

20 GEOMETRY AND MEASURES: CIRCLES

LEARNING OBJECTIVES

- Identify and apply circle definitions and properties
- Know and use the formulae for area and circumference of a circle
- Calculate arc lengths, angles and areas of sectors of circles

SPECIFICATION LINKS

- G9, G17, G18, N8, A2

STARTER ACTIVITY

- Parts of a circle; 5 minutes; page 132**

This activity tests the student's understanding of terminology relating to circles.

MAIN ACTIVITIES

- Area and circumference; 20 minutes; page 133**

Ensure that the student is familiar with π and remind them that this is just a number. Remind the student how to give exact solutions, and how to round to a given degree of accuracy. Work through the activity.

- Parts of circles; 20 minutes; page 134**

Encourage the student to think logically about what is known and how they can use this to deduce the lengths and areas of arcs and sectors.

PLENARY ACTIVITY

- Area or circumference?; 5 minutes**

Give the student different measurements with units (cm/m/mm/inches and $\text{cm}^2/\text{m}^2/\text{mm}^2/\text{inches}^2$) and ask them to identify whether each value is an area or a circumference. Move on to the formulae $2\pi r$ and πr^2 . Encourage them to notice that areas all contain the radius squared.

HOMEWORK ACTIVITY

- Problem solving with circles; 40 minutes; page 135**

Full instructions are given on the activity sheet.

SUPPORT IDEA

- Area and circumference of a circle** Copy the following table and ask the student to complete it:

Radius (cm)	1	2	3	4	5	6	7	8	9	10
Circumference										
Area										

EXTENSION IDEA

- Parts of circles** Ask the student to write a formula for finding the area and circumference of semicircles and quarter-circles. Extend this to any size sector.

PROGRESS AND OBSERVATIONS

STARTER ACTIVITY: PARTS OF A CIRCLE

TIMING: 5 MINS

LEARNING OBJECTIVES

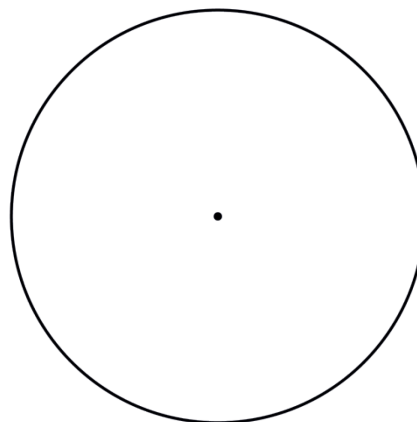
- Identify and apply circle definitions and properties

EQUIPMENT

- coloured pens/pencils

1. On the circle:

- colour the circumference red
- draw on a blue radius
- draw on an orange diameter
- draw on a green chord.



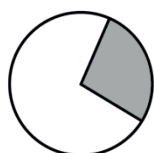
2. Draw lines to match the words with the correct diagrams.

sector

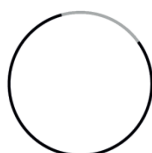
segment

arc

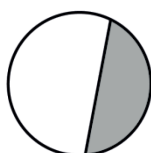
tangent



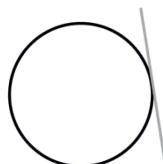
A



B



C



D

MAIN ACTIVITY: AREA AND CIRCUMFERENCE

TIMING: 20 MINS

LEARNING OBJECTIVES

- Know and use the formulae for area and circumference of a circle

EQUIPMENT

- calculator

You need to remember these formulae:

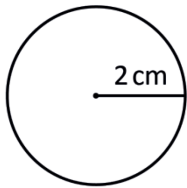
circumference of a circle = $2\pi r$

area of a circle = πr^2



1. Work out the circumference and the area of each of these circles. Give your answers to 2 decimal places.

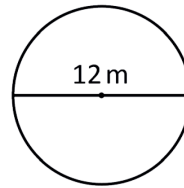
a)



circumference =

area =

b)



circumference =

area =

c) diameter = 15 mm

circumference =

area =

d) radius = 3.5 cm

circumference =

area =



2. Without using a calculator, write down the exact area and circumference of each of these circles.

a) diameter = 14 cm

b) radius = 0.5 m



3. A circle has circumference $k\pi$. If the circle has radius 4.5, what is the value of k ?

.....



4. Work out the radii of these circles to 2 significant figures.

a) circumference = 100 cm

b) area = 25 cm^2

MAIN ACTIVITY: PARTS OF CIRCLES

TIMING: 20 MINS

LEARNING OBJECTIVES

- Calculate arc lengths, angles and areas of sectors of circles

EQUIPMENT

none

1. Explain how to find:

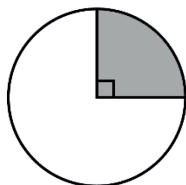
- a) the area of any semicircle
-

- b) the length of an arc on a semicircle
-

- c) the perimeter of any semicircle.
-

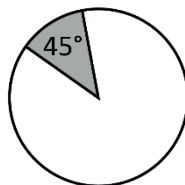
2. Each of these circles has a diameter of 10 cm. Work out the area of the shaded areas.
Give exact answers.

a)



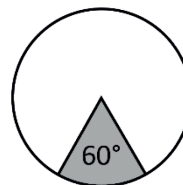
.....

b)



.....

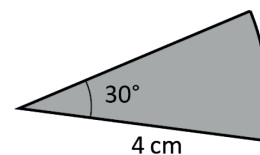
c)



.....

3. Work out the perimeter of this sector. Give an exact answer.

.....



HOMEWORK ACTIVITY: PROBLEM SOLVING WITH CIRCLES

TIMING: 40 MINS

LEARNING OBJECTIVES

- Identify and apply circle definitions and properties
- Know and use the formulae for area and circumference of a circle
- Calculate arc lengths, angles and areas of sectors of circles

EQUIPMENT

- calculator



1. A bicycle wheel has a diameter of 65 cm. How many complete revolutions will it make on a 2 km bike ride?
-



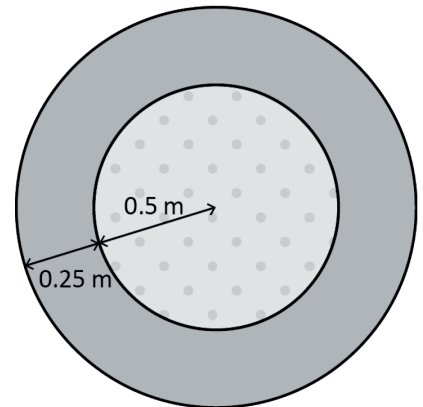
2. A stained glass window is made in the following design.

- a) Giving your answers to 2 decimal places, work out the area of:

i) speckled glass

ii) grey glass.

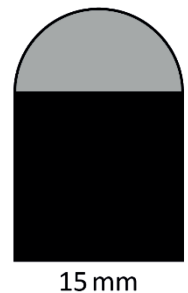
- b) Speckled glass costs £15.75 per square metre.
 Grey glass costs £12.00 per square metre.
 What is the cost of glazing the window?
-



3. A company's logo is in the shape of a square with a semicircle on top. The logo is 15 mm wide.

- a) Work out the total area of the logo. Give your answer to 1 decimal place.
-

- b) What percentage of the logo is grey? Give your answer to 2 significant figures.
-



4. The perimeter of this quarter circle is $m + n\pi$. Work out the values of m and n .
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20 ANSWERS

STARTER ACTIVITY: PARTS OF A CIRCLE

1. Check student's diagram.
2. A sector, B arc, C segment, D tangent

MAIN ACTIVITY: AREA AND CIRCUMFERENCE

1. a) circumference = 12.57 cm area = 12.57 cm² b) circumference = 37.70 m area = 113.10 m²
c) circumference = 47.12 mm area = 176.71 mm² d) circumference = 21.99 cm area = 38.48 cm²
2. a) area = 49π m², circumference = 14π m
b) area = $\frac{1}{4}\pi$ m², circumference = π m
3. $k = 9$
4. a) 16 cm b) 2.8 cm

MAIN ACTIVITY: PARTS OF CIRCLES

1. a) Find the area of the whole circle and then halve it.
b) Find the circumference of the whole circle and halve it.
c) Find the circumference of the whole circle, halve it, and then add the diameter.
2. a) $\frac{25\pi}{4}$ cm b) $\frac{25\pi}{8}$ cm c) $\frac{25\pi}{6}$ cm
3. $\frac{2\pi}{3} + 8$ cm

HOMEWORK ACTIVITY: PROBLEM SOLVING WITH CIRCLES

1. 979
2. a) i) 0.79 m² ii) 0.98 m² b) £24.20
3. a) 313.4 mm² b) 28%
4. $m = 16$, $n = 4$

GLOSSARY

Arc

Part of the circumference of a circle

Sector

Part of a circle enclosed by an arc and two radii

Segment

Part of a circle enclosed by a chord and an arc