

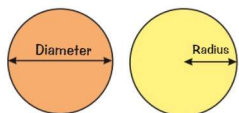
Knowledge Organiser: Year 9 Maths; Circles (Part 1)



Circles

There's a surprising number of **circle terms** you need to know — don't mix them up. Oh, and it's probably best to have a snack before starting this page. All the talk of **pi** can make you a bit peckish.

Radius and Diameter



The **DIAMETER** goes **right across** the circle, passing through the **centre**.
The **RADIUS** goes from the **centre** of the circle to any point on the **edge**.

The DIAMETER IS EXACTLY DOUBLE THE RADIUS

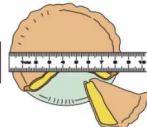
So if the radius is 4 cm, the diameter is 8 cm,
and if the diameter is 24 m, the radius is 12 m.

Area, Circumference and π

There are two more important formulas for you to **learn** — **circumference** and **area** of a circle.
The circumference is the distance round the outside of the circle (its **perimeter**).

1) **CIRCUMFERENCE** = $\pi \times \text{diameter}$
= $\pi \times \text{radius} \times 2$

$C = \pi \times D$ or $C = 2 \times \pi \times r$



2) **AREA** = $\pi \times (\text{radius})^2$

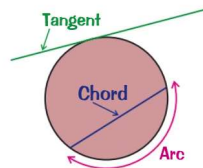
$A = \pi \times r^2$

$\pi = 3.141592\dots = 3.142$ (approx)

The big thing to remember is that π (called "pi") is just an **ordinary number** (3.14159...) which is often rounded off to 3.142. You can just use the π button on your calculator (which is way more accurate).

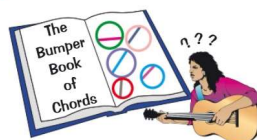
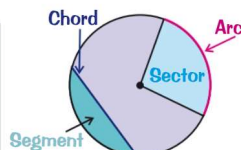
So a circle with radius **6 cm** has a **circumference** of $2 \times \pi \times r = 2 \times \pi \times 6 = 37.7 \text{ cm}$ (1 d.p.)
and an **area** of $\pi \times r^2 = \pi \times 6^2 = 113.1 \text{ cm}^2$ (1 d.p.).

Tangents, Chords, Arcs, Sectors and Segments



A **TANGENT** is a straight line that **just touches the outside** of a circle.
A **CHORD** is a line drawn **across the inside** of a circle.
AN **ARC** is just **part of the circumference** of a circle.

A **SECTOR** is a wedge-shaped area (like a slice of cake) cut right from the centre.
SEGMENTS are the areas you get when you cut a circle with a chord.



Arc Lengths and Areas of Sectors



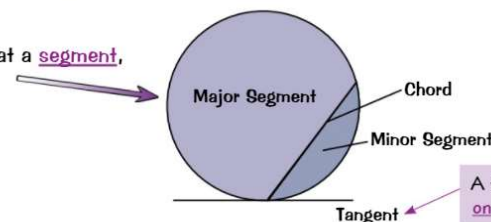
These next ones are a bit more tricky — before you try and **learn** the **formulas**, make sure you know what a **sector** and an **arc** are (I've helpfully labelled the diagram below — I'm nice like that).



Area of Sector = $\frac{x}{360} \times \text{Area of full Circle}$

Length of Arc = $\frac{x}{360} \times \text{Circumference of full Circle}$

You also need to know what a **segment**, a **chord** and a **tangent** are.



A tangent **just touches one point** of the circle.

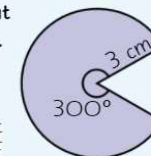
EXAMPLE:

In the diagram on the right, a sector with angle 60° has been cut out of a circle with radius 3 cm. Find the exact area of the shaded shape.

Use the formula to find the area of the shaded sector:

$$\begin{aligned} \text{area of sector} &= \frac{x}{360} \times \pi r^2 = \frac{300}{360} \times \pi \times 3^2 \\ &= \frac{5}{6} \times \pi \times 9 = \frac{15}{2} \pi \text{ cm}^2 \end{aligned}$$

'Exact area' means leave your answer in terms of π .



3D Shapes — Volume

Another page on volumes now — my generosity knows no limits.

Volumes of Spheres



VOLUME OF SPHERE = $\frac{4}{3} \pi r^3$



A **hemisphere** is half a sphere. So the volume of a hemisphere is just half the volume of a full sphere, $V = \frac{2}{3} \pi r^3$.



How do we use Knowledge Organisers in Mathematics?

How can you use knowledge organisers at home to help us?

- **Retrieval Practice:** Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.

I will also use these at home to complete my own independent learning and revision of these key topics.

GLUE HERE