

Okehampton College

Mathematics



Year 9

Summer Term Review

Name:

Core

| | |
|---------|---------------------------------------|
| Topic 1 | Angles in Parallel Lines and Polygons |
| Topic 2 | Ratio |
| Topic 3 | Linear Equations |
| Topic 4 | Area and circumference of circles |
| | Answers |

This booklet is to be used by the students in maths groups 9xMa4, 9xMa5 and 9yMa4

Introduction – how to use this booklet

This booklet is to help you review and revise the key topics covered towards the end of the academic year (and mostly by remote learning).

Early in the Autumn term you will have a written assessment on questions from these topics and your performance will help your teachers plan how to support you next year.

Each section contains a Knowledge Organiser on the topic, followed by practice questions. The answers are at the end of the booklet.

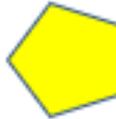
If you have completed most of the remote learning lessons set on Class Charts, you may still like to use this booklet to review what you have learnt and help you prepare for the assessment.

If you have not been able to complete many of the lessons, the knowledge organisers should help you catch up on the topics and answer the practice questions. You should check your work against the answers and if necessary, go back and correct any mistakes.

You will still be able to log in to the Sparx lessons (codes given on Class Charts for your class) until 31st July, so you can still use this resource to catch up on some topics and practise the skills.

**This booklet is to be used by the students in
maths groups 9xMa4, 9xMa5 and 9yMa4**

A regular polygon has all equal lengths and all its angles are equal.



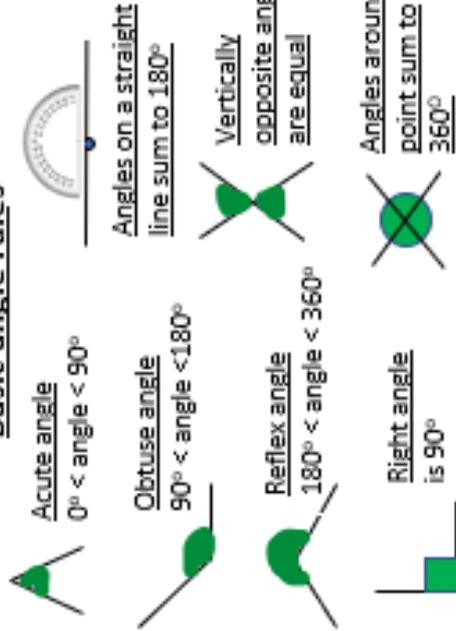
Angles in parallel lines and polygons



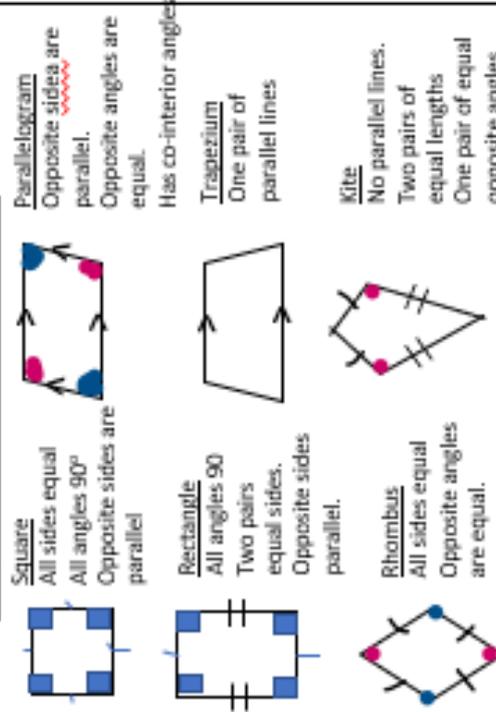
An irregular polygon has sides and angles of different sizes.



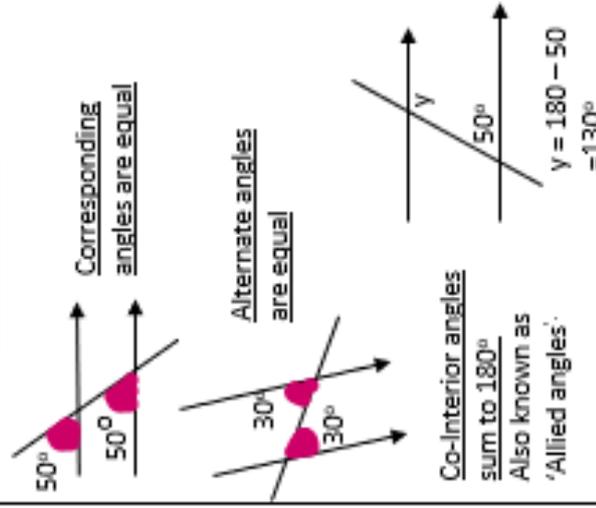
Basic angle rules



Properties of Quadrilaterals



Parallel Lines



Sum of interior angles = (number of sides - 2) x 180

Sum of interior angles = $(5 - 2) \times 180 = 540^\circ$

This irregular pentagon can be split up into 3 triangles and each triangle has an angle sum of 180°
Hence $3 \times 180 = 540^\circ$



Interior angles are enclosed by the polygon

Sum of exterior angles



An interior angle is adjacent to an exterior angle in all polygons.
Therefore
Interior + exterior = 180°

Exterior angles all add up to 360°

Missing angles in regular polygons

Exterior angle in regular polygons

= $360 \div \text{number of sides}$

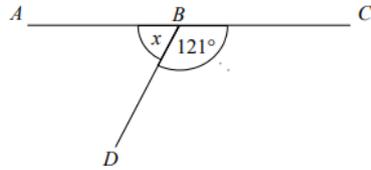
Interior angle in regular polygons

= $\frac{\text{number of sides} - 2}{\text{number of sides}} \times 180^\circ$

Year 9 Core – Angles: parallel lines and polygons

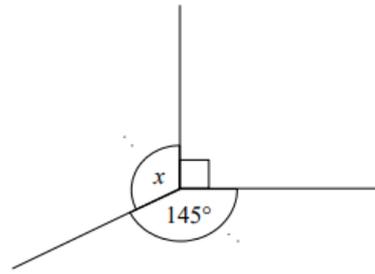
1.

ABC is a straight line. Work out the size of the angle marked x .



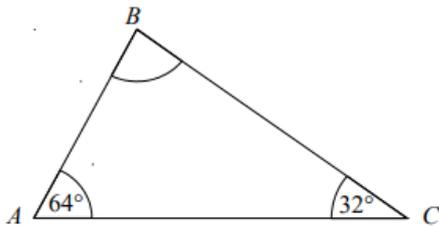
2.

Work out the size of the angle marked x .



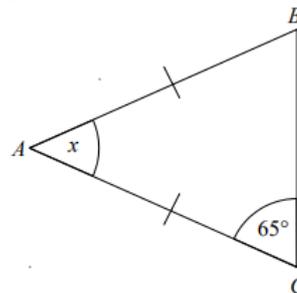
3.

Work out the size of angle ABC

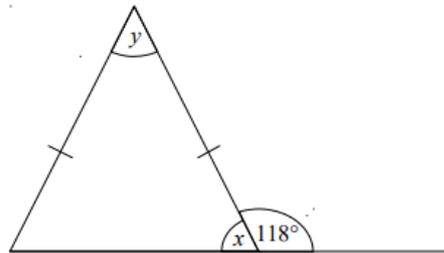


4.

ABC is an isosceles triangle, work out the size of angle x .



5



(a) Work out the size of the angle marked x .

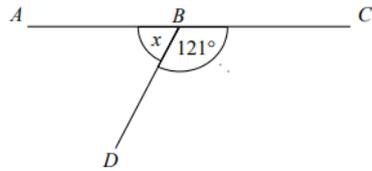
..... °

(b) Work out the size of the angle marked y .

..... °

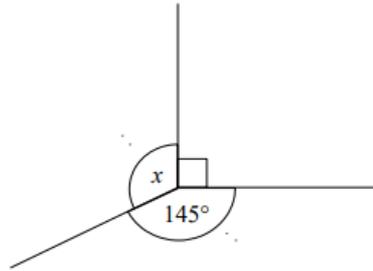
(c) Give reasons for your answer.

ABC is a straight line. Work out the size of the angle marked x .

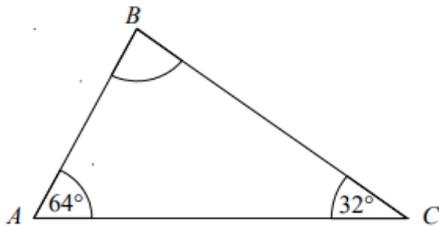


2

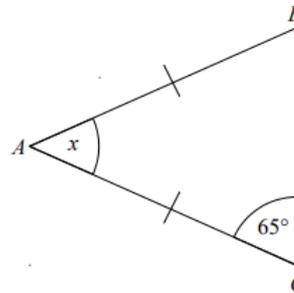
Work out the size of the angle marked x .



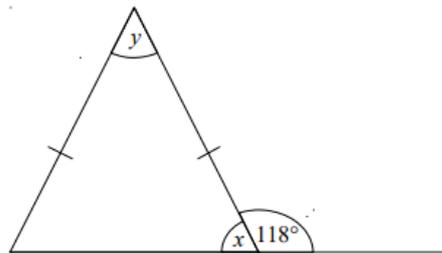
3. Work out the size of angle ABC



4. ABC is an isosceles triangle, work out the size of angle x .



5



(a) Work out the size of the angle marked x .

..... °

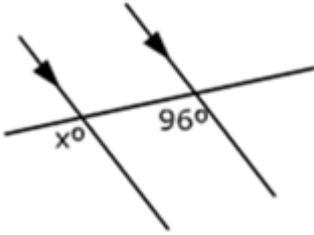
(b) Work out the size of the angle marked y .

..... °

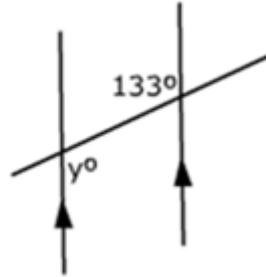
(c) Give reasons for your answer.

Year 9 Core – Angles: parallel lines and polygons

1. Find the missing angle – give a reason for your answer.



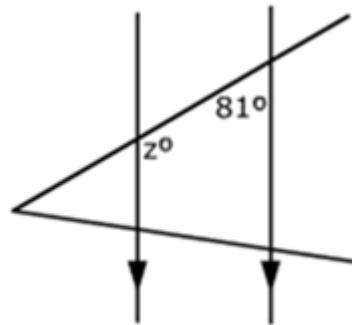
2. Find the missing angle – give a reason for your answer.



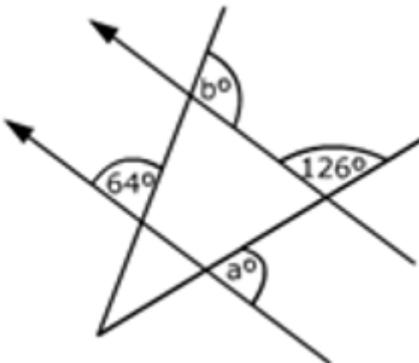
3. Find the missing angle – give a reason for your answer.



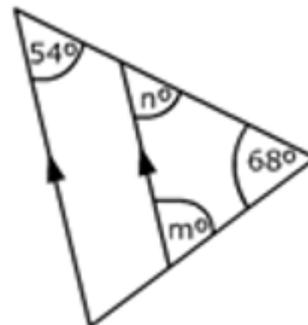
4. Find the missing angle – give a reason for your answer.



5. Find the missing angles – give reasons for your answer.



6. Find the missing angles – give reasons for your answer.



7 Complete the table

| Name of regular polygon | Number of Sides | Size of exterior angle | Sum of all interior angles | Size of interior angle |
|-------------------------|-----------------|--|--|--|
| Equilateral triangle | 3 | $360^\circ \div 3 = \underline{\quad}$ | $1 \times 180^\circ = \underline{\quad}$ | $\underline{\quad} \div 3 = \underline{\quad}$ |
| Square | 4 | $360^\circ \div 4 = \underline{\quad}$ | $2 \times 180^\circ = \underline{\quad}$ | $\underline{\quad} \div 4 = \underline{\quad}$ |
| Pentagon | 5 | | | |
| Hexagon | | | | |
| Heptagon | | | | |
| Octagon | | | | |
| Nonagon | | | | |
| Decagon | | | | |
| n -sided polygon | n | $360^\circ \div \underline{\quad}$ | $\underline{\quad} \times 180^\circ$ | $\underline{\quad} \div \underline{\quad}$ |

8. What is each interior angle of a regular polygon with 14 sides?

9. Calculate the sum of the interior angles of a polygon with 22 sides.

9. Each interior angle of a regular polygon is 168° . How many sides does the polygon have?

10. How many sides do these regular polygons have if their exterior angles are...?
a) 30° b) 18°

Ratio compares the size of one part to another part



The blue hearts and the red hearts are in the ratio

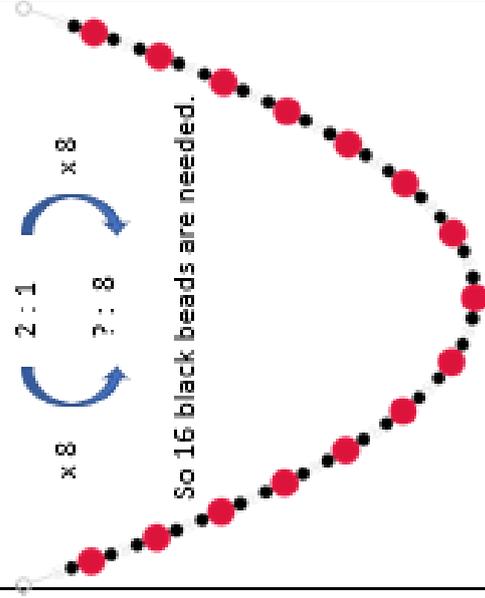
3 : 2

For every 3 blue hearts there are 2 red hearts.

We can scale up or scale down ratios to help solve problems.

Example: A necklace had black to red beads in the ratio 2 : 1

How many black beads would you need if you had 8 red beads:



Ratio

Simplifying Ratios

To simplify a ratio then divide all parts by a common factor.

(4 : 6)
(2 : 3)
Divide both parts by 2

(14 : 16)
(7 : 8)
Divide both parts by 2

(36 : 48)
(18 : 24)
(3 : 4)
Divide both parts by 2 and then by 6.

Keep simplifying until there are no more common factors as in the third example. Can you spot how to simplify this with just one division?

Sharing in a ratio

Steps:

1. Add the total parts of the ratio.
2. Divide the amount to be shared by the number of parts to find the value of 1 part.
3. Multiply each part of the ratio by this amount.

This method only works if you know the total amount!

Share £80 in the ratio 3 : 2

1. Total parts = $3 + 2 = 5$
2. $\text{£}80 \div 5 = \text{£}16$
Each part is worth £16
3. $3 \times 16 = 48$
 $2 \times 16 = 32$

Answer £48: £32
You can check by adding together the final answer – it should equal the amount shared.

Write ratio as a fraction:

The denominator will always equal the sum of the parts.

Example: A Year 9 maths class had boys to girls in the ratio 2 : 3. What fraction of the class were boys?

$2 + 3 = 5$ so the denominator will be 5. 2 parts are boys so the fraction is $\frac{2}{5}$.

Harder questions – using a unitary method

Find out what one part of the ratio is worth using a unitary method.

Example: Money was shared in the ratio 3 : 2 : 5 between Ann, Bob and Cat. Given that Bob had £16, find out how much money was shared out.

A : B : C
3 : 2 : 5

Bob has two parts so
2 parts = 16
1 part = 8

Total = $(3 \times 8) + (2 \times 8) + (5 \times 8) = \text{£}80$

Year 9 Core – Ratio

| | | | |
|---|---|---|--|
| 1 | Write down the ratio of 350 cm to 25 cm. Give your answer in its simplest form. | 2 | Write down the ratio of 220 kg to 5 kg. Give your answer in its simplest form. |
| 3 | (a) Write the ratio 32 : 24 in its simplest form (b) $\frac{1}{9}$ of people in a class are left handed. Write the ratio of left handed people to right handed people | 4 | Write the ratio 12 : 30 in the form 1 : n |
| 5 | There are some cubes in a bag. $\frac{1}{6}$ of the cubes are red. The rest of the cubes are blue. Write the ratio of the number of red cubes to the number of blue cubes. Give your answer in the form 1 : n | | |
| 6 | There are only blue counters, red counters and yellow counters in a bag. There are twice as many blue counters as yellow counters. There are three times as many red counters as yellow counters. Write down the ratio of blue counters to red counters to yellow counters. | | |

Dividing and Sharing Ratio

1. Divide £24 into the ratio 1 : 3. (Total 4 parts)

$$£24 \div 4 = \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \times 1 = \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \times 3 = \underline{\hspace{2cm}}$$

$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$

2. Divide 800ml into the ratio 3 : 7. (Total 10 parts)

$$800\text{ml} \div 10 = \underline{\hspace{2cm}}$$

$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$

3. Share 56 sweets in the ratio 2 : 5. (Total 7 parts)

$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$

4. Divide £72 into the ratio 4 : 5.

$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$

5. Divide 84 pens into the ratio 5 : 9.

$\underline{\hspace{2cm}} : \underline{\hspace{2cm}}$

6. Share £120 in the ratio 5 : 2 : 5. (Total 12 parts)

$$£120 \div 12 = \underline{\hspace{2cm}}$$

$\underline{\hspace{2cm}} : \underline{\hspace{2cm}} : \underline{\hspace{2cm}}$

7. Divide 24L into the ratio 3 : 3 : 2.

_____ : _____ : _____

8. Share 96 sheep in the ratio 7 : 1 : 4.

_____ : _____ : _____

9. A school collected £140 for charity. It was decided to divide the money between Dr Barnados and the RSPCA in the ratio 4 : 3. How much did each charity receive?

Dr Barnados: _____ RSPCA: _____

10. Mr Allen, Mr Broome and Mr Collins own 2, 5 and 7 parts of a business respectively. The business makes £420 profit in a week. How much does each man get?

Mr Allen: _____ Mr Broome: _____ Mr Collins: _____



Linear Equations



Inverse operations are key in solving linear equations.

Inverse means 'opposite'

The inverse operation of **addition** is **subtraction**.

The inverse operation of **multiplication** is **division**.

One and two step equations

Work backwards using the inverse operations. Remember to perform the inverse on both sides of the equation to keep it balanced. Keep taking the inverses until you arrive at the answer.

Example one-step

$$\begin{array}{l} a + 5 = 11 \\ -5 \left(\right) -5 \\ \hline a = 6 \end{array}$$

Example two-step

$$\begin{array}{l} 4 = 3b - 7 \\ +7 \left(\right) +7 \\ \hline 11 = 3b \\ \div 3 \left(\right) \div 3 \\ \hline \frac{11}{3} = b \end{array}$$

Equations with unknowns both sides

You need to balance the unknowns first so you are left with just one instance of the unknown in your equation.

Example:

$$\begin{array}{l} 5f + 2 = 2f - 2 \\ -2f \left(\right) -2f \\ \hline 3f + 2 = -2 \\ -2 \left(\right) -2 \\ \hline 3f = -4 \\ \div 3 \left(\right) \div 3 \\ \hline f = -\frac{4}{3} \end{array}$$

Subtract 2f from both sides then subtract 2 from each side and finally divide both sides by 3 to obtain the final answer.

Fractional equations

To solve equations with fractions you will need to multiply both sides of the equation by the denominator at some stage. It is important to do the inverse operation in the right order.

Solve

$$\begin{array}{l} \frac{t-2}{5} = 3 \\ t-2 = 15 \quad (\text{multiply both sides by 5}) \\ t = 17 \quad (\text{add 2 to both sides}) \end{array}$$

Equations with brackets

Two different methods for single brackets.

Method 1: divide by the number in front of the bracket first.

$$\begin{array}{l} 3(2p + 1) = 12 \\ \div 3 \left(\right) \div 3 \\ \hline 2p + 1 = 4 \\ -1 \left(\right) -1 \\ \hline 2p = 3 \\ \div 2 \left(\right) \div 2 \\ \hline p = 1.5 \end{array}$$

Method 2: multiply out the brackets first.

$$\begin{array}{l} 3(2p + 1) = 12 \\ -3 \left(\right) -3 \\ \hline 6p + 3 = 12 \\ -3 \left(\right) -3 \\ \hline 6p = 9 \\ \div 6 \left(\right) \div 6 \\ \hline p = 1.5 \end{array}$$

Setting up and solving an equation

Read the text carefully and pick out the relevant parts.

A milkman sets off from the dairy with eight crates of milk, each containing b bottles. He delivers 92 bottles to a large factory and finds that he has exactly 100 bottles left on his float. How many bottles were in each crate?

The equation is: $8b - 92 = 100$

$$8b = 192 \quad (\text{add 92 to both sides})$$

$$b = 24 \quad (\text{divide both sides by 8})$$

There were 24 bottles in each crate.

Year 9 Core – Linear Equations

| | |
|--|--|
| 1 Solve $x + 4 = 19$ Solve $7y = 63$ | 2 Solve $5 - m = 12$ Solve $2a - 5 = 19$ |
| 3 Solve $\frac{d}{2} = 9.5$ | 4 Solve $4(a - 3) = 22$ |
| 5 Solve $5(x - 6) = 65$ | 6 Solve $\frac{y}{3} - 5 = 4$ |
| 7 Solve $24 = 4(2x - 5)$ | 8 Solve $\frac{d+3}{4} = 5$ |

| | |
|----|--|
| 9 | <p>(a) Solve $6w = 4w + 9$</p> <p>(b) Solve $3x + 8 = 2$</p> |
| 10 | <p>Solve $3x + 12 = 5x + 4$</p> |
| 11 | <p>Solve $2m - 20 = 10 + 7m$</p> |
| 12 | <p>Solve $10 - 2s = s - 8$</p> |
| 13 | <p>Solve $2x + 20 = 6x - 12$</p> |



Area and circumference of circles



What is π ?

π (pronounced pi) is a very special number in maths.

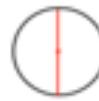
If you divide the circumference of any circle and divide it by its diameter the answer is always 3.1415926535.....
That is why it was given it's own name as it is so special!

$$\pi = 3.1415926535 \dots$$

Parts of a Circle



Radius



Diameter



Chord



Tangent



Segment

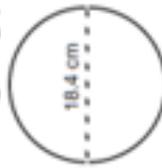


Sector

Circumference of a Circle

Circumference = $\pi \times$ diameter
 $C = \pi d$

Calculate the circumference of this circle giving your answer to 1.d.p.

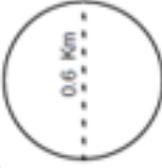


$$\begin{aligned} C &= \pi \times d \\ C &= \pi \times 18.4 \\ C &= 57.8053\dots \\ C &= 57.8 \text{ cm (1.d.p.)} \end{aligned}$$

Area of a Circle

Area = $\pi \times$ radius²
 $A = \pi r^2$

Calculate the area of this circle giving your answer to 1.d.p.



$$\begin{aligned} A &= \pi \times r^2 \\ A &= \pi \times 0.3^2 \\ A &= 0.2874\dots \\ A &= 0.3 \text{ cm}^2 \text{ (1.d.p.)} \end{aligned}$$

Giving Answers in Terms of π

(This is on the non calc paper only).

Calculate the circumference and area of this circle giving your answers in terms of π .



$$\begin{aligned} C &= \pi \times d \\ C &= \pi \times 2 \times 8 \\ C &= 16\pi \text{ cm} \\ A &= \pi \times r^2 \\ A &= \pi \times 8^2 \\ A &= 64\pi \text{ cm}^2 \end{aligned}$$

Perimeter of a Semicircle

Calculate the perimeter of this semi-circle, giving answer to 1 d.p.



The curve is half of the circumference, then add on the straight length (the diameter).

$$\begin{aligned} P &= \frac{\pi \times d}{2} + d \\ P &= \frac{\pi \times 24}{2} + 24 \\ P &= 61.6991\dots \\ P &= 61.7 \text{ cm (1.d.p.)} \end{aligned}$$

Area of a Semicircle

Calculate the area of this semi-circle, giving your answer to 1 d.p.



Find the area of the whole circle, then halve it.

$$\begin{aligned} A &= \frac{\pi \times r^2}{2} \\ A &= \frac{\pi \times 12^2}{2} \\ A &= 226.1946 \\ A &= 226.2 \text{ cm}^2 \text{ (1.d.p.)} \end{aligned}$$

Quarter Circles



Perimeter of a quarter circle

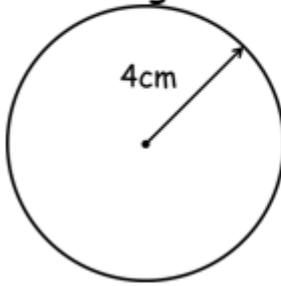
$$C = \frac{\pi \times d}{4} + r + r$$

Area of a quarter circle

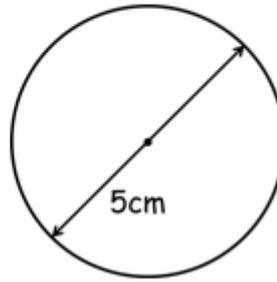
$$A = \frac{\pi \times r^2}{4}$$

Year 9 Core – Area and Circumference of circles

Calculate the area and circumference of the circles with the following dimensions:

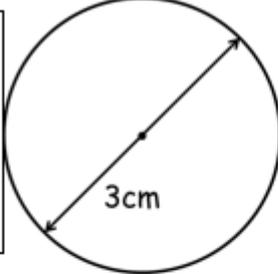


$$\begin{aligned}
 A &= \pi r^2 \\
 &= \pi \times 4^2 \\
 &= \underline{\hspace{2cm}} \text{cm}^2 \\
 C &= \pi d \\
 &= \pi \times 8 \\
 &= \underline{\hspace{2cm}} \text{cm}
 \end{aligned}$$

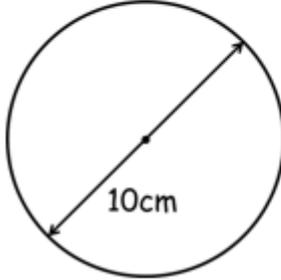
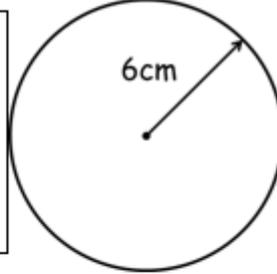


$$\begin{aligned}
 A &= \pi r^2 \\
 &= \pi \times 2.5^2 \\
 &= \underline{\hspace{2cm}} \text{cm}^2 \\
 C &= \pi d \\
 &= \pi \times 5 \\
 &= \underline{\hspace{2cm}} \text{cm}
 \end{aligned}$$

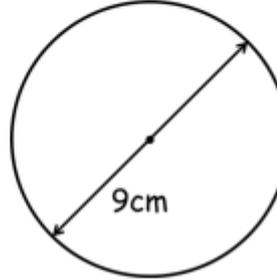
$$\begin{aligned}
 A &= \pi r^2 \\
 &= \pi \times 1.5^2 \\
 &= \underline{\hspace{2cm}} \text{cm}^2 \\
 C &= \pi d \\
 &= \pi \times 3 \\
 &= \underline{\hspace{2cm}} \text{cm}
 \end{aligned}$$



$$\begin{aligned}
 A &= \pi r^2 \\
 &= \pi \times \underline{\hspace{1cm}}^2 \\
 &= \underline{\hspace{2cm}} \text{cm}^2 \\
 C &= \pi d \\
 &= \pi \times \underline{\hspace{1cm}} \\
 &= \underline{\hspace{2cm}} \text{cm}
 \end{aligned}$$



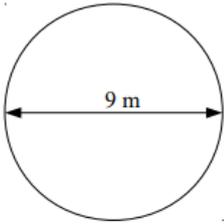
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 &= \underline{\hspace{2cm}} \text{cm}
 \end{aligned}$$



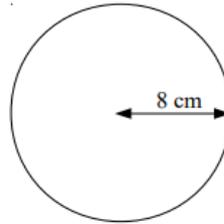
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 A &= \pi r^2 \\
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 &= \underline{\hspace{2cm}} \text{cm}^2 \\
 C &= \pi d \\
 &= \pi \times \underline{\hspace{1cm}} \\
 &= \underline{\hspace{2cm}} \text{cm}
 \end{aligned}$$

| | |
|---|--|
| <p>1. Calculate the area</p> <div style="text-align: center; margin-top: 20px;"> <p>A circle with a diameter of 14cm. The diameter is shown as a line segment passing through the center from one side of the circle to the other, labeled '14cm'.</p> </div> | <p>2. Find the circumference</p> <div style="text-align: center; margin-top: 20px;"> <p>A circle with a radius of 3.5cm. The radius is shown as a line segment from the center to the circumference, labeled '3.5cm'.</p> </div> |
| <p>3. Find the circumference</p> <div style="text-align: center; margin-top: 20px;"> <p>A circle with a radius of 3cm. The radius is shown as a line segment from the center to the circumference, labeled '3cm'.</p> </div> | <p>4. What is the area of this circle?</p> <div style="text-align: center; margin-top: 20px;"> <p>A circle with a radius of 2cm. The radius is shown as a line segment from the center to the circumference, labeled '2cm'.</p> </div> |

5. A circle has a diameter of 9 m.
Work out the area of the circle.
Give your answer correct to 1 decimal place.



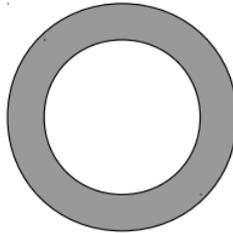
6. A circle has a radius of 8 cm.
Work out the area of the circle.
Give your answer in terms of π



7. The diagram shows a shaded ring formed by cutting a smaller circle out of a larger circle.

The radius of the smaller circle is 6 cm.
The diameter of the larger circle is 15 cm.

Find the area of the shaded ring.

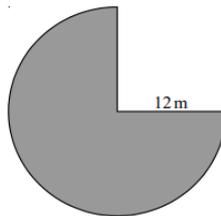


- 8 a. A circle has a diameter of 12 mm.
Work out the circumference of the circle.
Give your answer in terms of π

- b. A circle has a radius of 6.5 cm.
Work out the circumference of the circle.
Give your answer correct to 2 decimal places.

9. The diagram shows three quarters of a circle with a radius of 12 metres.

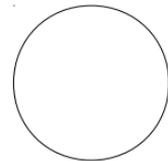
Find the perimeter of the shape.



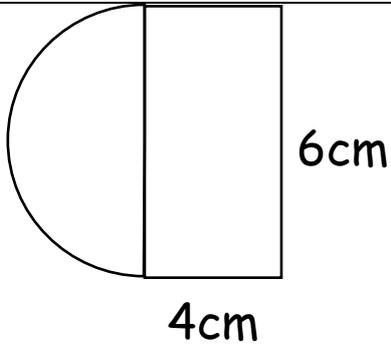
10. A circular field has a diameter of 32 metres.
A farmer wants to build a fence around the edge of the field.

Each metre of fence will cost £15.95

Work out the total cost of the fence.



11



Calculate the area of compound shapes by splitting them up into more recognisable shapes.

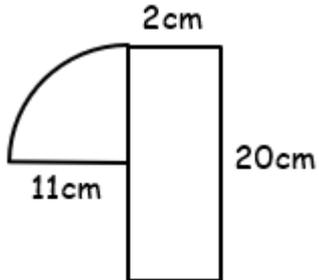
This question has been started for you.

Area of **rectangle** = $b \times h$

Area of **semi-circle** = $\frac{\pi r^2}{2}$

Total area =
rectangle + semi-circle

12



Area of **rectangle** = $b \times h$

Area of **quarter-circle** = $\frac{\pi r^2}{4}$

Total area =
rectangle + quarter circle

ANSWERS

1. ABC is a straight line. Work out the size of the angle marked x.

$x = 180 - 121 = 59^\circ$
angles on a straight line sum to 180°

2. Work out the size of the angle marked x.

$x = 360 - 90 - 145 = 125^\circ$
angles around a point sum to 360°

3. Work out the size of angle ABC.

$\angle ABC = 180 - 64 - 32 = 84^\circ$
angles in a triangle sum to 180°

4. ABC is an isosceles triangle, work out the size of angle x.

$\angle ABC = 65^\circ$
Base angles of an isosceles triangle are equal
 $x = 180 - 65 - 65 = 50^\circ$

5. (a) Work out the size of the angle marked x.

$180 - 118 = 62^\circ$

(b) Work out the size of the angle marked y.

$180 - 62 - 62 = 56^\circ$

(c) Give reasons for your answer:
angles on a straight line sum to 180°
base angles in an isosceles triangle are equal
angles in a triangle sum to 180°

Year 9 Higher – Angles; parallel lines and polygons

1. Find the missing angle – give a reason for your answer.

$x = 96^\circ$
Corresponding angles are equal

2. Find the missing angle – give a reason for your answer.

$y = 133^\circ$
alternate angles are equal

3. Find the missing angle – give a reason for your answer.

$x = 180 - 126 = 54^\circ$
allied angles sum to 180°

4. Find the missing angle – give a reason for your answer.

$z = 180 - 81 = 99^\circ$
allied angles sum to 180°

5. Find the missing angles – give reasons for your answer.

angles on straight line sum to 180°
vertically opposite angles are equal
 $a = 180 - 126 = 54^\circ$ (allied angles sum to 180°)
 $b = 116^\circ$ (corresponding angles are equal)

6. Find the missing angles – give reasons for your answer.

Tip: sometimes helps to extend the lines
 $n = 54^\circ$ (corresponding angles are equal)
 $m = 180 - 68 - 54 = 58^\circ$ (angles in a triangle sum to 180°)

7. Complete the table

| Name of regular polygon | Number of Sides | Size of exterior angle | Sum of all interior angles | Size of interior angle |
|-------------------------|-----------------|--------------------------------|----------------------------------|------------------------------|
| Equilateral triangle | 3 | $360^\circ \div 3 = 120^\circ$ | $1 \times 180^\circ = 180^\circ$ | $180 \div 3 = 60^\circ$ |
| Square | 4 | $360^\circ \div 4 = 90$ | $2 \times 180^\circ = 360^\circ$ | $360 \div 4 = 90^\circ$ |
| Pentagon | 5 | 72° | 540° | $540 \div 5 = 108^\circ$ |
| Hexagon | 6 | 60° | 720° | $720 \div 6 = 120^\circ$ |
| Heptagon | 7 | 51.43° | 900° | $900 \div 7 = 128.57^\circ$ |
| Octagon | 8 | 45° | 1080° | $1080 \div 8 = 135^\circ$ |
| Nonagon | 9 | 40° | 1260 | $1260 \div 9 = 140^\circ$ |
| Decagon | 10 | 36° | 1440 | $1440 \div 10 = 144^\circ$ |
| n-sided polygon | n | $360^\circ \div n$ | $(n-2) \times 180^\circ$ | $\frac{(n-2) \times 180}{n}$ |

8. What is each interior angle of a regular polygon with 14 sides?

$\frac{(14-2) \times 180}{14} = 157.29^\circ$

9. Each interior angle of a regular polygon is 168° . How many sides does the polygon have?

$180 - 168 = 12^\circ$ (exterior angle)
 $360 \div 12 = 30$
30 sides.

10. How many sides do these regular polygons have if their exterior angles are...?
a) 30° b) 18°

a) $360 \div 30 = 12$ sides
b) $360 \div 18 = 20$ sides

Year 9 Core – Ratio

2. Write down the ratio of 350 cm to 25 cm. Give your answer in its simplest form.

$350 : 25$
 $14 : 1$
divide both parts by 25

2. Write down the ratio of 220 kg to 5 kg. Give your answer in its simplest form.

$220 : 5$
 $44 : 1$

3. (a) Write the ratio 32 : 24 in its simplest form

$32 : 24$
 $16 : 12$
 $8 : 6$
 $4 : 3$

(b) $\frac{1}{9}$ of people in a class are left handed. Write the ratio of left handed people to right handed people

$1 : 8$
as number of parts must add up to the denominator.

4. Write the ratio 12 : 30 in the form 1 : n

$\div 12 \rightarrow \frac{12}{12} : \frac{30}{12}$
 $1 : \frac{5}{2}$
 $1 : \frac{5}{2}$
 $1 : 2.5$

5. There are some cubes in a bag. $\frac{1}{6}$ of the cubes are red. The rest of the cubes are blue. Write the ratio of the number of red cubes to the number of blue cubes. Give your answer in the form 1 : n

$\frac{1}{6} = \text{red} \Rightarrow \frac{5}{6} = \text{blue}$ so ratio $1 : 5$

6. There are only blue counters, red counters and yellow counters in a bag. There are twice as many blue counters as yellow counters. There are three times as many red counters as yellow counters. Write down the ratio of blue counters to red counters to yellow counters.

Hard which colour has the least?
yellow so let yellow have one part
 $B : R : Y$ Twice as many blue and three times as many red
 $2 : 3 : 1$

Dividing and Sharing Ratio

- Divide £24 into the ratio 1 : 3. (Total 4 parts)
 $£24 \div 4 = 6$
 $6 \times 1 = 6$
 $6 \times 3 = 18$
6 : 18
- Divide 800ml into the ratio 3 : 7. (Total 10 parts)
 $800 \text{ml} \div 10 = 80$
 $3 \times 80 = 240$
 $7 \times 80 = 560$
240 : 560
- Share 56 sweets in the ratio 2 : 5. (Total 7 parts)
 $2+5 = 7$
 $56 \div 7 = 8$
 $2 \times 8 = 16$
 $5 \times 8 = 40$
16 : 40
- Divide £72 into the ratio 4 : 5.
 $4+5 = 9$
 $72 \div 9 = 8$
 $4 \times 8 = 32$
 $5 \times 8 = 40$
32 : 40
- Divide 84 pens into the ratio 5 : 9.
 $9+5 = 14$
 $84 \div 14 = 6$
 $5 \times 6 = 30$
 $9 \times 6 = 54$
30 : 54
- Share £120 in the ratio 5 : 2 : 5. (Total 12 parts)
 $£120 \div 12 = 10$
 $5 \times 10 = 50$
 $2 \times 10 = 20$
 $5 \times 10 = 50$
50 : 20 : 50

- Divide 24L into the ratio 3 : 3 : 2. $3+3+2 = 8$
 $24 \div 8 = 3$
 $3 \times 3 = 9$
 $3 \times 3 = 9$
 $3 \times 2 = 6$
9 : 9 : 6
- Share 96 sheep in the ratio 7 : 1 : 4. $7+1+4 = 12$
 $96 \div 12 = 8$
 $7 \times 8 = 56$
 $1 \times 8 = 8$
 $4 \times 8 = 32$
56 : 8 : 32
- A school collected £140 for charity. It was decided to divide the money between Dr Barnados and the RSPCA in the ratio 4 : 3. How much did each charity receive? $4+3 = 7$
 $140 \div 7 = 20$
 $4 \times 20 = 80$
 $3 \times 20 = 60$

 Dr Barnados: 80 RSPCA: 60
- Mr Allen, Mr Broome and Mr Collins own 2, 5 and 7 parts of a business respectively. The business makes £420 profit in a week. How much does each man get? $2+5+7 = 14$
 $420 \div 14 = £30$
 $2 \times 30 = 60$
 $5 \times 30 = 150$
 $7 \times 30 = 210$

 Mr Allen: £60 Mr Broome: £150 Mr Collins: £210

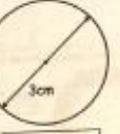
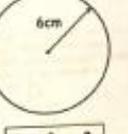
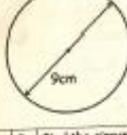
Year 9 Core - Linear Equations

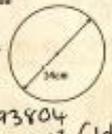
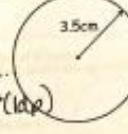
- | | | | |
|---|---|---|--|
| 1 | Solve $x+4=19$ $x=16$ | 2 | Solve $5-m=12$ $5-12=m$ $-7=m$ |
| | Solve $7y=63$ $y=9 \downarrow \div 7$ | | Solve $2a-5=19$ $2a=24 \downarrow +5$ $a=12 \downarrow \div 2$ |
| 3 | Solve $\frac{d}{2}=9.5$ $d=2 \times 9.5$ $d=19$ | 4 | Solve $4(a-3)=22$ $4a-12=22 \downarrow +12$ $4a=34 \downarrow \div 4$ $a=\frac{34}{4}$ |
| 5 | Solve $5(x-6)=65$ $5x-30=65 \downarrow +30$ $5x=95 \downarrow \div 5$ $x=19$ | 6 | Solve $\frac{y}{3}-5=4$ $\frac{y}{3}=9 \downarrow +5$ $y=3 \times 9 \downarrow \times 3$ $y=27$ |
| 7 | Solve $24=4(2x-5)$ $24=8x-20 \downarrow +20$ $44=8x \downarrow \div 8$ $\frac{44}{8}=x$ $\frac{11}{2}=x$ simplify | 8 | Solve $\frac{d+3}{4}=5$ $d+3=20 \downarrow \times 4$ $d=17 \downarrow -3$ |

- | | |
|----|---|
| 9 | (a) Solve $6w-4w=9$ $2w=9$ $w=\frac{9}{2}$ |
| | (b) Solve $3x+8=2$ $3x=-6 \downarrow \div 3$ $x=-2$ |
| 10 | Solve $3x+12=5x+4$ $12=2x+4 \downarrow -3x$ $8=2x \downarrow -4$ $4=x \downarrow \div 2$ |
| 11 | Solve $2m-20=10+7m$ $-20=10+5m \downarrow -2m$ $-30=5m \downarrow -10$ $-30=m \downarrow \div 5$ $-6=m$ simplify. |
| 12 | Solve $10-2s=s-8$ $10=3s-8 \downarrow +2s$ $18=3s \downarrow +8$ $\frac{18}{3}=s \downarrow \div 3$ $6=s$ simplify. |
| 13 | Solve $2x+20=6x-12$ $20=4x-12 \downarrow -2x$ $34=4x \downarrow +12$ $\frac{34}{4}=x \downarrow \div 4$ $\frac{17}{2}=x$ simplify |

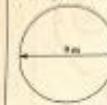
Year 9 Core - Area and Circumference of circles

Calculate the area and circumference of the circles with the following dimensions: all to 1dp

| | | | |
|---|--|---|---|
|  | $A = \pi r^2$ $= \pi \times 4^2$ $= 50.3 \text{ cm}^2$ $C = 2\pi r$ $= \pi \times 8$ $= 25.1 \text{ cm}$ |  | $A = \pi r^2$ $= \pi \times 2.5^2$ $= 19.6 \text{ cm}^2$ $C = 2\pi r$ $= \pi \times 5$ $= 15.7 \text{ cm}$ |
| $A = \pi r^2$ $= \pi \times 1.5^2$ $= 7.1 \text{ cm}^2$ $C = 2\pi r$ $= \pi \times 3$ $= 9.4 \text{ cm}$ |  | $A = \pi r^2$ $= \pi \times 6^2$ $= 113.1 \text{ cm}^2$ $C = 2\pi r$ $= \pi \times 12$ $= 37.7 \text{ cm}$ |  |
|  | $A = \pi r^2$ $= \pi \times 5^2$ $= 78.5 \text{ cm}^2$ $C = 2\pi r$ $= \pi \times 10$ $= 31.4 \text{ cm}$ |  | $A = \pi r^2$ $= \pi \times 4.5^2$ $= 63.6 \text{ cm}^2$ $C = 2\pi r$ $= \pi \times 9$ $= 28.3 \text{ cm}$ |

| | |
|--|--|
| 1. Calculate the area  $A = \pi r^2$ $= \pi \times 7^2$ $= 153.93804$ $= 153.9 \text{ cm}^2$ (1dp) | 2. Find the circumference  $C = \pi D$ $= \pi \times 7$ $= 21.99114$ $= 22.0 \text{ cm}$ (1dp) |
| 3. Find the circumference  $C = \pi D$ $= \pi \times 6$ $= 18.849555$ $= 18.8 \text{ cm}$ (1dp) | 4. What is the area of this circle?  $A = \pi r^2$ $= \pi \times 2^2$ $= 4\pi$ $= 12.56637$ $= 12.6 \text{ cm}^2$ (1dp) |

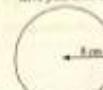
5. A circle has a diameter of 9 cm. Work out the area of the circle. Give your answer correct to 1 decimal place.



$r = 9 \div 2 = 4.5$

$A = \pi r^2$
 $= \pi \times 4.5^2$
 $= 63.6 \text{ cm}^2$ (1dp)

6. A circle has a radius of 8 cm. Work out the area of the circle. Give your answer in terms of π .



$A = \pi r^2$
 $= \pi \times 8^2$
 $= 64\pi \text{ cm}^2$

don't forget units

7. The diagram shows a shaded ring formed by cutting a smaller circle out of a larger circle. The radius of the smaller circle is 4 cm. The diameter of the larger circle is 13 cm. Find the area of the shaded ring.



area shaded = area whole - area smaller

area whole = $\pi r^2 = \pi \times 7^2 = 56.25\pi$

area smaller = $\pi r^2 = \pi \times 4^2 = 16\pi$

Shaded area = $56.25\pi - 16\pi = 40.25\pi$

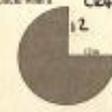
8. A circle has a diameter of 12 mm. Work out the circumference of the circle. Give your answer in terms of π .

$C = \pi D$
 $= \pi \times 12$
 $= 12\pi \text{ mm}$

9. A circle has a radius of 6.5 cm. Work out the circumference of the circle. Give your answer correct to 2 decimal places.

$C = \pi D$
 $= \pi \times 13$
 $= 40.84 \text{ cm}$ (2dp)

10. The diagram shows three quarters of a circle with a radius of 12 metres. Find the perimeter of the shape.



Circumference = $\pi D = 24\pi$

Perimeter = $(\frac{3}{4} \text{ of } 24\pi) + 12 + 12$
 $= 18\pi + 24$
 $= 80.5 \text{ m}$ (1dp)

11. A circular field has a diameter of 32 metres. A farmer wants to build a fence around the edge of the field. Each metre of fence will cost £15.95.

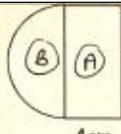


Work out the total cost of the fence.

$C = \pi D$
 $= \pi \times 32 = 32\pi \text{ m}$

$32\pi \times £15.95 = £1653.47$

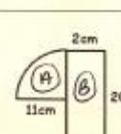
11. Calculate the area of compound shapes by splitting them up into more recognisable shapes. This question has been started for you.



Area A = $b \times h = 6 \times 4 = 24 \text{ cm}^2$

Area B = $\frac{1}{2} \times \pi r^2 = \frac{\pi \times 3^2}{2} = 4.5\pi \text{ cm}^2$

Total area = $24 + 4.5\pi = 38.1 \text{ cm}^2$ (1dp)



Area $\frac{1}{4}$ circle = $\frac{\pi r^2}{4} = \frac{\pi \times 11^2}{4} = 30.25\pi \text{ cm}^2$

Area B = $b \times h = 2 \times 20 = 40 \text{ cm}^2$

Total area = $30.25\pi + 40 = 135.0 \text{ cm}^2$ (1dp)

Well done if you managed to work through most of these questions. Remember you can log in to Mathswatch and search for the topic. You will normally find a short video and lots of practice questions that will really help strengthen your maths skills.

