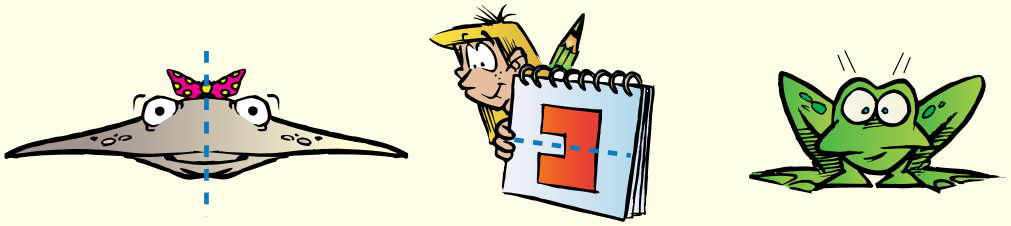
2D Space

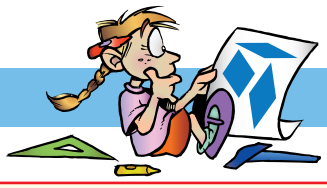
This Concept Dictionary consists of Teaching Points extracted from Maths Builder's worksheets and shows the development of important maths concepts from the 2D Space strand, Year 0 to Year 6.

1:03 Symmetry

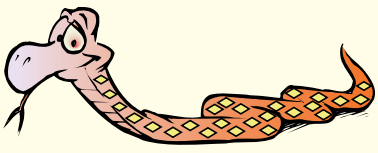
Objects or pictures are symmetrical if both sides would match if they were folded along the middle.



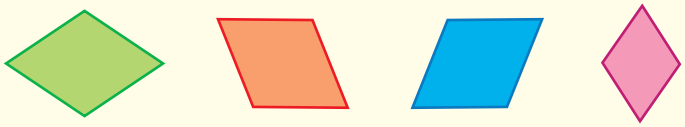
1:04 The rhombus



Rhombus



Rhombus is another name for diamond.
It has 4 sides and 4 corners (angles).



All four sides have the same length.

Maths Builder Year 5
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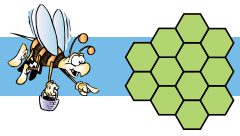
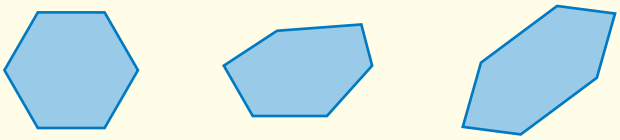
1:06 Hexagons

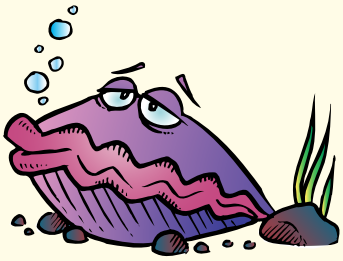


2D Space

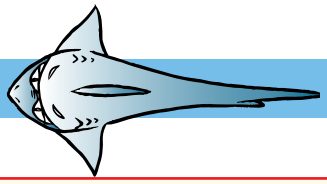
Hexagon

An hexagon has 6 straight sides and 6 corners.



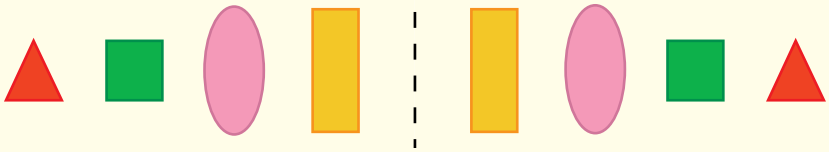


1:08 Symmetrical patterns



2D Space

This is a symmetrical pattern.

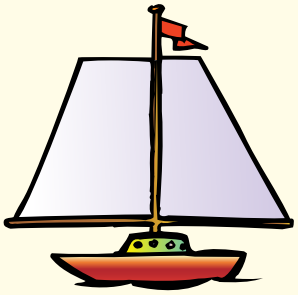


1:09 Trapeziums

2D Space

Trapeziums

A trapezium has 4 straight sides.
2 sides go in the same direction.



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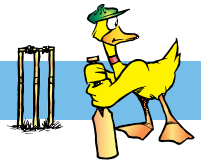
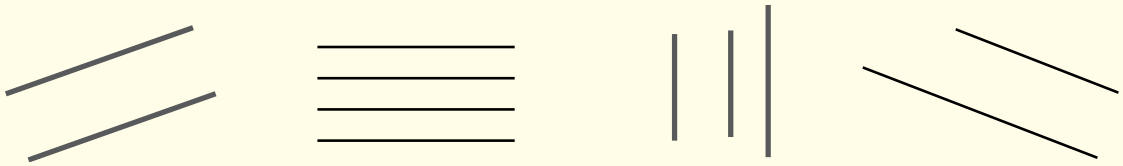
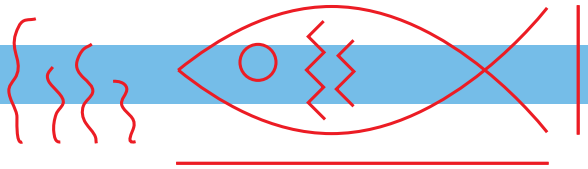
2:01 Parallel lines



Two or more lines that run in the same direction are called parallel lines.



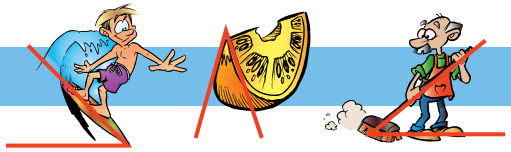
2:02 Lines

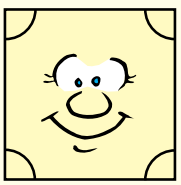


Lines going straight across are called **horizontal**.

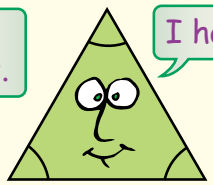
Lines going straight up and down are called **vertical**.

2:03 Angles

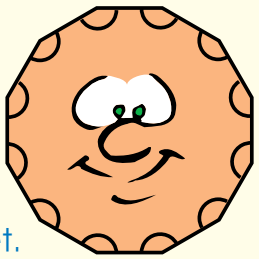




I have 4 angles.



I have 3.



Look at all mine!

____ angles

An angle is made where two lines (arms) meet.

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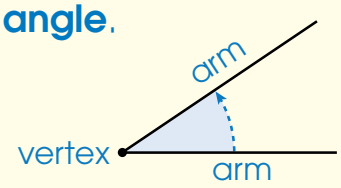
2:05 Angles - arms and vertices

one vertex,
two vertices

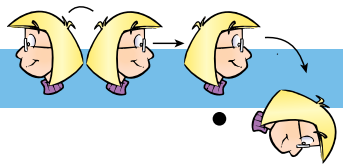
2D Space

When two straight lines meet they make an **angle**.

- The two lines are called **arms**.
- The corner where the two lines meet is called the **vertex**.

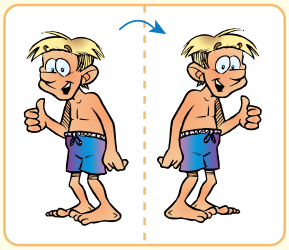


2:06 Flip, slide and turn

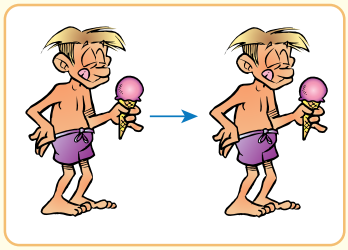


2D Space

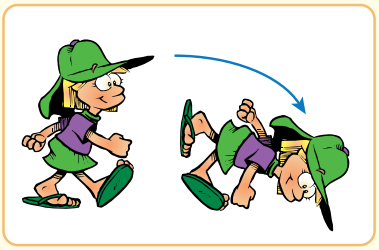
Flip (reflect)

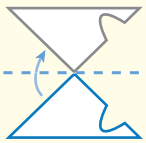


Slide (move)

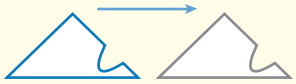


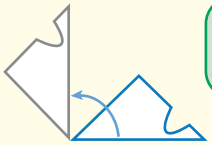
Turn (rotate)





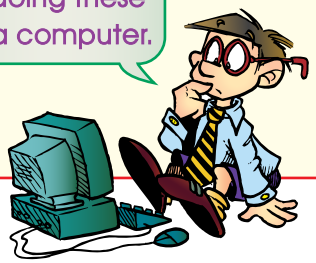
Flip, slide or turn?



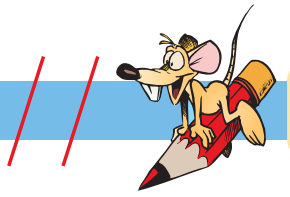


Each move is a single flip, slide or turn.

Try doing these on a computer.



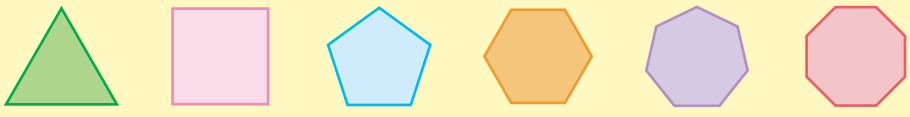
3:01 2D shapes



Parallel lines go in the same direction.

(2D Space)

A **regular** shape has all sides and all angles equal.



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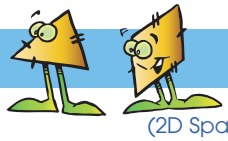
3:02 The pentagon

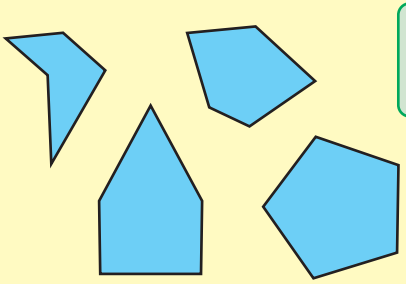
Pentagons have 5 sides.



(2D Space)

The pentagon

A pentagon has **5** straight sides, **5** corners (verticies) and **5** angles.



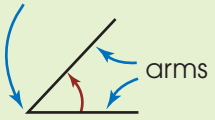
A regular pentagon has 5 equal sides and 5 equal angles.

3:03 Comparing angles

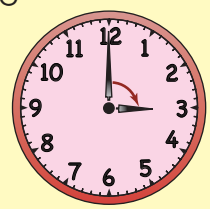
(2D Space)

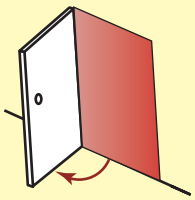
When two lines meet they form an angle.

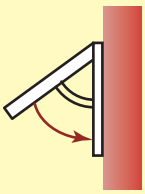
vertex (or corner)



The size of an angle is the amount of turning between its arms.





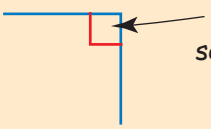


3:04 The right angle

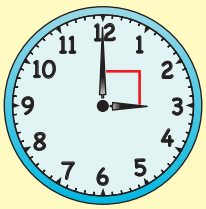
A **right angle** is one quarter of a full turn.

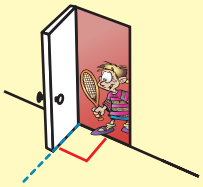
(2D Space)

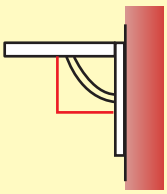
A square corner (like the corner of a page) is called a right angle.



We use this square marking to show a right angle.







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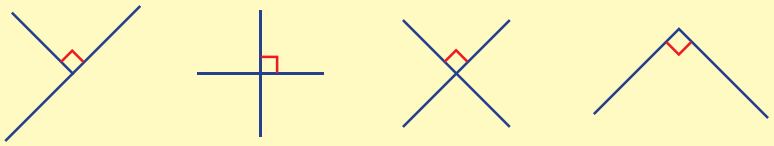
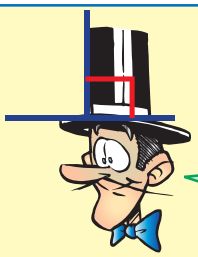
3:05 Perpendicular lines and right angles

A square corner.

(2D Space)

Perpendicular lines meet at right angles.





These pairs of lines are perpendicular.

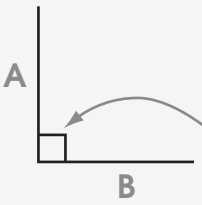
3:05 Consolidation

Perpendicular lines and right angles

The sides of a square corner are perpendicular.

(2D Space)

Perpendicular lines are two lines that meet at right angles.

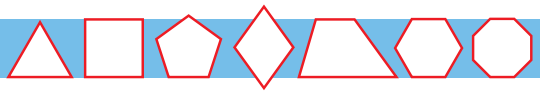


Line A is perpendicular to line B.

We mark a right angle to show perpendicular lines.

We use this mark to show that lines are perpendicular.

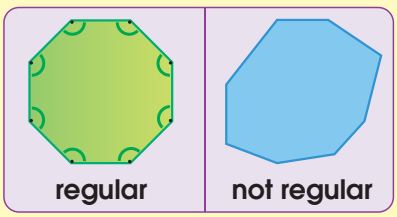
3:06 The octagon



Can you name these shapes?

(2D Space)

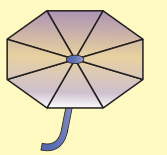
An **octagon** has 8 sides, 8 vertices and 8 angles.



The octagon

A **regular octagon** has
8 equal sides
and
8 equal angles.

An octagon makes a great beach umbrella. The octagon below looks like a car.



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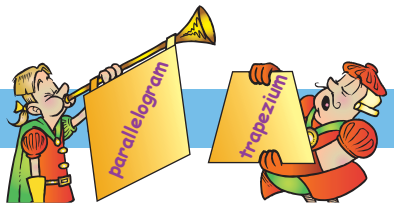
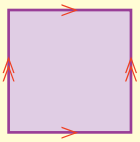
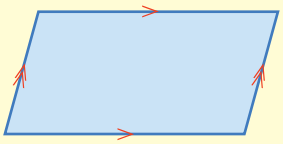
3:07 The parallelogram



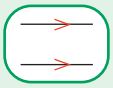
(2D Space)

The parallelogram has 4 straight sides. The **opposite sides** are **parallel** and have the **same length**.

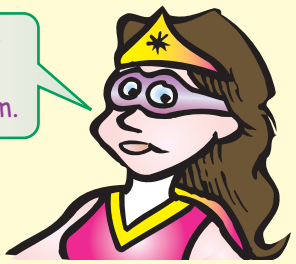




We can use arrows to show parallel sides.



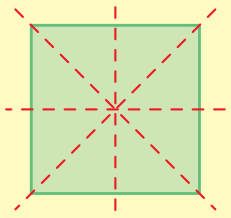
A square is a special parallelogram.



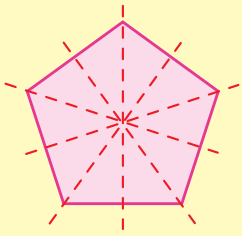
3:08 Lines of symmetry

(2D Space)

A shape can have more than 1 line of symmetry.

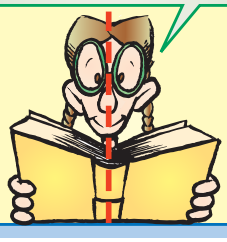


A square has 4 lines of symmetry.



A regular pentagon has 5 lines of symmetry.

A line of symmetry always goes through the centre.

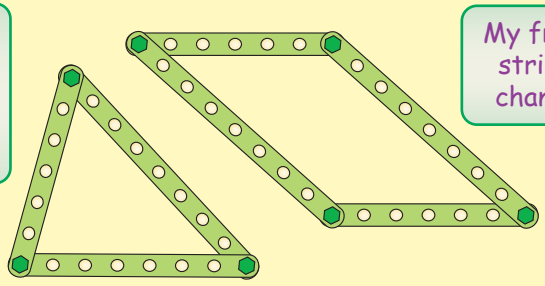


3:09 Rigidity of frames

Triangles in the bike frame make it strong.

(2D Space)

I joined 3 Meccano strips. My frame won't move.



My frame has 4 strips. It can change shape.

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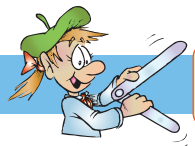
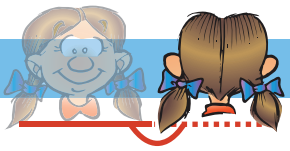
4:05 Angles



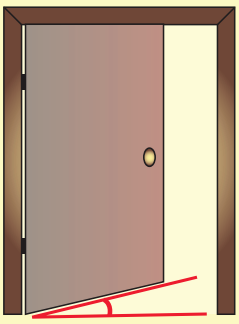
This is a movable angle.

This angle is a half turn.

(2D Space)



Teaching



Sometimes one arm of an angle cannot be seen.

The door has opened from the doorway.

The angle is made by the amount of turning from the doorway.

The **angle made with the horizontal** is shown.

The **angle of leaning** is shown.

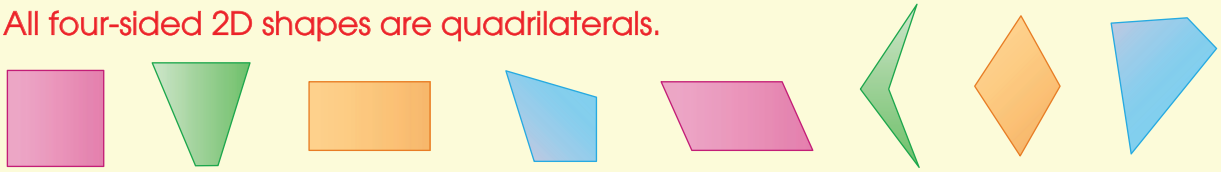
4:06 Quadrilaterals

Quadrilaterals have four straight sides.

(2D Space)

Teaching

All four-sided 2D shapes are quadrilaterals.



5:01 Polygons

Wow!

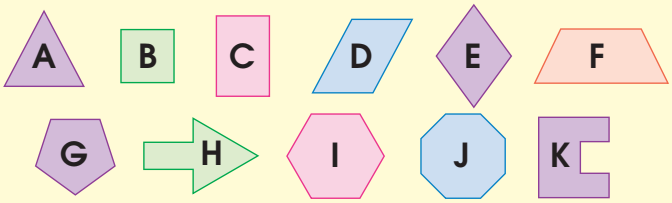
A polygon that has 10 sides is called a decagon.

A decade is 10 years.

(2D Space)

Teaching

Shapes that are made up of 3 or more straight sides are called **polygons**.



The outline of this coin is a polygon.

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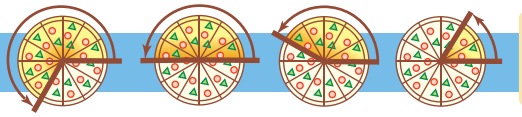
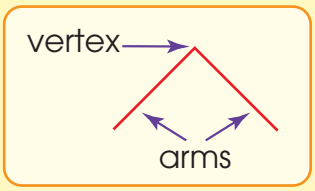
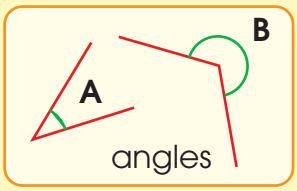
5:02 Angles

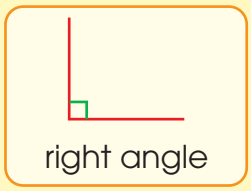


The size of an angle is its amount of turn.

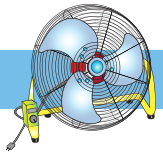
(2D Space)







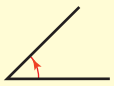
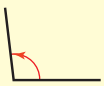
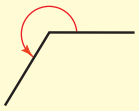
5:03 Types of angles



The blades of the fan turn many revolutions each second.

(2D Space)

Angles have different names according to their size.

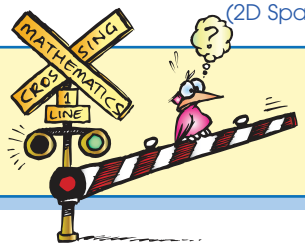
acute angle	right angle	obtuse angle	straight angle	reflex angle	a revolution
					
smaller than a right angle	a quarter of a turn	larger than a right angle but smaller than a straight angle	half of a turn	larger than a straight angle but smaller than a revolution	one whole turn

5:05 Lines

Lines can be straight, wavy, curved, zig-zag, parallel, intersecting, sloping, horizontal, vertical or broken.

(2D Space)

Intersecting lines are lines that cross over each other.



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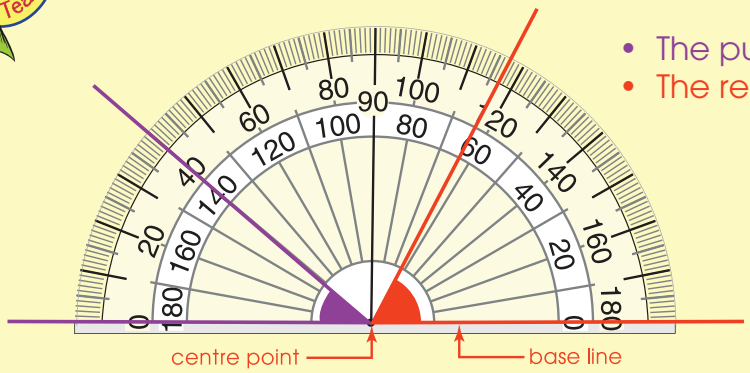
5:06 Measuring angles

a straight angle = 180°

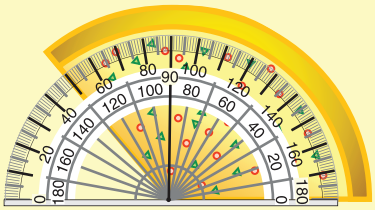
a right angle = 90°

(2D Space)

A protractor is used to draw angles or to measure their size.
Each small unit on the protractor is one degree of turn.



- The purple angle measures 40°.
- The red angle measures 63°.

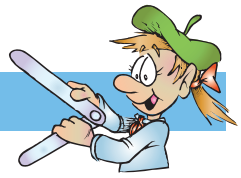


My piece of pizza has been cut at an angle of 130°.

- The centre point is placed at the vertex of the angle.
- The base line is placed on one arm of the angle.
- There are two scales so we can measure from either side.

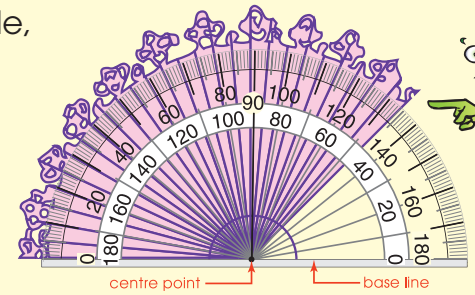
5:07 Measuring angles

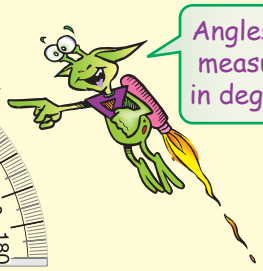
Angles that are less than 90° are called acute angles.



(2D Space)

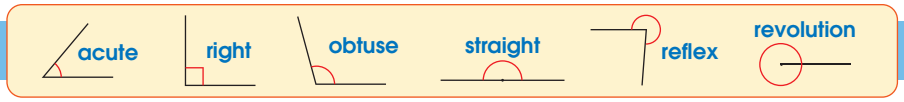
- To measure the size of an angle, place the centre point at the vertex of the angle and place the base line along one arm.
- The fan opens to an angle of 134°.





Angles are measured in degrees.

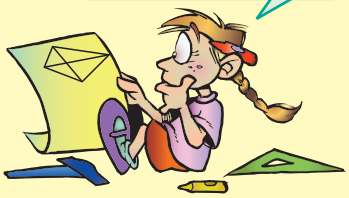
5:08 Diagonals



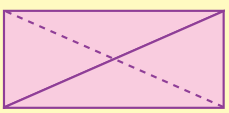
(2D Space)

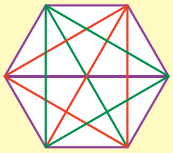
Diagonals are straight lines drawn from one corner to another non-adjacent corner (corners not next to each other).

Use a ruler to keep the lines straight.



A rectangle has two diagonals.





A hexagon has 9 diagonals.

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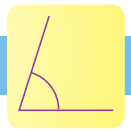
5:11 Drawing acute angles

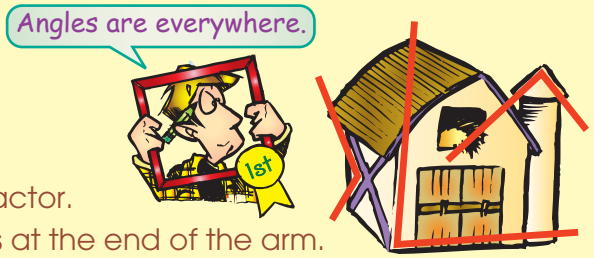


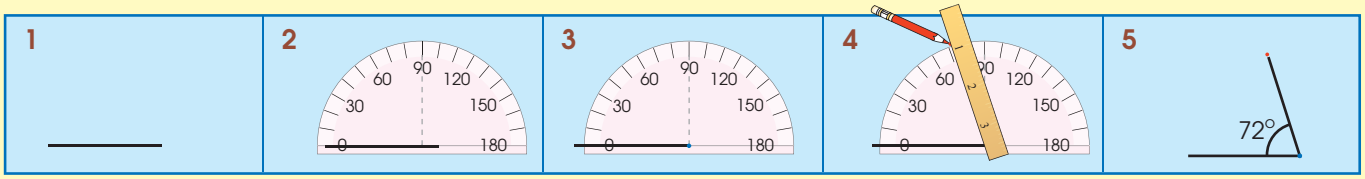
For an acute angle, the amount of turn is less than 90°.

(2D Space)

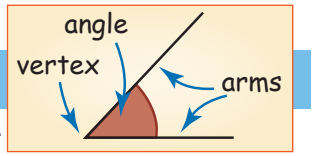
Procedure: How to draw an angle of 72°
What you need: pencil, ruler, protractor
Steps:

1. Draw one arm of the angle.
2. Place the arm on the base line of the protractor.
3. Move the protractor until the centre point is at the end of the arm.
4. Follow the scale from 0 and find where 72° lies. Mark the place.
5. Remove the protractor and rule a line to join the dot to the end of the arm.





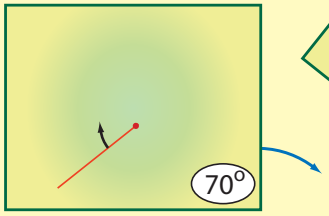
5:12 Constructing acute angles

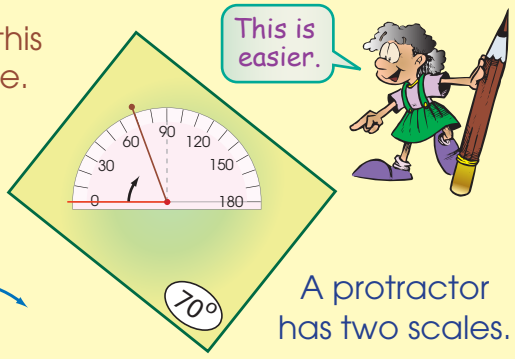


(2D Space)

When drawing angles beginning with a sloping arm, turn the page so that the arm of the angle lies in front of you, from left to right.

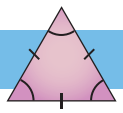
Draw an angle on this arm that is 70° in size.





A protractor has two scales.

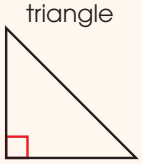
5:13 Types of triangles



The same marks on sides or angles mean they are equal.

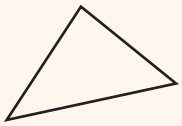
(2D Space)

A right-angled triangle



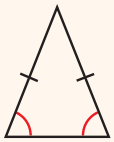
One angle is a right-angle.

A scalene triangle



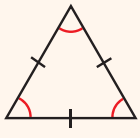
No sides equal.
No angles equal.

An isosceles triangle



Two sides equal.
Two angles equal.

An equilateral triangle



All sides equal.
All angles equal.

If 2 sides are equal then 2 of the angles are equal. If 3 sides are equal, then the 3 angles are equal.

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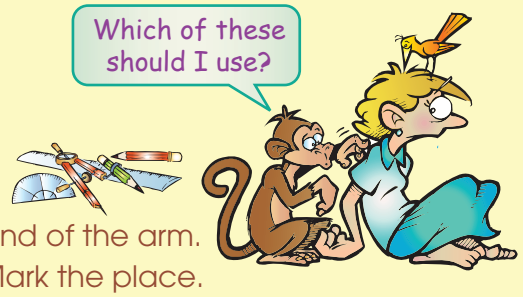
5:16 Constructing obtuse angles

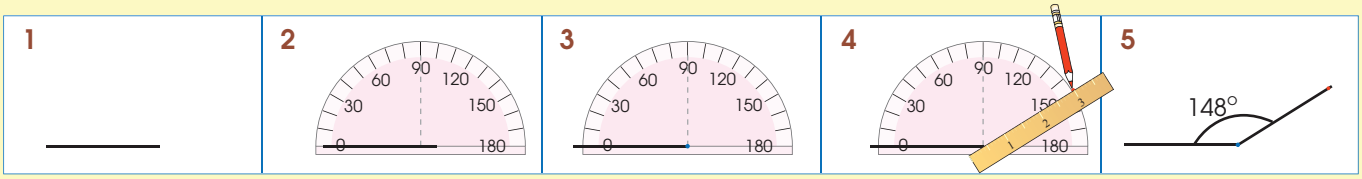
Obtuse angles are larger than 90° but smaller than 180°.

(2D Space)

Procedure: To draw an angle of 148°
What you need: pencil, ruler, protractor
Steps:

1. Draw one arm of the angle.
2. Place the arm on the base line of the protractor.
3. Move the protractor till the centre point is at the end of the arm.
4. Follow the scale from 0 and find where 148° lies. Mark the place.
5. Remove the protractor. Rule a line to join the dot to the end of the arm.

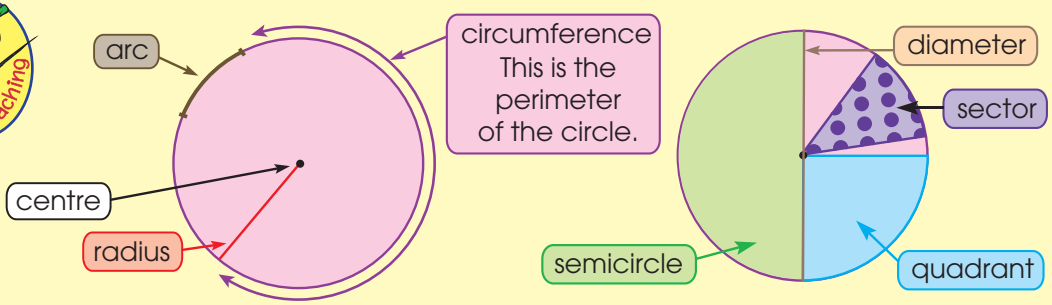




5:17 Parts of a circle

How could you use string to find the circumference of a circle?

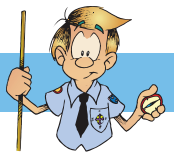
(2D Space)



The term semicircle can refer to half of the inside of the circle OR half of the circumference.

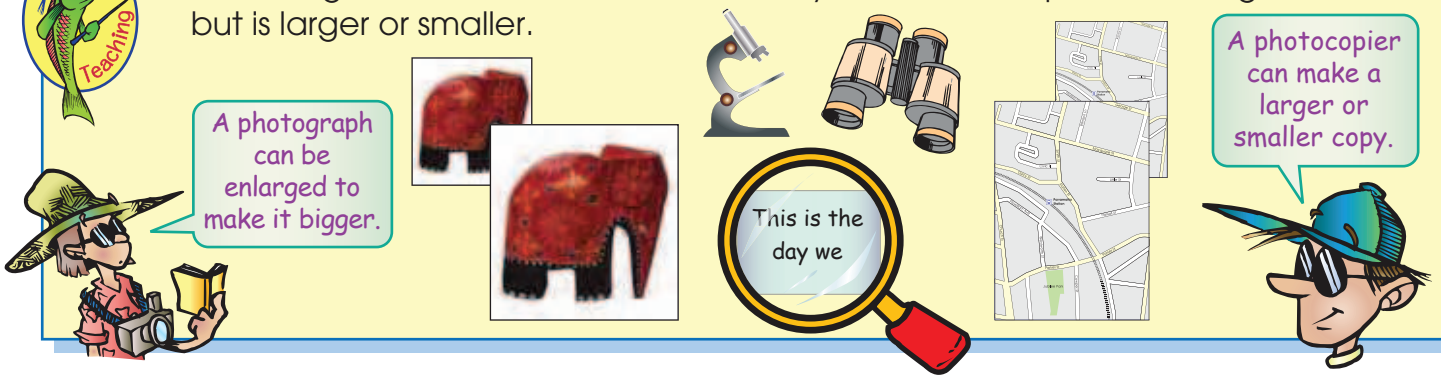
5:18 Enlargements and reductions

Plans and maps are reductions.



(2D Space)

An enlargement or reduction has exactly the same shape as the original, but is larger or smaller.



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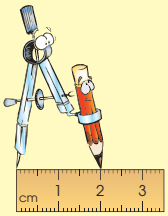
5:19 Creating circles

one radius
two radii

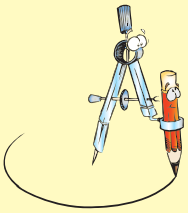
The sharp part is called the point of the compass.

(2D Space)

Drawing a circle



Open the compass to 2 cm. Make sure the pencil and point (spikey part) are level.

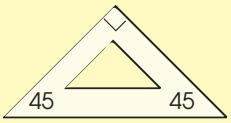


Put a dot for the centre. Place the compass point on the centre point and turn the compass around.

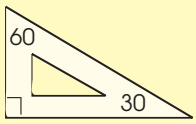
6:04 Identifying 2D shapes

(2D Space)

Set squares can be used to draw 2D shapes.



This set square has 45° and 90° angles.



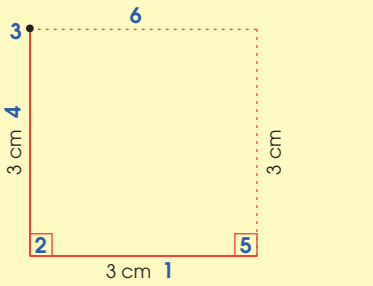
This set square has 30°, 60° and 90° angles.

Procedure:

To draw a square with sides 3 cm:

Steps

1. Draw a 3 cm line.
2. Put the right-angle (90°) of the set square on the end of the line.
3. Put a dot 3 cm along the edge of the set square.
4. Join the end of the line and the dot making the side 3 cm long.
5. Repeat steps 2-4 on the end of each line.

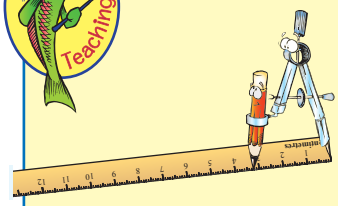


6:10 Circle designs

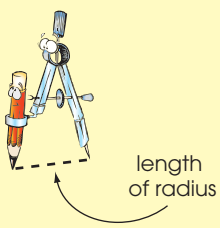
arc, quadrant, sector, circumference, radius, diameter

(2D Space)

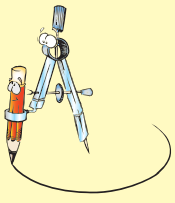
We use a pair of compasses to draw a circle.



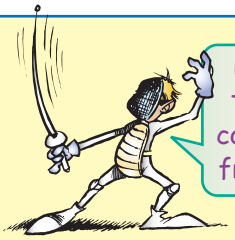
Open the pencil tip and compass point to the length of the radius.



Make sure the pencil tip and the compass point are level.



Put the compass point on the centre of the circle and turn the compass around from the top.



Press down to keep the compass point from slipping.

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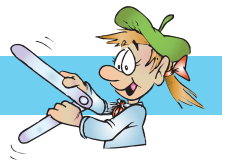
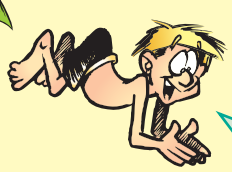
6:11 Measuring reflex angles

A revolution = 360°

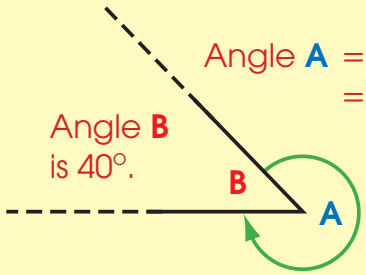
(2D Space)



To measure the size of angle **A**, measure angle **B** and take it away from 360°.



Extend each arm of the angle before using the protractor.



Angle **A** = 360° − 40°
= 320°

A circular protractor could be used to measure angle A.

6:12 Constructing reflex angles

A reflex angle is between 180° and 360°.

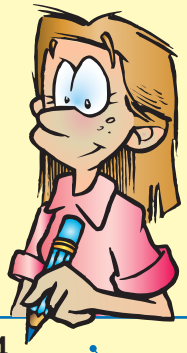
(2D Space)

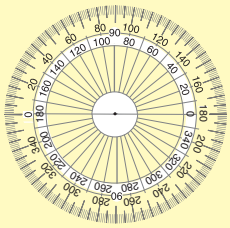
Procedure: To draw a reflex angle of 315°

What you need: pencil, ruler, protractor

Steps:

1. Calculate 360° − 315° (that is 45°).
2. Draw one arm of the angle.
3. Place a dot next to the protractor at 45°.
4. Draw the second arm of the angle to that new dot.
5. Mark the reflex angle with 315°.





Angle **A** is 315°.

1	2	3	4	5
3 6 0° − 3 1 5°			45°	45° A 315°

6:13 Rotational symmetry

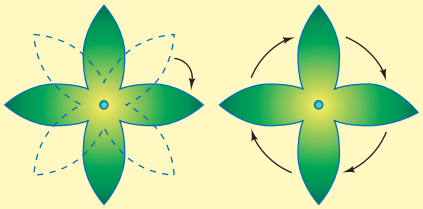
(2D Space)

This logo has rotational symmetry of order 3.

To have rotational symmetry a tracing must match the original shape after part of a full turn.

The tracing matches the original shape 4 times in a full turn. This is called order 4.

The first match is at a quarter turn.



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