MATHEMATICS
GRADE 8

DATE: .....

TOPIC: Perimeter and Area of 2 D Shapes

CONCEPTS & SKILLS TO BE ACHIEVED: **By the end of the lesson learners should know and be able to:** • **The properties of polygons to understand their formulae** • **The difference between perimeter and area** • **Calculate perimeter and area of squares, rectangles, triangles and circles** • **Decompose composite shapes and calculate the area.** • **Convert between different SI units.**	
RESOURCES:	DBE Workbook, Sasol-Inzalo book, Textbooks,
ONLINE RESOURCES	

DAY 1: Perimeter and Area of squares and rectangles

LESSON DEVELOPMENT

Revision:

Learners, familiarize yourself with the following!!

Perimeter: This is the distance around a flat shape. This can be measured in millimetres, centimetres, metres and kilometres

Formula:

What is the perimeter of a square? — 4 × length of side **OR** 4s

What is the perimeter of a rectangle? — $2l + 2b$ **OR** $2(l + b)$

Area: The number of unit squares that cover the surface of a closed figure. This is measured in square millimetres, square centimetres, square metres and square kilometres.

Formula:

What is the area of a square? — side × side **OR** S × S **OR** S^2

What is the area of a rectangle? — $l \times b$

❖ ***Remember that the length of the rectangle is the longer side.***

CLASSWORK:

Square:

Perimeter and Area:

P and A is a shorter way to write Perimeter and Area.

Take note

1. If a square has a length of 7cm, calculate

1.1. The perimeter and

1.2. The area of the square.

2. If the perimeter of a square is 64 cm:

2.1. Determine the length of each side

2.2. Calculate the area of the square.

Rectangle:

Perimeter and Area:

1. The area of a rectangle is 60cm^2 and its length is 12 cm.

1.1. Calculate the breadth of the rectangle

1.2. Calculate the perimeter of the rectangle

CONSOLIDATION

IT IS IMPORTANT TO REMEMBER:

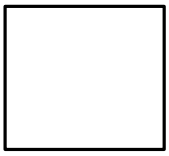
- **When calculating the area of a 2D shape, the answers must always be in the appropriate SI square unit (cm^2/mm^2/m^2).**
-

HOMEWORK:

Do the following exercises,applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW

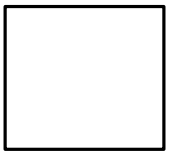
1. Use the formulae to calculate the perimeters of the following shapes:

1.1. 4 cm



1.2. 5 cm

1.3 1,5 cm



1.4. 12 cm

2. Calculate the following by making use of the formulae:

2.1. The perimeter of a square is 32 cm. What is the area of the square?

2.2. The area of a rectangle is 72 cm^2 and its length is 9 cm.

2.2.1. Calculate its breadth

2.2.2. Calculate its perimeter

2.3. What is the perimeter and area of the following shape?

2,1 cm

MEMORANDUM: DAY 1:

CLASSWORK:

Square:

1.1. $P = 4s = 4 \times 7cm = 28$ cm

1.2. $A = s^2 = (7cm)^2 = 49$ cm^2

2.1. $4s = P$

$4s = 64$ cm

$S = 16$ cm (64 cm ÷ 4)

2.2 $A = s^2 = (16cm)^2 = 256cm^2$

Rectangle:

1.1. $l \times b = A$

12 cm $\times b = 60cm^2$

$b = 60$ cm^2 ÷ 12 cm

$b = 5$ cm

1.2. $P = 2(l + b)$

$= 2(12$ cm + 5 cm)

$= 2(17$ cm)

$= 34$ cm

HOMEWORK:

1.1. $P = 4s = 4(4cm) = 16$ cm

1.2. $P = 2l + 2b$ **OR** $P = 2(l + b)$

$= 2(5cm) + 2(3cm)$ $= 2(5$ cm + 3 cm)

= 10 cm + 6 cm
= 16cm

= 2(8 cm)
= 16 cm

1.3. P = 4s = 4(1,5 cm) = 6 cm

1.4. $P = 2l + 2b$
= 2(12 cm) + 2(8 cm)
= 24 cm+ 16 cm
= 40 cm

OR $P = 2(l + b)$
= 2(12 cm + 8 cm)
= 2(20 cm)
= 40 cm

2.1. P = 32 cm
S = 32 cm ÷ 4
= 8 cm
$\therefore A = S^2$
= (8cm)^2
= 64 cm^2

2.2.1. A of rectangle = $l \times b$
72 cm^2 = 9 cm × b
b = 72 cm^2 ÷ 9 cm
= 8 cm

2.2.2. P of rectangle = $2(l + b)$
= 2(9 cm + 8 cm)
= 2(17 cm)
= 34 cm

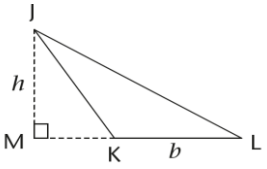
2.3. $P = 2(l + b)$
= 2(2,1 cm + 1,8 cm)
= 2(3, 9)
= 7, 8 cm
$A = l \times b$
= 2,1 cm × 1,8 cm
= 3, 78 cm^2

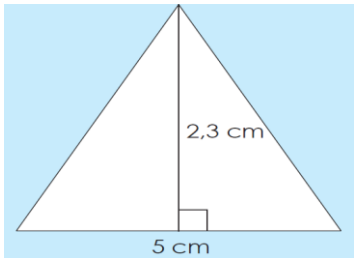
DAY 2: Area of Triangles

LESSON DEVELOPMENT

CLASSWORK:

Area of a Triangle = ½ (base × perpendicular height)
= ½ (b × h)

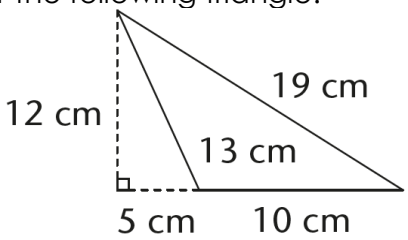




A = ½ (b × h)
= ½ (5 cm × 2,3 cm)
= ½ (11,5cm²)
= 5,75 cm²

Activity:

1. Consider the following triangle:



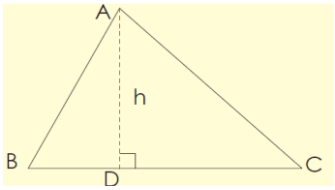
1.1. Calculate the perimeter
1.2. Calculate the area

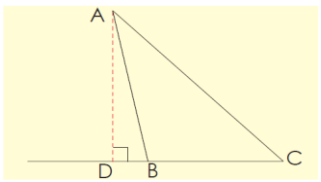
❖ ***To calculate the area of a triangle using the above formula, the height with respect to the chosen base must be used.***

CONSOLIDATION

IT IS IMPORTANT TO REMEMBER:

- **The height of a triangle, is the line segment drawn from any vertex (usually a dotted line) perpendicular to the opposite side.**





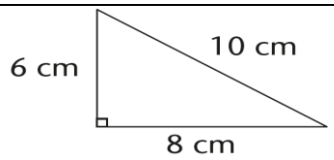
❖ ***Perpendicular means where two lines meet at a right angle.***

HOMEWORK:

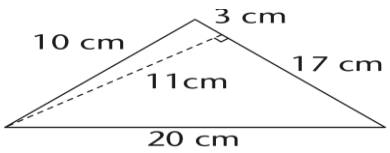
Do the following exercises, applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW

1. Calculate the area of the following triangles:

1.1.



1.2.



2. Calculate the area of the following:

2.1. Base = 8 cm; Height = 15 cm

2.2. Base = 9,4 cm; Height = 2,25 cm

MEMORANDUM: DAY 2:

CLASSWORK:

1.1. P = 10 cm + 13 cm + 19 cm = 42 cm **** Add all the sides***

1.2. A = ½ (b × h)
= ½ (10 cm × 12 cm)
= ½ (120 cm^2)
= 60 cm^2

HOMEWORK:

1.1. A = ½ ($b \times h$)
= ½ (8 cm × 6 cm)
= ½ (48 cm^2)
= 24 cm^2

1.2. A = ½ ($b \times h$)
= ½ (20 cm × 11 cm)
= ½ (220 cm^2)
= 110 cm^2

1.3. A = ½ (b × h)
= ½ (8 cm × 1,5 cm)
= ½ (12 cm^2)
= 6 cm^2

1.4. A = ½ (b × h)
= ½ (9,4 cm × 2,25 cm)
= ½ (21,15 cm^2)
= 10, 58 cm^2

DAY 3: Area of Composite shapes

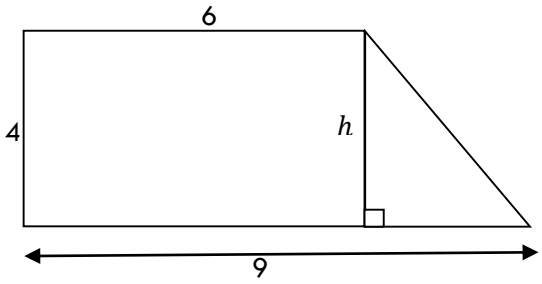
LESSON DEVELOPMENT

CLASSWORK:

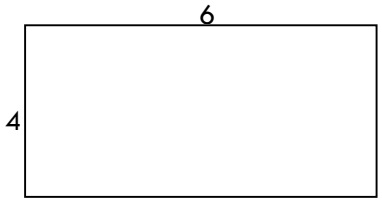
What is a composite shape?

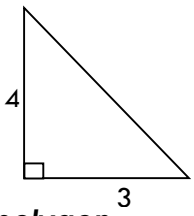
It is a shape which is made up of **two or more** polygons

1.

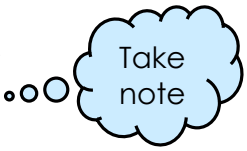


This shape above, comprises of a ***rectangle*** and a ***triangle***. To calculate the area of the shape, we have to break up the shape into a rectangle and a triangle.

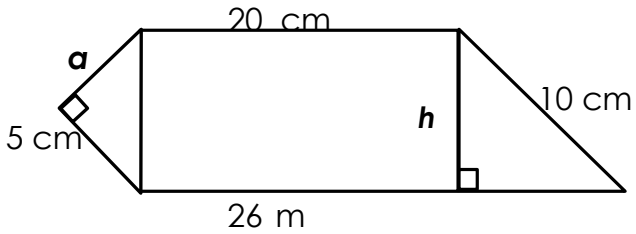




You should clearly indicate the dimensions of each polygon.



2.



2.1. Calculate the length of ***h***.

2.2. Calculate the length of ***a.***

2.3 Calculate the area of the above shape. Round off your answers to two decimal places.

CONSOLIDATION

IT IS IMPORTANT TO REMEMBER:

- Decompose the shape into rectangles, squares and/or triangles.
- Indicate the units of the dimensions

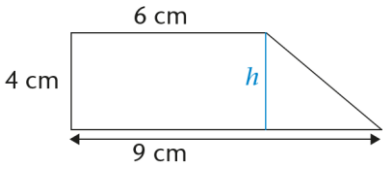
HOMEWORK:

Do the following exercises, applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW

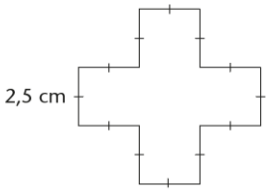
Activities:

1. Use a ruler and pencil to divide each shape into rectangles, squares and/or triangles. The first one is done for you.
2. Work out the length of the sides you need and then calculate the area of the shapes. Round off your answers to two decimal places where necessary.

2.1



2.2



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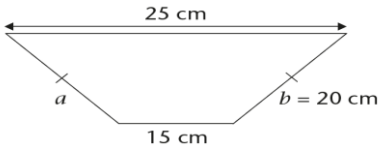
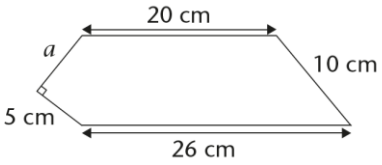


2.4



MEMORANDUM: DAY 3:

CLASSWORK:

1.Area of the shape = Area of rectangle + Area of triangle
$= l \times b + \frac{1}{2}(b \times h)$
$= (6\text{ cm} \times 4\text{ cm}) + \frac{1}{2}(3\text{ cm} \times 4\text{ cm})$
$= 24\text{ cm}^2 + 6\text{ cm}^2$
$= 30\text{ cm}^2$

2.1. $h^2 = (10\text{ cm})^2 - (\mathbf{6cm})^2$ (**26 cm – 20 cm**)
$= 100\text{ cm}^2 - 36\text{ cm}^2$
$= 64\text{ cm}^2$
$\therefore h = 8\text{ cm}$

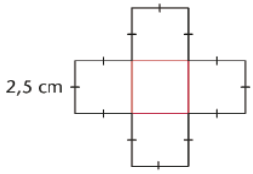
2.2 $a^2 = (8\text{ cm})^2 - (5\text{ cm})^2$
$= 64\text{ cm}^2 - 25\text{ cm}^2$
$= 39\text{ cm}^2$
$\therefore a = 6{,}24\text{ cm}^2$

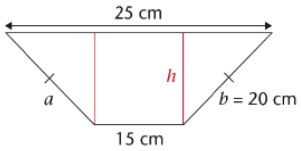
2.3 Area = Area of left Δ + Area of rectangle + Area of right Δ
$= \frac{1}{2}(b \times h) + l \times b + \frac{1}{2}(b \times h)$
$= \frac{1}{2}(5\text{ cm} \times 6{,}24\text{ cm}) + (20\text{ cm} \times 8\text{ cm}) + \frac{1}{2}(6\text{cm} \times 8\text{ cm})$
$= 15{,}6\text{ cm}^2 + 160\text{ cm}^2 + 24\text{ cm}^2$

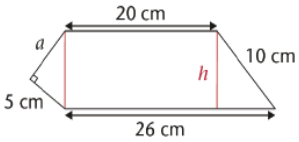
= 199,6 cm²

HOMEWORK:

1.







2.1. Area of shape = A of rectangle + A of triangle
= $l \times b$ + ½ (b × h)
= (6 cm × 4 cm) + ½ (3 cm × 4 cm)
= 24 cm² + 6 cm²
= 30 cm²

2.2. Area of one square = $S \times S$
= 2,5 cm × 2,5 cm
= 6, 25 cm²
Area of shape = 5 × 6, 25 cm²
= 31, 25 cm²

***there are 5 squares in total**

Take note

2.3. a = b = 20 cm (congruent triangles)
h² = (20 cm)² – (5 cm)²
= 375 cm²
∴h ≈ 19,36 cm
Area of rectangle = 15 cm × 19, 36 cm
= 290,4 cm²
Area of triangle = ½ (5 cm × 19, 36 c)
= 48, 4 cm²
Area of shape = (2 × 48, 4 cm²) + 290, 4 cm²
= 96, 8 cm² + 290, 4 cm²
= 387, 2 cm²

2.4. h² = (10 cm)² – (6 cm)²
= 64 cm²
∴ h = 8 cm
a² = 64 cm² – 25 cm²
= 39 cm²
∴ a ≈ 6, 24 cm
Area of left triangle = ½ (5 × 6,24) cm²
≈ 15, 6 cm²
Area of rectangle = 20 cm × 8cm
= 160 cm²
Area of right triangle = ½ (6 cm × 8 cm)
= 24 cm²
Area of shape = 15, 6 cm² + 160 cm² + 24 cm²
= 199, 6 cm²

*** the answer of $\sqrt{64}$**

Take note

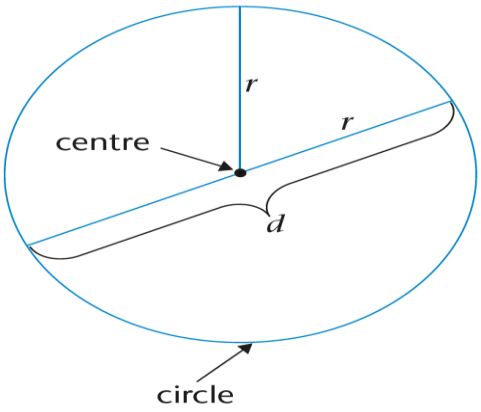
❖ ***You can draw each smaller shape and its dimensions separately so that you do not get confused.***

DAY 4: Perimeter of a circle

LESSON DEVELOPMENT

CLASSWORK:

Revision: Parts of a circle

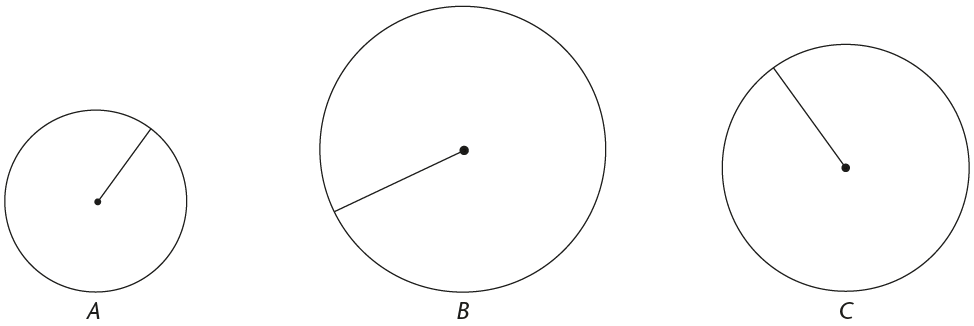


The **centre** of a circle is the point in the middle (centre)in the middle of the circle.
The **circumference** (C) is the distance around the Circle. It is the length of the curved line that forms the circle.
The **radius**(r)is the line segment drawn from the centre of the circle to any point on the circle.
The **diameter** (d) is the line segment passing through the centre of the circle and joining any two points on the circle.

- ***The length of the radius is always half the length of the diameter: ($r = \frac{1}{2}d$) OR The length of the diameter is always twice the length of the radius: ($d = 2r$)***

Activities:

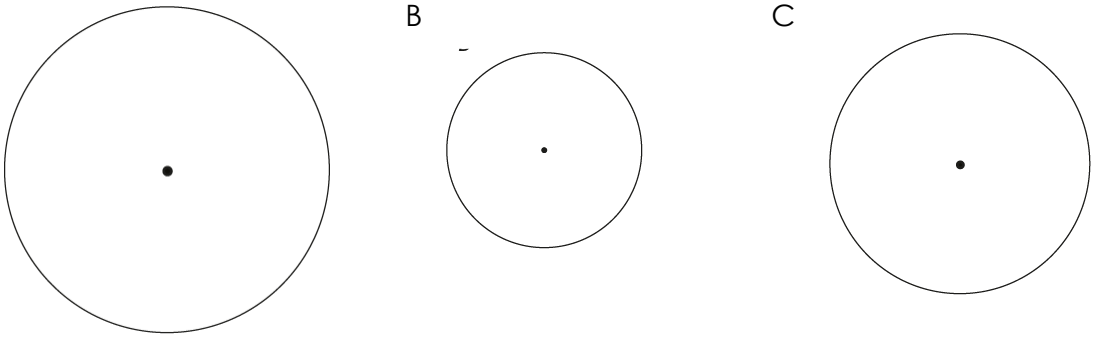
1. Use a ruler and measure the radius of the different circles. Calculate the different diameters based on the measured radii (plural of radius)



Circle	A	B	C
Radius (mm)			
Diameter (mm)			

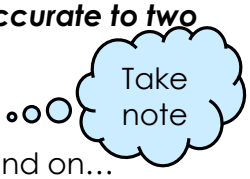
2. Here are 3 circles with different circumferences and diameters:

A B C



Circle	Diameter (cm)	Circumference (cm)	Circumference ÷ diameter
A	5	15, 71	3, 14
B	3	9, 42	3, 14
C	4	12, 57	3, 14

What do you notice about the last column?
The circumference of any circle divided by its diameter is equal to 3,14 accurate to two decimal places.



That constant number (3,14) is called **PI** and its Greek symbol is π.
π is an ***irrational number***, meaning the numbers after the comma go on and on…

∴ circumference ÷ diameter = π.

So, if we do the inverse of the above we will get the circumference:
Pi × diameter = circumference

∴ Circumference of a circle = πd ***Pi × diameter***
= $\pi(2r)$ ***diameter = 2 radii***
=$2\pi r$

Example 1
Calculate the **circumference** of the circle with:

1.1. A diameter of 25 cm
$C = \pi d$ = (3,14) (25 cm) = 78,5 cm

1.2. A radius of 10 mm
$C = 2\pi r$ = 2(3,14) (10 mm) = 62,8 mm

Example 2
Calculate the **radius** of a circle with a diameter of 125 mm.
r = d ÷ 2
= 125 mm ÷ 2 = 62,5 mm

Example 3
Calculate the **radius** of a circle with a circumference of 110 cm
2πr = C
2(3,14)r = 110 cm
6, 28r = 110 cm
r = 17, 52 cm

- ***The fraction of 3,14 is*** $\frac{22}{7}$.

CONSOLIDATION:

IT IS IMPORTANT TO REMEMBER:

- $d = 2r$ and $r = \frac{1}{2}d$
- Circumference of a circle: $C = 2\pi r$ or $C = \pi d$
- $\pi \approx 3, 14$ or $\frac{22}{7}$

- Know how to convert between SI units

HOMEWORK:

Do the following exercises, applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW

Activities:

1. Calculate the circumference of a circle with:

1.1. A radius of 10 mm

1.2. A diameter of 100 mm

1.3. A radius of 40 mm

2. Calculate the radius and circumference of a circle with a diameter of:

2.1. 125 mm

2.2. 70 cm

3. Calculate the radius of a circle with a circumference of 200 m.

MEMORANDUM: DAY 4:

CLASSWORK:

Activity 1:

Circle	A	B	C
Radius (mm)	14	22	19
Diameter (mm)	28	44	38

HOMEWORK:

Activities:

1.1. $C = 2\pi r$
$= 2(3,14)(10\text{ mm})$
$= 2(31,4)$
$= 62,8\text{ mm}$

1.2. $C = \pi d$
$= 3,14 \times 100\text{ m}$
$= 314\text{ m}$

1.3. $C = 2\pi r$
$= 2(3,14)(40\text{ m})$
$= 2(125,6\text{ m})$
$= 251,2\text{ m}$

2.1. $r = d \div 2$
$= 125\text{ mm} \div 2 = 62,5\text{ mm}$

2.2. $r = d \div 2$
$= 70\text{ cm} \div 2 = 219,8\text{ cm}$

2. $C = 2\pi r$
$200\text{ m} = 2(3,14)r$
$200\text{ m} = 6,28r$
$r = 31,85\text{ m}$

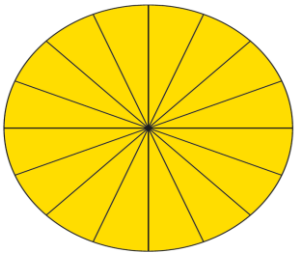
DAY 5: Area of Circles

LESSON DEVELOPMENT

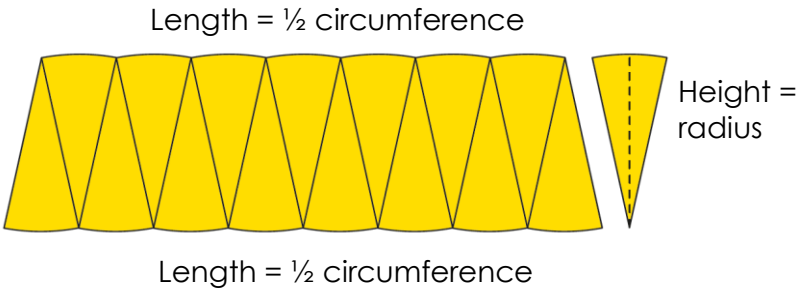
CLASSWORK:

Take a circle and divide it into 16 equal sectors(A) and then re-arrange the sectors to form a rectangle(B).

A



B



The **height** of the new shape corresponds with the radius of the circle. The **length** of the new shape corresponds to ½ of the circumference.

Area of a Circle = ½ × circumference × r

$= ½ \times 2\pi r \times r$

$= (½ \times \frac{2}{1}) \times \pi \times r^2$

$= \pi r^2$

Activity:

1. Calculate the area of a circle with a radius of:

1.1. 9 cm

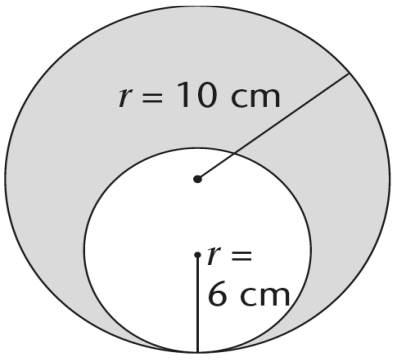
1.2. 5, 9 cm

2. Calculate the radius of a circle with the following area:

   76 m^2

❖ ***Do not forget that the inverse of squared numbers/units is the square root of that numbers/units***

3. Calculate the area of the shaded part of the shape below:



CONSOLIDATION:

IT IS IMPORTANT TO REMEMBER:

- If a number is squared, you use the square root of that number for the inverse calculation.

CLASSWORK:

1.1. $A = \pi r^2$
$= 3,14\ (9\ cm)^2$
$= 3,14 \times 81\ cm^2$
$= 254,34\ cm^2$

1.2. $A = \pi r^2$
$= 3,14(5,9\ cm)^2$
$= 3,14 \times 34,82\ cm^2$
$= 109,30\ cm^2$

2. $76\ m^2 = \pi r^2$
$76\ m^2 = 3,14 \times r^2$
$24,2\ m^2 = r^2$ ***divide both sides by 3,14***
$\therefore r = 4,92\ m$ * $\sqrt{24.2}\ m^2$

3.1. Area of large circle $= \pi r^2$
$= 3,14 \times (10\ cm)^2$
$= 3,14 \times 100\ cm^2$
$= 314\ cm^2$

3.2. Area of small circle $= \pi r^2$
$= 3,14 \times (6\ cm)^2$
$= 3,14 \times 36\ cm^2$
$= 113,04\ cm^2$

Area of the shaded part $= 314\ cm^2 - 113.04\ cm^2$
$= 200,96\ cm^2$

HOMEWORK:

Do the following exercises, applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW

Activities:

1. Calculate the area of the circle if the radius is equal to:

1.1. 3,7cm

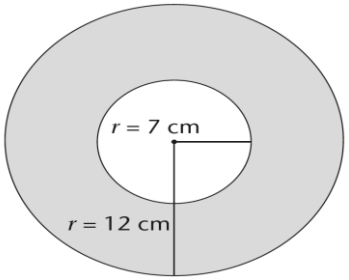
1.2. 10,1 cm

2. Calculate the radius of a circle with the following area:

2.1. $78,54\ cm^2$

2.2. $100\ cm^2$

3. Work out the area of the shaded part of the following shape:



MEMORANDUM: DAY 5:

HOMEWORK:

Answers:

1.1. Area of circle = πr^2
$= 3,14 \times (3,7\ cm)^2$
$= 3,14 \times 13,69\ cm^2$
$= 42,99\ cm^2$

1.2. Area of circle = πr^2
$= 3,14 \times (10,1\ cm)^2$
$= 3,14 \times 102,01\ cm^2$
$= 320,31\ cm^2$

2.1. $78,54\ cm^2 = \pi r^2$
$78,54\ cm^2 = 3,14 \times r^2$
$25,01\ cm^2 = r^2$
$\therefore r = 5,0\ cm$

2.2. $100\ m^2 = \pi r^2$
$100\ m^2 = 3,14 \times r^2$
$31,85\ m^2 = r^2$
$\therefore r = 5,64\ m$

3 A of large circle = $3,14 \times (12\ cm)^2$
$= 3,14 \times 144\ cm^2$
$= 452,16\ cm^2$
A of small circle = $3,14 \times (7\ cm)^2$
$= 3,14 \times 49\ cm^2$
$= 153,86\ cm^2$
A of shaded part = A of large circle – A of small circle
$= 452,16\ cm^2 - 153,86\ cm^2$
$= 298,3\ cm^2$

You can cut this out to keep handy:

NAME OF 2D	PERIMETER/AREA	FORMULAE
RECTANGLE	Perimeter	$P = 2(l + b)$ *or* $P = 2l + 2b$
	Area	$A = l \times b$
SQUARE	Perimeter	$P = 4s$
	Area	$A = s^2$
TRIANGLE	Perimeter	Sum of all the sides
	Area	$A = \frac{1}{2}(l \times b)$
CIRCLE	Circumference	$C = 2\pi r$
	Area	$A = \pi r^2$

Conversion of SI Units
1 cm = 10 mm
1 cm^2 = 1 cm × 1 cm
1 cm^2 = 10 mm × 10 mm
1 cm^2 = 100 mm^2
1 m = 100 cm
1 m^2 = 100 cm × 100 cm
1 m^2 = 10 000 cm^2
1 km = 1 000 m
1 km^2 = 1 000 m × 1 000 m
1 km^2 = 1 000 000 m^2

WORDBOX	
Abbreviation/Symbol	**Word**
C	Circumference
r	Radius
d	Diameter
π	Pi
A	Area
P	Perimeter
h	Height
l	Length
b	Breadth