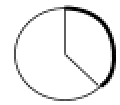
Circles

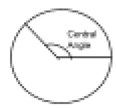
Parts of a Circle: Vocabulary

Arc: Part of a circle defined by a chord or two radii. It is a part of the whole circumference.

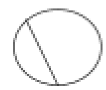


Area of a disc: The measure of the surface of a disc. Think of it as a Pizza with all the fixings.

Central Angle: An angle formed by two radii.



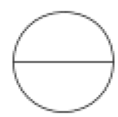
Chord: A segment joining any two points on a circle. Think of it as if someone was swinging from a cord (rope) attached to two points on a circle.



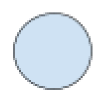
Circle: Closed line segment with all points an equal distance from the interior point known as the centre.

Circumference: The perimeter or length around a circle (2 Dimensional, 2D).

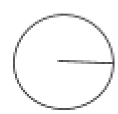
Diameter: It is the longest chord in a circle passing through its centre. It is also the circle's axis of symmetry.



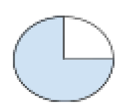
Disc: A region of a plane comprising the circle and the interior. Think about a music CD with no hole in the middle (2-D).



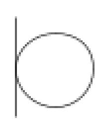
Radius: It represents half of the diameter. It is a line segment with one endpoint at the centre of the circle and the other at any point along the outside of the circle.



Sector: Part of a disc defined by two radii. Think of it as the area of a piece of the whole pizza.



Tangent: A line that intersects a circle at one point only.



Circumference/Perimeter of a Circle

Circumference or Perimeter of a circle is the length around a circle. It would be the distance you would have to travel in order to take a walk around a circular path.

The **Formulas** for Circumference of a Circle when given the length of the radius or diameter are:

$$C = \pi d$$
$$= \pi (10)$$
$$= 31.4159$$

OR

$$C = 2 \pi r$$
$$= 2 (\pi) (5)$$
$$= 31.4159$$

This Formula can also be expressed as:

$$d = \frac{C}{\pi}$$

OR

$$r = \frac{C}{2\pi}$$

Use this formula
If you are given the circumference of a circle and asked to find the diameter. It can be used to find the radius also by taking your diameter and dividing it by two.

Use this formula if you are given the circumference of a circle and asked to find the radius. The formula for diameter also works if you divide diameter by two to get the radius.

Finding the Measure of a Central Arc

METHOD 1: Use Proportions

All circles have 360°. Finding the measure of a central arc involves finding how much of the circle's circumference is taken up by an arc created by a central angle of a certain number of degrees out of the total 360°.

In the diagram at the right, the circle has 360°. The radius is given as being 10 cm and we need to find the measure of the central arc created by a central angle of 120°.

red by an angle

Step #1: Find the circumference of the whole circle.
We were told that r= 10cm so d=2X10 or 20cm.

$C = \pi d$
$= \pi (20)$
$= 62.83$ cm^2

Step #2: Create a Proportion as follows:

$$\frac{\text{Central Angle° (part)}}{\text{Central Angle° (whole) (Always 360°)}} = \frac{\text{Length of Arc (part of circumference)}}{\text{Length of the total circumference of the circle}}$$

Step #3: Cross Multiply and solve for X. Your answer will be the portion of the circumference (central arc) created by the central angle.

$$\frac{120°}{360°} = \frac{X}{62.83}$$
$$360 (X) = 120 (62.83)$$
$$360X = 7539.6$$
$$\frac{360X}{360} = \frac{7539.6}{360}$$
$$X = 20.94$$

Therefore the measure of the central arc, or portion of the circumference is 20.94 cm.

METHOD 2: Use this formula

Circumference of an arc is a portion (fraction) of the total circumference so use

$$\text{Length of an Arc} = \frac{\text{Degrees of Arc}}{\text{Degrees of a Circle}} \times \text{Total Circumference}$$

$$= \frac{120^\circ}{360^\circ} \times 62.83$$

$$= 20.94 \text{ cm}$$

Squares and Square Roots

A number **Squared** means the number times itself i.e. 7X7=49 OR X^2

A **square root** of a number means what number times itself will equal a certain number. The symbol for square root of 16 is √. That means what number times itself will equal 16. The answer is 4, because 4X4 = 16. To find the answer using your calculator, push 16, then the square root button.

X	X^2	$\sqrt{X^2}$
1	1	1
2	4	2
3	9	3
4	16	4
5	25	5
6	36	6
7	49	7
8	64	8
9	81	9
10	100	10
11	121	11
12	144	12
13	169	13
14	196	14
15	225	15
16	256	16
17	289	17
18	324	18
19	361	19
20	400	20

Area of a Circle/Disc

Area of a circle is the measurement of the interior surface of a circle/disc. Think of it as a pizza with all the fixings. To find the area of a pizza with a diameter of 10 cm use the following formula. $A = \pi r^2$

$$= \pi (5)^2$$
$$= \pi (25)$$
$$= 78.54 \text{ cm}^2$$

- If you are given the diameter as in this example, divide it by two to get the radius and then start.
- Perform order of operations evaluating the r^2 first then multiply by π.

Situations 1

If you are given the area of a circle and asked to find the radius.
i.e. The area of a circle is 153.938 cm^2. Find the length of the radius and the diameter. $A = \pi r^2$

$$153.938 = \pi r^2$$
$$\frac{153.938}{\pi} = \frac{\pi r^2}{\pi}$$
$$49 = r^2$$
$$49 = r$$
$$7 = r$$

The radius is 7 cm and the diameter is 7 X 2 or 14 cm.

Situation 2

If you are given the Perimeter of a circle and are asked to find the area.
i.e. The Perimeter of a disc is 56.549cm, what is the area?

Work backwards to Find the Radius $C = \pi d$

$$56.549 = \pi d$$
$$\frac{56.549}{\pi} = \frac{\pi d}{\pi}$$
$$18 = d$$

If the diameter is 18cm, then the radius is 9cm. Use the radius to calculate area.

$A = \pi r^2$

$= \pi (9)^2$

$= \pi (81)$

$= 254.469 \text{cm}^2$

If the radius is 9cm, then the area is 254.469cm^2

Area of a Sector of a Disc

METHOD 1: Use Proportions

To find the area of a sector of a disc, you need to compare the area of the sector to the area of the whole circle. (Think of it as finding the area of a portion of pizza remaining).

Step #1: Find the area of the whole circle.

We were told that r= 10cm

$A = \pi r^2$

$= \pi (10)^2$

$= \pi (100)$

$= 314.159\ cm^2$

Step #2: Create a Proportion as follows:

$$\frac{\text{Sector's Angle}^\circ \text{ (part)}}{\text{Disc's Angle}^\circ \text{ (whole)}} = \frac{\text{Sector's Area (Part)}}{\text{Disc's Area (whole thing)}}$$

(Always 360°)

Step #3: Cross Multiply and solve for X. Your answer will be the area of the sector created by the central angle.

$$\frac{120}{360} = \frac{X}{314.159}$$

$360 (X) = 120 (314.159)$

$360X = 37699.08$

$$\frac{360X}{361} = \frac{37699.08}{360}$$

$X = 104.72\ cm^2$

The measure of the sector's area or portion of the area is $104.72\ cm^2$

METHOD 2: Use this formula

Area of a sector is a portion (fraction) of the total area so use:

$$\text{Area of a Sector} = \frac{\text{Degrees of Sector}}{\text{Degrees of a Circle}} \times \text{Total Area}$$

$$= \frac{120^\circ}{360^\circ} \times 314.159$$

$= 104.72$ cm