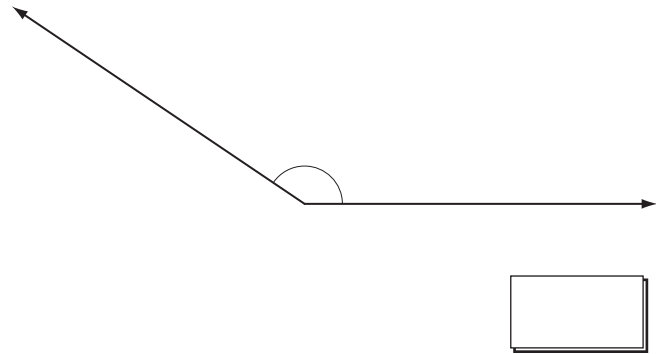
d) Without measuring, would you estimate that the size of this angle is closer to 125° or to 140° ?



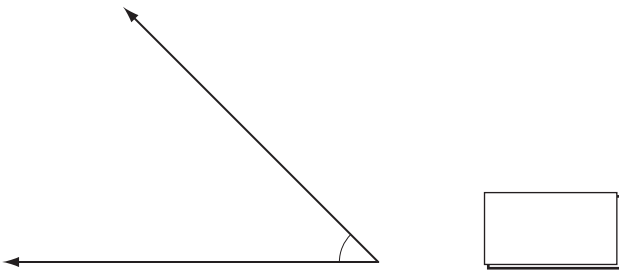
e) Without measuring, would you estimate that the size of this angle is closer to 95° or to 110° ?



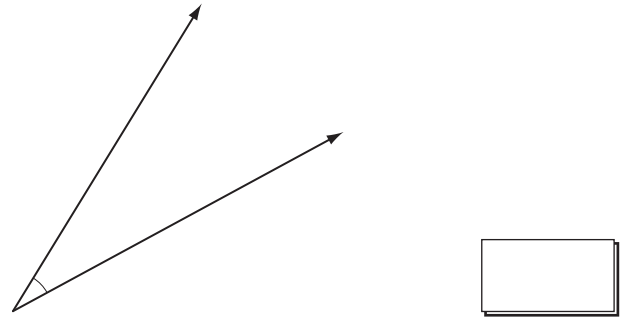
f) Without measuring, would you estimate that the size of this angle is closer to 135° or to 145° ?



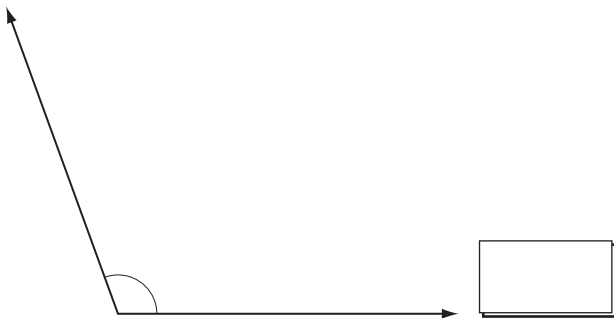
g) Without measuring, would you estimate that the size of this angle is closer to 45° or to 60° ?



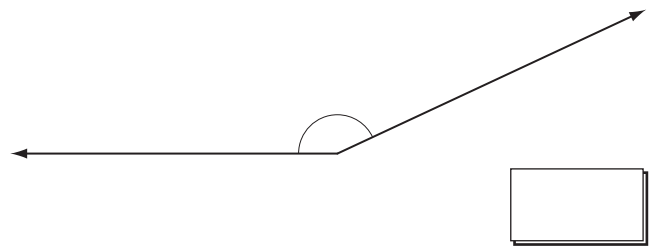
h) Without measuring, would you estimate that the size of this angle is closer to 30° or to 45° ?



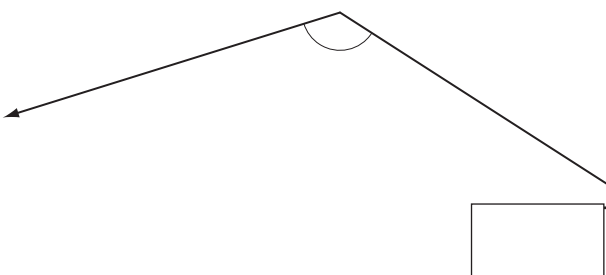
i) Without measuring, would you estimate that the size of this angle is closer to 95° or to 110° ?



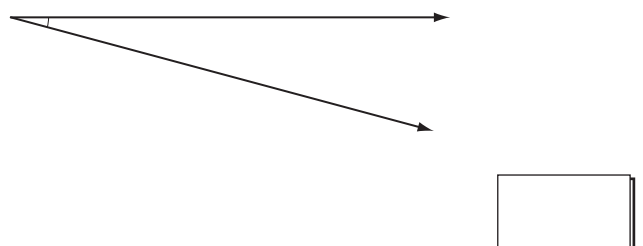
j) Without measuring, would you estimate that the size of this angle is closer to 155° or to 170° ?



k) Without measuring, would you estimate that the size of this angle is closer to 130° or to 150° ?



l) Without measuring, would you estimate that the size of this angle is closer to 5° or to 15° ?

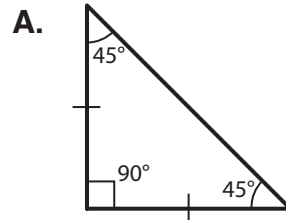


Skill 27.3 Drawing lines and polygons.

MM4.2 1 1 2 2 3 3 4 4
MM5.1 1 1 2 2 3 3 4 4

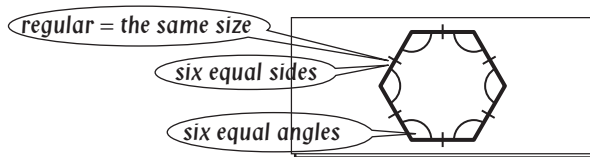
- Consider the definitions of triangles, squares, rectangles, rhombi, parallelograms, kites, trapeziums and regular polygons. (see Glossary)
- Mark:
 - Right angles with a corner (\perp).
 - Congruent angles with similar curved lines (\frown)
(the second pair of congruent angles takes on a pair of curved lines).
 - Congruent sides with a dash ($|$)
(the second pair of congruent lines takes on a pair of dashes).
 - Parallel lines with an arrow ($>$)
(the second pair of parallel lines takes on a second pair of arrows).

Q. Draw an isosceles right-angled triangle marking the congruent sides and congruent angles.



One corner marking the right angle (90°)
One dash marking each of the congruent sides
One curved line marking each of the congruent angles (45°)

a) Draw a regular hexagon marking the congruent sides and congruent angles.



b) Draw a rectangle marking all congruent sides and diagonals.



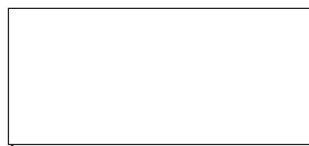
c) Draw a rhombus marking all congruent sides and perpendicular diagonals.



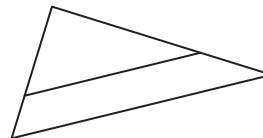
d) Draw an isosceles obtuse-angled triangle marking the congruent sides and congruent angles.



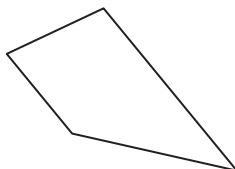
e) Draw a regular pentagon marking the congruent sides and congruent angles.



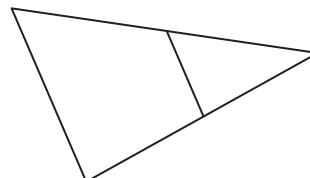
f) Use arrows to show the pair of parallel lines in this diagram.



g) Use arrows to show the pair of parallel lines in this diagram.



h) Use arrows to show the pair of parallel lines in this diagram.



Skill 27.4 Classifying angles.

MM4.2 1 1 2 2 3 3 4 4
MM5.1 1 1 2 2 3 3 4 4

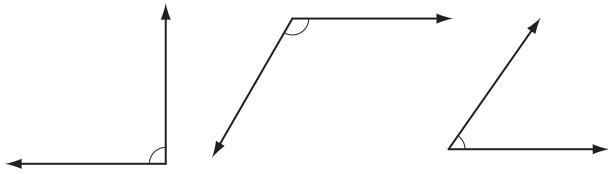
- Consider the definitions and properties of a variety of angles.

(see Glossary and Maths Facts, page 386)

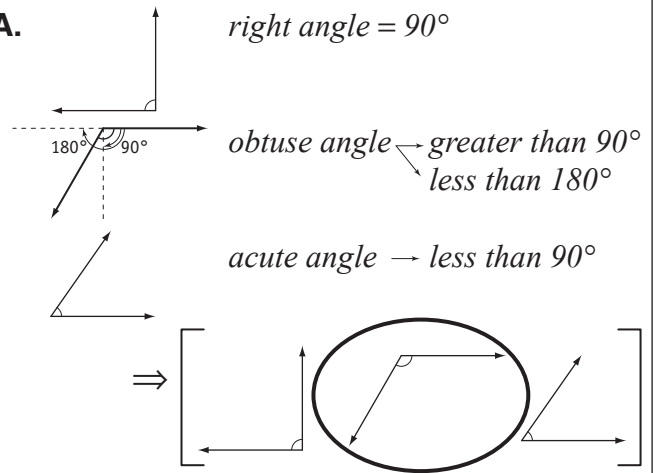
Hints: An angle can be classified according to its size (acute, right, obtuse, straight and reflex).

Two angles can be classified according to their position in relation to one another (adjacent, supplementary, complementary or vertically opposite).

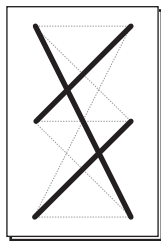
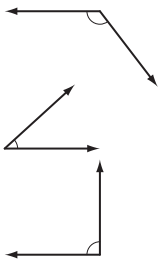
Q. Circle the obtuse angle.



A.



a) Match each angle to its description:

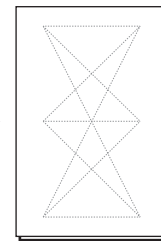
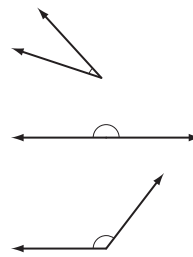


acute

right

obtuse

b) Match each angle to its description:

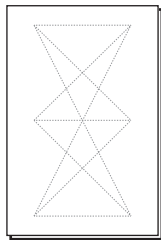
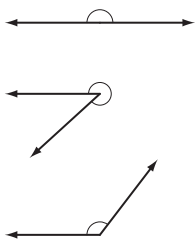


obtuse

acute

straight

c) Match each angle to its description:

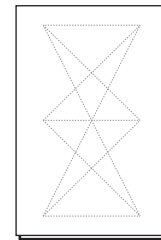
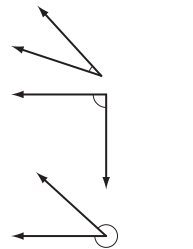


obtuse

reflex

straight

d) Match each angle to its description:

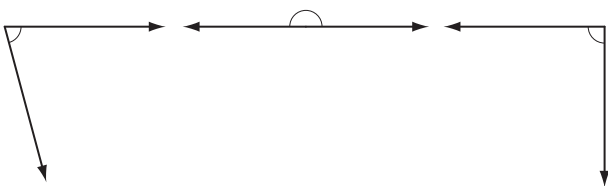


acute

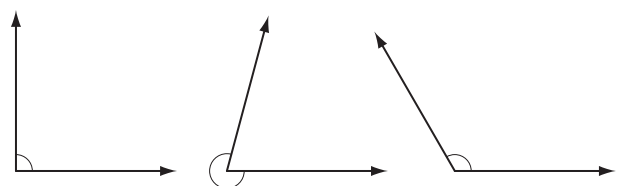
reflex

right

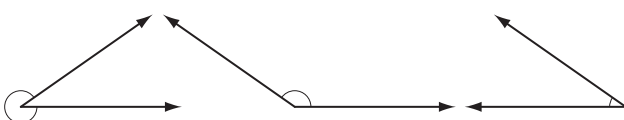
e) Circle the right angle.



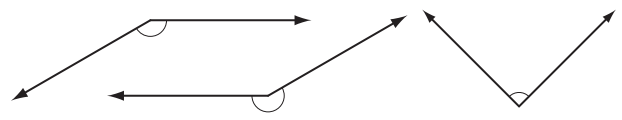
f) Circle the reflex angle.



g) Circle the acute angle.



h) Circle the obtuse angle.



Skill 27.5 Classifying and describing the properties of triangles.

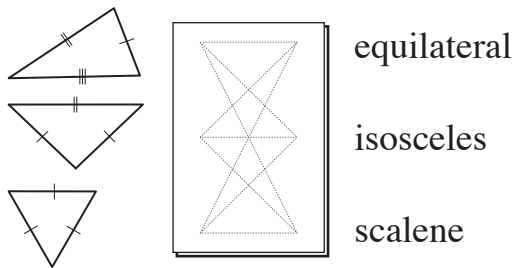
MM4.2 11 223 44
MM5.1 11 223 44

- Look for equal sides or equal angles.
- Look at the types of angles inside the triangle.

Sides and angles	Triangle type
no equal sides/angles	scalene
two equal sides/angles	isosceles
three equal sides/angles	equilateral

Angles	Triangle type
all acute angles	acute-angled
one right angle	right-angled
one obtuse angle	obtuse-angled

Q. Match each triangle to its description:



A.

no equal sides ⇒ **scalene**

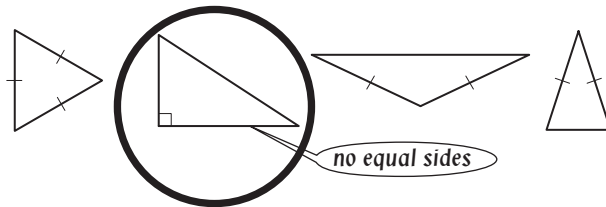
two equal sides ⇒ **isosceles**

three equal sides ⇒ **equilateral**

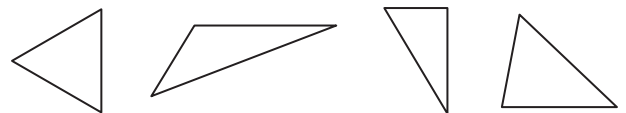
⇒

equilateral
isosceles
scalene

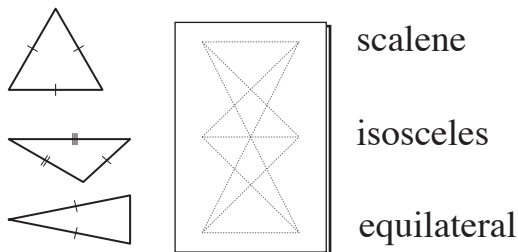
a) Circle the triangle that is **not** isosceles.



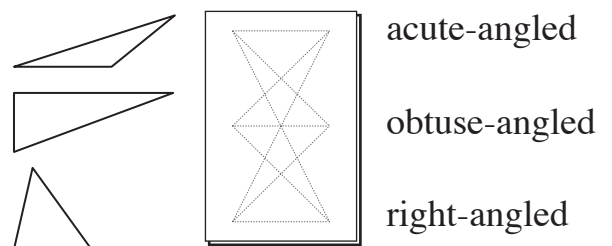
b) Circle the triangle that is obtuse-angled.



c) Match each triangle to its description:



d) Match each triangle to its description:



e) I am a 2-dimensional shape with three sides. I have two of my sides of equal length. What am I?

- A) a square
- B) a right-angled triangle
- C) an isosceles triangle
- D) an equilateral triangle



f) I am a 2-dimensional shape with three sides. I have an obtuse angle. What am I?

- A) an acute-angled triangle
- B) a right-angled triangle
- C) an equilateral triangle
- D) an obtuse-angled triangle



- Consider the properties of squares, rectangles, rhombi, parallelograms, kites and trapeziums. (see Glossary, page 360)

Q. I am a quadrilateral with no parallel sides. I have one pair of opposite angles equal, and my diagonals intersect at right angles. What am I?

- A) a rhombus
B) a trapezium
C) a kite
D) a square

- A.** A) a rhombus has opposite sides parallel $\Rightarrow A$ false
B) a trapezium has one pair of opposite sides parallel $\Rightarrow B$ false
C) a kite has a pair of opposite angles equal and diagonals intersecting at right angles $\Rightarrow C$ true
D) a square has opposite sides parallel $\Rightarrow D$ false

The answer is **C**.

a) I am a 2-dimensional shape with four sides. Both my pairs of opposite sides are parallel. All angles are equal to 90° . What am I?

- A) a trapezium
B) a rectangle
C) a rhombus
D) a parallelogram

b) I am a quadrilateral with all my sides equal in length. My diagonals intersect at right angles, but are not equal in length. What am I?

- A) a kite
B) a rectangle
C) a rhombus
D) a parallelogram

c) I am a 2-dimensional shape with four sides. My diagonals are equal, and all my sides are equal. What am I?

- A) a rhombus
B) a rectangle
C) a parallelogram
D) a square

d) I am a quadrilateral with all my angles equal to 90° . My diagonals are equal in length. What am I?

- A) a trapezium
B) a parallelogram
C) a rectangle
D) a rhombus

e) I am a 2-dimensional shape with four sides. My diagonals are not equal in length and bisect each other but not at right angles. What am I?

- A) a rhombus
B) a parallelogram
C) a kite
D) a trapezium

f) I am a 2-dimensional shape with four sides. Adjacent angles are not equal and I have two axes of symmetry. What am I?

- A) a rhombus
B) a rectangle
C) a parallelogram
D) a square

g) I am a quadrilateral with both pairs of opposite sides parallel and diagonals equal in length. What am I?

- A) a kite
B) a rectangle
C) a rhombus
D) a parallelogram

h) I am a quadrilateral with both pairs of opposite sides equal in length, but no axis of symmetry. What am I?

- A) a trapezium
B) a parallelogram
C) a rectangle
D) a rhombus

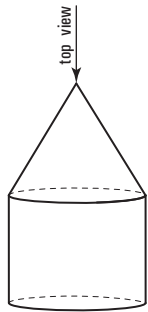
EITHER

- Imagine what you would see from the stated direction

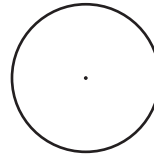
OR

- Make a model and observe the view.

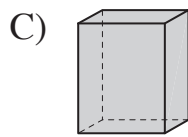
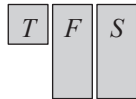
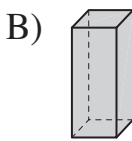
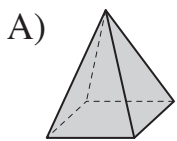
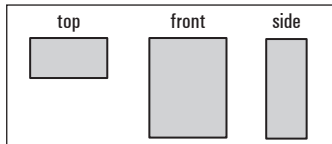
Q. Sketch the top view of this solid.



A.



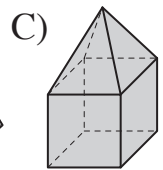
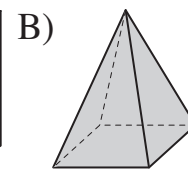
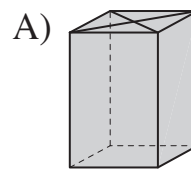
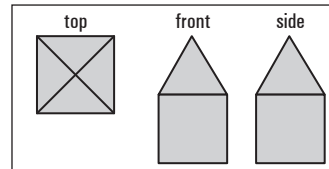
a) Which solid has the top, front and side views shown?



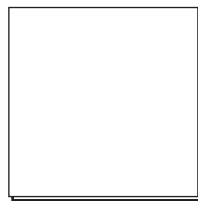
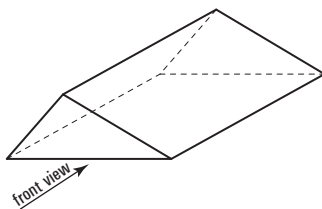
*T F S
as above*



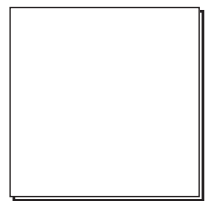
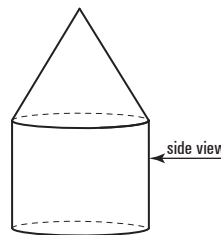
b) Which solid has the top, front and side views shown?



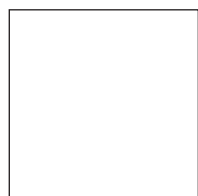
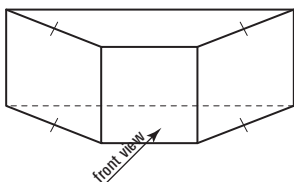
c) Sketch the front view of this solid.



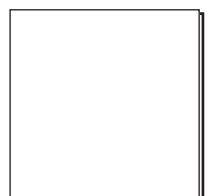
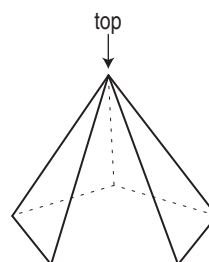
d) Sketch the side view of this solid.



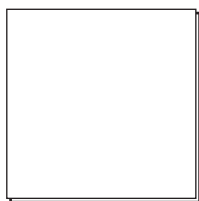
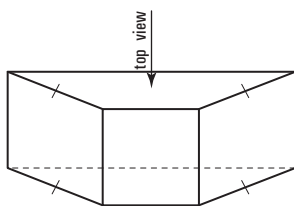
e) Sketch the front view of this solid.



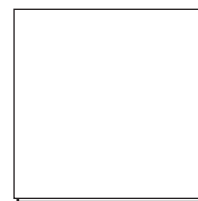
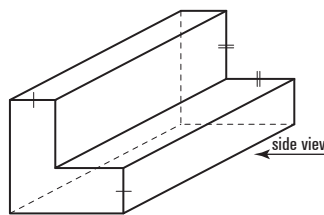
f) Sketch the top view of this solid.



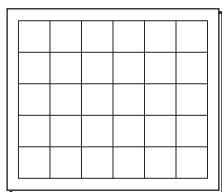
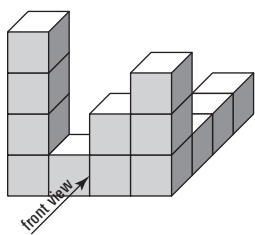
g) Sketch the top view of this solid.



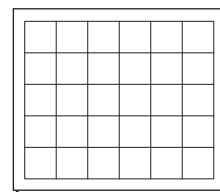
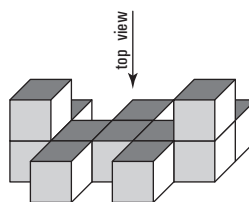
h) Sketch the side view of this solid.



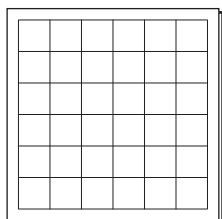
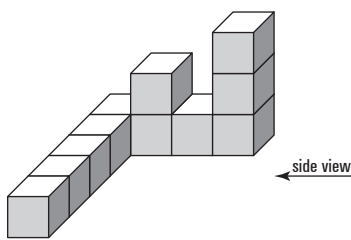
i) Draw the front view of this solid.



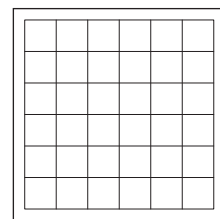
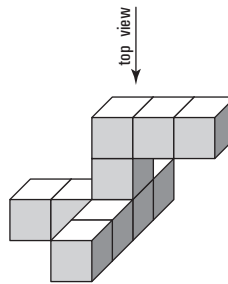
j) Draw the top view of this solid.



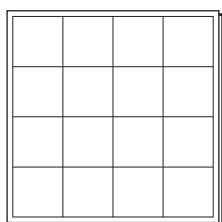
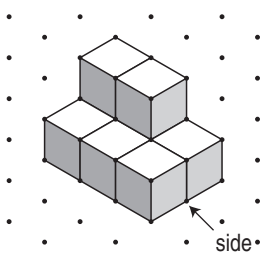
k) Draw the side view of this solid.



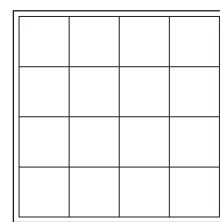
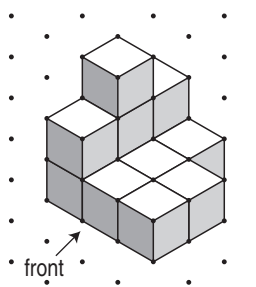
l) Draw the top view of this solid.



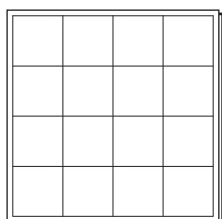
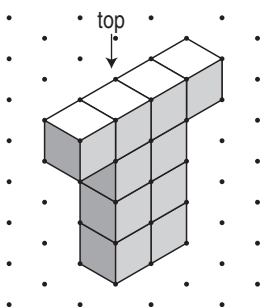
m) Draw the side view of this solid.



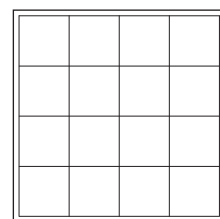
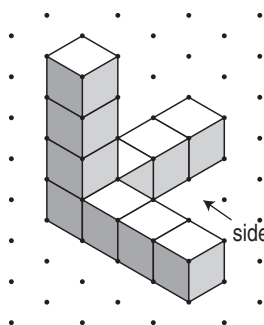
n) Draw the front view of this solid.



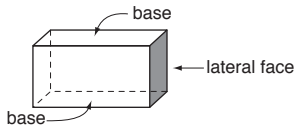
o) Draw the top view of this solid.



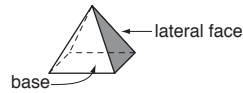
p) Draw the side view of this solid.



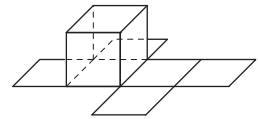
Prism



Pyramid



Cube



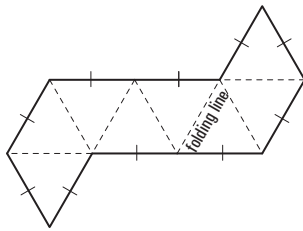
EITHER

- Identify the shapes in the net.
- Imagine the shape folded.

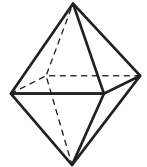
OR

- Make a model by tracing, cutting out and folding the net.

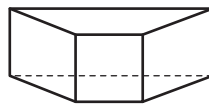
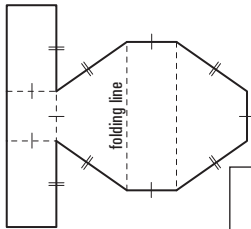
Q. What 3-dimensional shape can this net be used to make?



A. *regular octohedron*

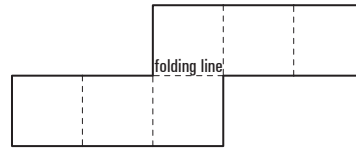


a) What 3-dimensional shape can this net be used to make?

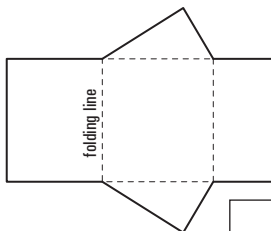


trapezoidal prism

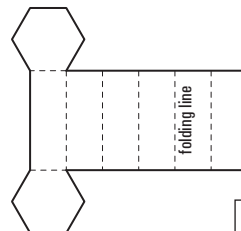
b) What 3-dimensional shape can this net be used to make?



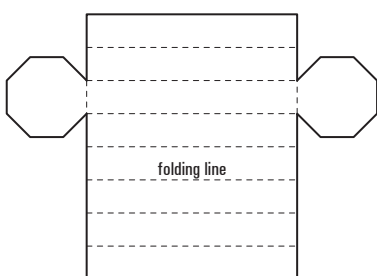
c) What 3-dimensional shape can this net be used to make?



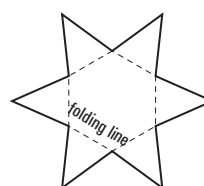
d) What 3-dimensional shape can this net be used to make?



e) What 3-dimensional shape can this net be used to make?

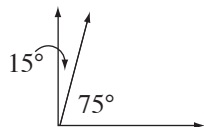


f) What 3-dimensional shape can this net be used to make?



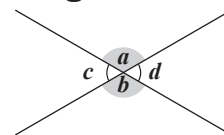
Complementary angles - add to 90°

$$15^\circ + 75^\circ = 90^\circ$$



Vertically opposite angles - are equal

$$\angle a = \angle b, \angle c = \angle d$$



To find the size of an angle when its complementary angle/angles are given

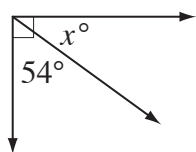
EITHER

- Subtract the given angles from 90° .

OR

- Write an equation involving the unknown angle x° .
- Solve the equation for x° .

Q. Find the value of x° .



A. x° and 54° are complementary: OR

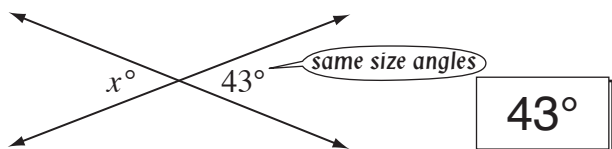
$$x^\circ = 90^\circ - 54^\circ = 36^\circ$$

$$x^\circ + 54^\circ = 90^\circ$$

$$x^\circ + 54^\circ - 54^\circ = 90^\circ - 54^\circ$$

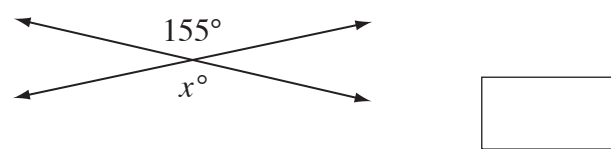
$$x^\circ = 36^\circ$$

a) Find the value of x° .

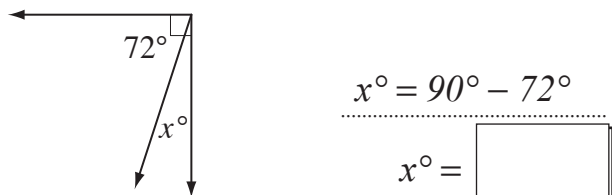


43°

b) Find the value of x° .



c) Find the value of x° .



$$x^\circ = 90^\circ - 72^\circ$$

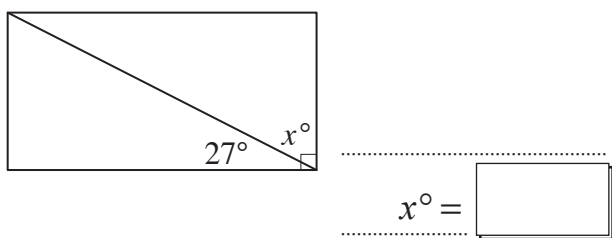
$x^\circ =$

d) Find the value of x° .



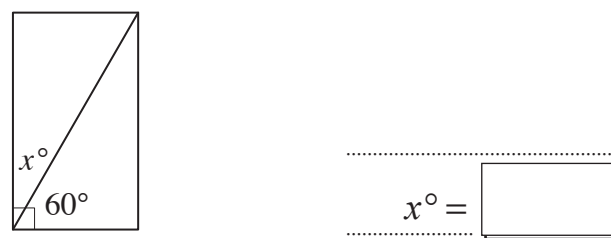
$x^\circ =$

e) Find the value of x° .



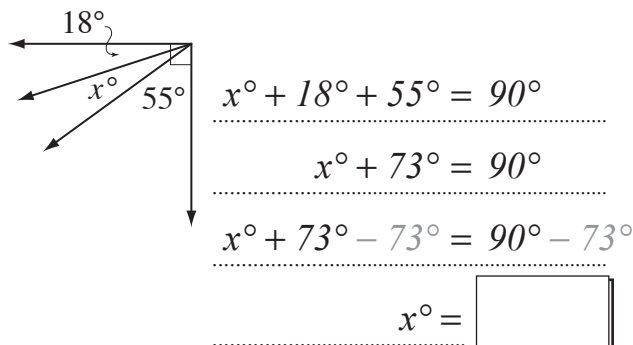
$x^\circ =$

f) Find the value of x° .



$x^\circ =$

g) Find the value of x° .



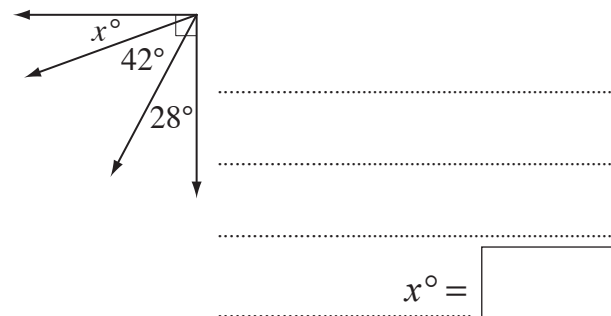
$$x^\circ + 18^\circ + 55^\circ = 90^\circ$$

$$x^\circ + 73^\circ = 90^\circ$$

$$x^\circ + 73^\circ - 73^\circ = 90^\circ - 73^\circ$$

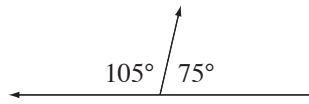
$x^\circ =$

h) Find the value of x° .



$x^\circ =$

Supplementary angles - add to 180°



$$105^\circ + 75^\circ = 180^\circ$$

To find the size of an angle when its supplementary angle/angles are given

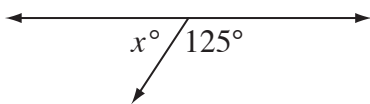
EITHER

- Subtract the given angles from 180° .

OR

- Write an equation involving the unknown angle x° .
- Solve the equation for x° .

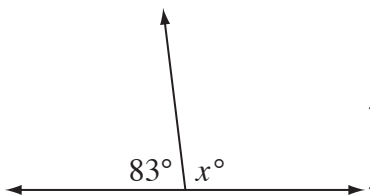
Q. Find the value of x° .



A. x° and 125° are supplementary:
 $x^\circ = 180^\circ - 125^\circ$
 $= 55^\circ$

OR $x^\circ + 125^\circ = 180^\circ$
 $x^\circ + 125^\circ - 125^\circ = 180^\circ - 125^\circ$
 $x^\circ = 55^\circ$

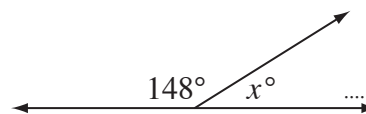
a) Find the value of x° .



$$x^\circ = 180^\circ - 83^\circ$$

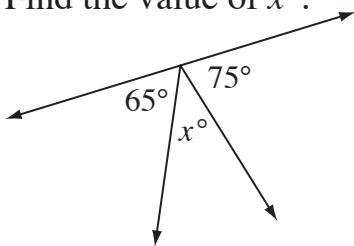
$$x^\circ = \boxed{97^\circ}$$

b) Find the value of x° .



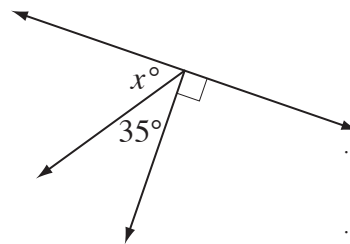
$$x^\circ = \boxed{}$$

c) Find the value of x° .



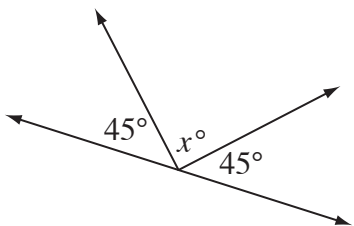
$$x^\circ = \boxed{}$$

d) Find the value of x° .



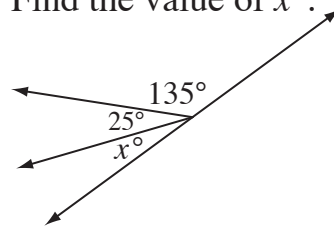
$$x^\circ = \boxed{}$$

e) Find the value of x° .



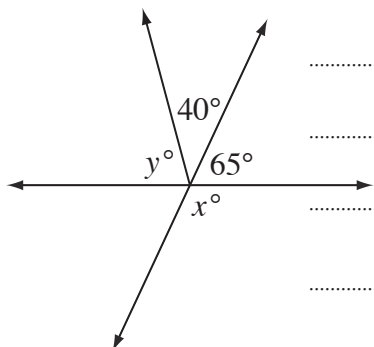
$$x^\circ = \boxed{}$$

f) Find the value of x° .



$$x^\circ = \boxed{}$$

g) Find the values of x° and y° .

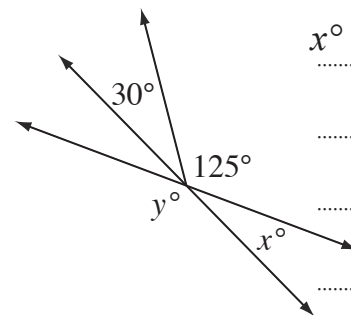


$$x^\circ + 65^\circ = 180^\circ$$

$$x^\circ = \boxed{}$$

$$y^\circ = \boxed{}$$

h) Find the values of x° and y° .



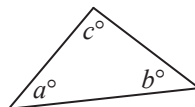
$$x^\circ + 30^\circ + 125^\circ = 180^\circ$$

$$x^\circ = \boxed{}$$

$$y^\circ = \boxed{}$$

Sum of interior angles in a triangle = 180°

$$a^\circ + b^\circ + c^\circ = 180^\circ$$



To find the size of an angle of a triangle when the other two angles are given

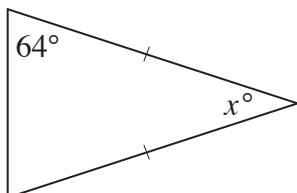
EITHER

- Subtract the sum of the given angles from 180° .

OR

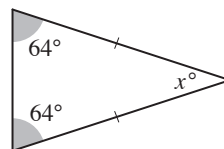
- Write an equation involving the unknown angle x° .
- Solve the equation for x° .

Q. Find the value of x° .



A. *Isosceles triangle* \Rightarrow base angles are equal:

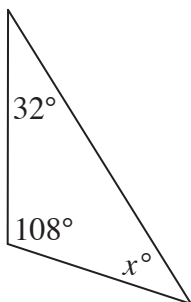
$$\begin{aligned} x^\circ &= 180^\circ - (64^\circ + 64^\circ) \\ &= 180^\circ - 128^\circ \\ &= 52^\circ \end{aligned}$$



OR

$$\begin{aligned} x^\circ + 64^\circ + 64^\circ &= 180^\circ \\ x^\circ + 128^\circ - 128^\circ &= 180^\circ - 128^\circ \\ x^\circ &= 52^\circ \end{aligned}$$

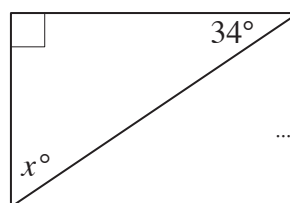
a) Find the value of x° .



$$\begin{aligned} x^\circ &= 180^\circ - (32^\circ + 108^\circ) \\ &= 180^\circ - 140^\circ \end{aligned}$$

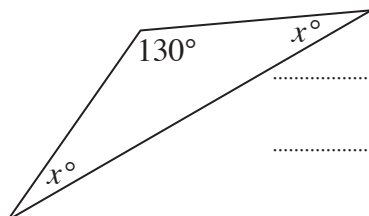
$$x^\circ = \boxed{40^\circ}$$

b) Find the value of x° .



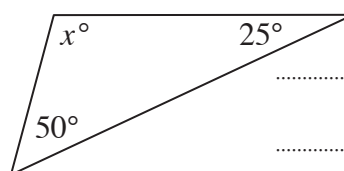
$$x^\circ = \boxed{}$$

c) Find the value of x° .



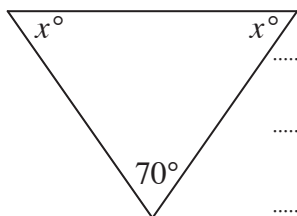
$$x^\circ = \boxed{}$$

d) Find the value of x° .



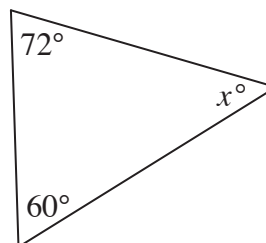
$$x^\circ = \boxed{}$$

e) Find the value of x° .



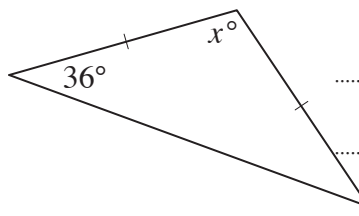
$$x^\circ = \boxed{}$$

f) Find the value of x° .



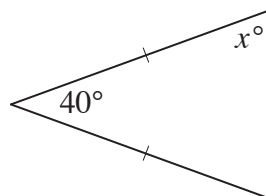
$$x^\circ = \boxed{}$$

g) Find the value of x° .



$$x^\circ = \boxed{}$$

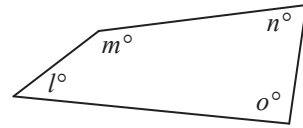
h) Find the value of x° .



$$x^\circ = \boxed{}$$

Sum of interior angles in a quadrilateral = 360°

$$l^\circ + m^\circ + n^\circ + o^\circ = 360^\circ$$



To find the size of an angle of a quadrilateral when the other two angles are given

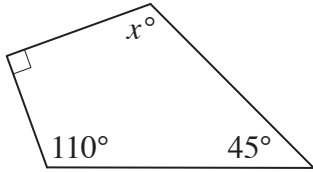
EITHER

- Subtract the sum of the given angles from 360° .

OR

- Write an equation involving the unknown angle x° .
- Solve the equation for x° .

Q. Find the value of x° .



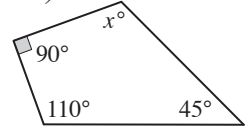
A. $x^\circ = 360^\circ - (90^\circ + 110^\circ + 45^\circ)$
 $= 360^\circ - 245^\circ$
 $= 115^\circ$

OR

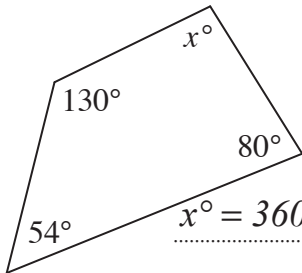
$$x^\circ + 90^\circ + 110^\circ + 45^\circ = 360^\circ$$

$$x^\circ + 245^\circ - 245^\circ = 360^\circ - 245^\circ$$

$$x^\circ = 115^\circ$$



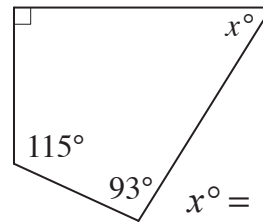
a) Find the value of x° .



$$x^\circ = 360^\circ - (130^\circ + 54^\circ + 80^\circ)$$

$$= 360^\circ - 264^\circ = \boxed{96^\circ}$$

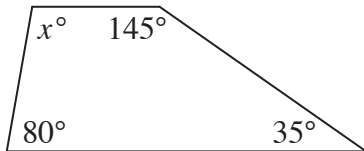
b) Find the value of x° .



$$x^\circ =$$

$$= \boxed{}$$

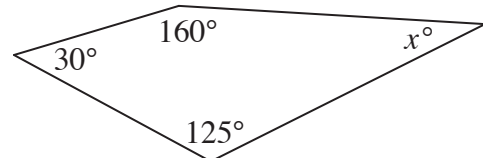
c) Find the value of x° .



$$x^\circ =$$

$$= \boxed{}$$

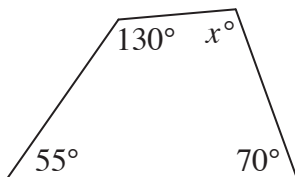
d) Find the value of x° .



$$x^\circ =$$

$$= \boxed{}$$

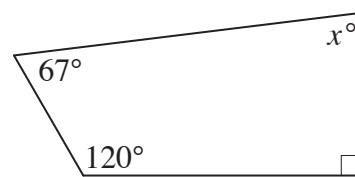
e) Find the value of x° .



$$x^\circ =$$

$$= \boxed{}$$

f) Find the value of x° .



$$x^\circ =$$

$$= \boxed{}$$

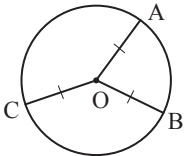
Skill 27.13 Describing the properties of circles.

MM4.2 11 22 33 44
MM5.1 11 22 33 44

- Consider the definitions and properties of radius (plural radii), chord, diameter, tangent and circumference of a circle. (see Glossary, and Math Facts, page 386)

Radius

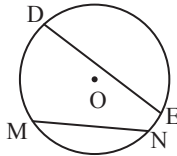
joins the centre with any point on the circle



$OA = OB = OC$

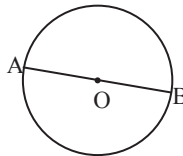
Chord

joins any two points on the circle



Diameter

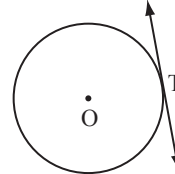
a chord passing through the centre



$AB = 2OA$

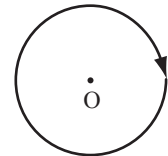
Tangent

a line touching the circle in one point



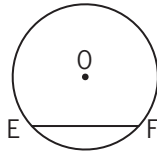
Circumference

the distance around the circle



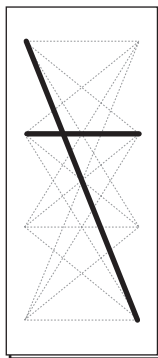
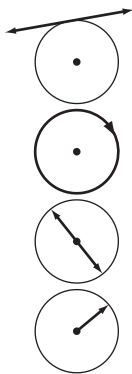
Q. What is \overline{EF} in this diagram?

- A) diameter
- B) tangent
- C) chord
- D) radius



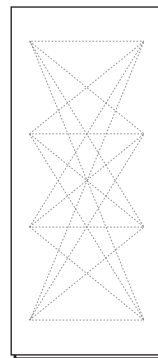
A. \overline{EF} joins two points on the circle and does not pass through the centre \Rightarrow **chord**

a) Match each diagram to its description:



- diameter
- circumference
- radius
- tangent

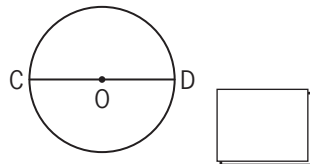
b) Match each diagram to its description:



- circumference
- radius
- diameter
- area

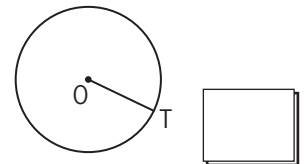
c) What is \overline{CD} in this diagram?

- A) tangent
- B) diameter
- C) radius
- D) circumference

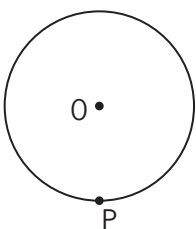


d) What is \overline{OT} in this diagram?

- A) chord
- B) tangent
- C) diameter
- D) radius



e) Draw the diameter passing through P.



f) Draw the radius passing through S.

