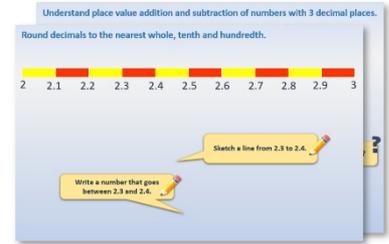


Year 6: Week 4, Day 4

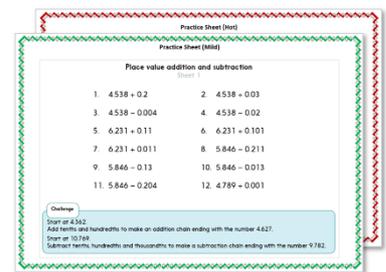
Circles

Each day covers one maths topic. It should take you about 1 hour or just a little more.

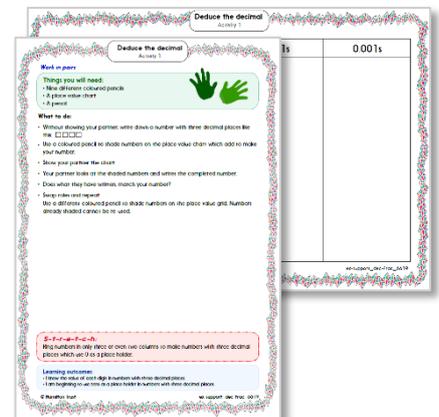
1. Start by reading through the **Learning Reminders**. They come from our *PowerPoint* slides.



2. Tackle the questions on the **Practice Sheet**. There might be a choice of either **Mild** (easier) or **Hot** (harder)! Check the answers.



3. Finding it tricky? That's OK... have a go with a grown-up at **A Bit Stuck?**



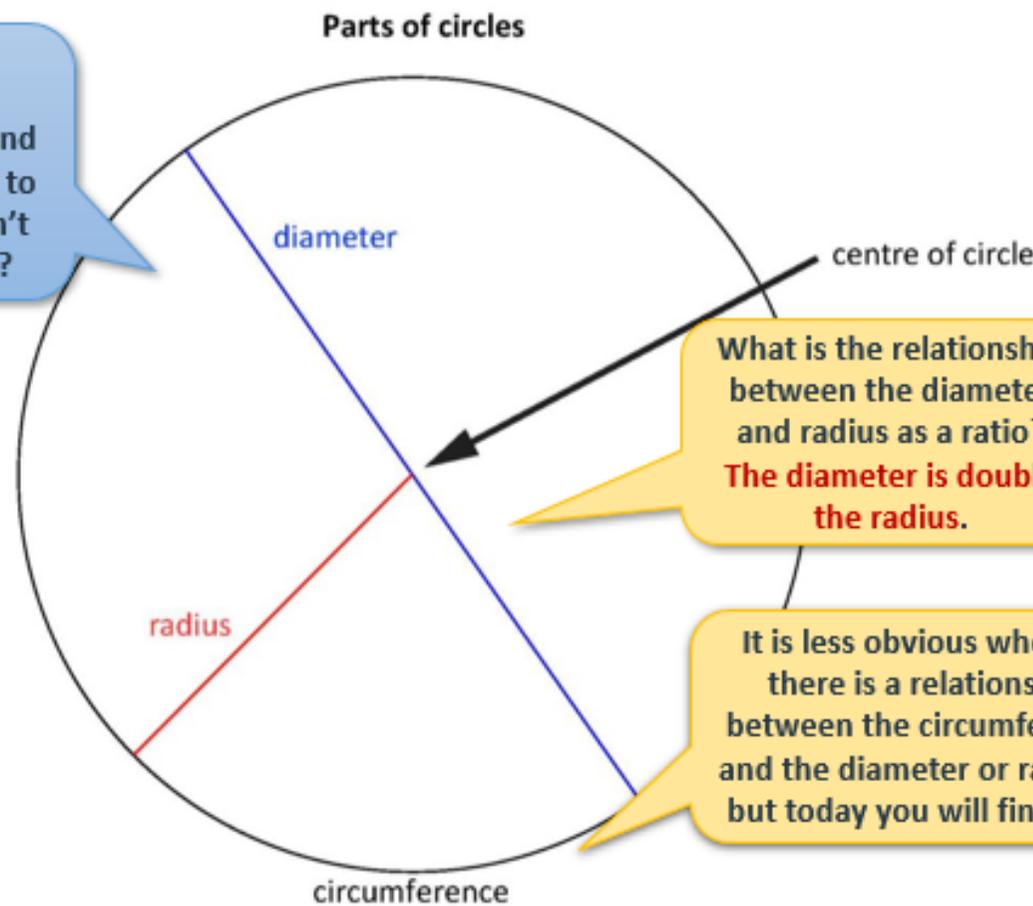
4. Think you've cracked it? Whizzed through the Practice Sheets? Have a go at the **Investigation...**

Learning Reminders

Name parts of circles and explore relationships between them.



How would you explain what a radius, diameter and circumference are to someone who can't see this diagram?



What is the relationship between the diameter and radius as a ratio?

The diameter is double the radius.

It is less obvious whether there is a relationship between the circumference and the diameter or radius – but today you will find out!

Practice Sheet for All (Mild)

Investigating circle relationships

Some children have been drawing and measuring circles. They measured the radius and diameter with a ruler, then the circumference as accurately as possible with a piece of string. They recorded their measurements in the table below.

Kayleigh makes a good generalisation, saying, "*The circumference of the circles always gets bigger as the diameter gets bigger.*"

Jay has also spotted something interesting, saying, "*The circumference of the circle with a diameter of 10cm was almost exactly 30cm – that's neat because 30 is 3 times 10.*"

Was Jay's observation just a coincidence or is there a pattern here? Investigate the ratio of the circumference of each circle to its diameter, filling in the last column of the table. You can use a calculator - divide the circumference by the diameter to give an accurate ratio.

Circle radius (cm)	Diameter (cm)	Circumference (cm)	Ratio of circumference: diameter
3	6	19.2	
3.9	7.8	22.9	
6.5	13	40.5	
2.3	4.6	14.5	
5	10	30.1	
8.4	16.8	53.7	
7.5	15	47.8	
3.5	7	22.0	

Use this space to tell Jay whether he's really onto something, or if his observation was a coincidence after all:

Practice Sheet for All (Hot)

Investigating circle relationships - Challenge!

So, the ratio of the circumference to the diameter in any circle is always approximately 3.1. This 'constant' value is called 'Pi' – the Greek letter π . It is an *irrational* number – the decimal places go on and on without repeating. The value of Pi to 2 decimal places is 3.14.

We can write this relationship in words:

The circumference (C) of a circle is equal to Pi (π) multiplied by the diameter (d).

Or we can write a formula using symbols:

$$C = \pi \times d$$

Taking a value of 3.1 for π (or 3.14 if you are happy multiplying with 2 decimal places), use this formula to answer these questions:

1. What is the circumference of a circle with diameter 10cm?
2. What is the circumference of a circle with diameter 100cm?
3. What is the circumference of a circle with diameter 3cm?
4. What is the circumference of a circle with radius 4cm?
5. What is the circumference of a circle with diameter 12cm?
6. The London Eye has a radius of 70m.
Roughly how far do you travel when you go once round it?
7. A wheel is 1m round the edge and is used to measure distances.
What is the distance from the edge to the middle?

Practice Sheet Answers

Investigating circle relationships (mild)

Circle radius (cm)	Diameter (cm)	Circumference (cm)	Ratio of circumference: diameter
3	6	19.2	3.2
3.9	7.8	22.9	2.94
6.5	13	40.5	3.12
2.3	4.6	14.5	3.15
5	10	30.1	3.01
8.4	16.8	53.7	3.2
7.5	15	47.8	3.19
3.5	7	22.0	3.14

All the ratios of circumference to diameter round to 3, therefore Jay was onto something with his observation.

Investigating circle relationships - Challenge! (hot)

1. $3.14 \times 10 = 31.4\text{cm}$ (or 31cm if π is 3.1).
2. $3.14 \times 100 = 314\text{cm}$ (or 310cm if π is 3.1).
3. $3.14 \times 3 = 9.42\text{cm}$ (or 9.3cm if π is 3.1).
4. Diameter = 2×4 therefore $3.14 \times 8 = 25.12\text{cm}$ (or 24.8cm if π is 3.1).
5. $3.14 \times 12 = 37.68\text{cm}$ (or 37.2cm if π is 3.1).
6. Distance once around London eye = $3.14 \times 140 = 439.6\text{m}$ (or 434m if π is 3.1).
7. The distance from the edge to the middle is roughly 15.9cm (or 16.1cm if π is 3.1).

A Bit Stuck? Going around in circles

Things you will need:

Pencil, ruler, circular objects, string, scissors



What to do:

1. Draw a circle – you could draw around a mug/small plate, etc.
2. Label the radius and diameter.
3. Explain how you could find the diameter if you know the length of the radius.
4. Go ahead and measure the radius, then calculate the diameter. Measure the diameter to check your calculation.
5. Use damp string to measure the circumference of a small plate.
6. Now measure its diameter. Calculate the circumference by multiplying the diameter by 3.14. How close was your damp string measurement?
7. Repeat with other plates/ cups etc.

S-t-r-e-t-c-h:

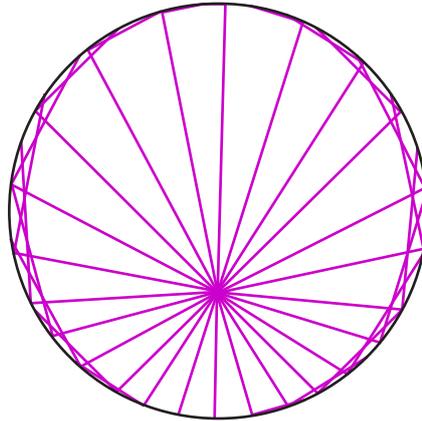
Alfie measured the circumference of a football centre-circle. It was 55metres!

If he has to mark out the centre circle on a different pitch, what should the radius of the circle be?

Investigation

Ellipse in a circle

1. Draw a circle of radius 5cm.
2. Pick a point about 1.5 or 2cm in from the circumference of the circle at the bottom. Draw straight line rays to the edge of the circle. You need to draw about 24 of these.



3. Using a sharp coloured pencil draw a line at right angles to the ray, where each ray reaches the circle. Draw it so that this line touches the circumference of the circle.
4. Sometimes you will need to draw this line from the ray to the left and sometimes you will need to draw it to the right.
5. When you have drawn all 24 lines, you will have created an ellipse.

Compare your ellipse with your partners.

Discuss what you notice about the shape of the ellipse in relation to where you drew your original point.

Challenge

Create a new ellipse that is 'shorter and wider' or 'longer and thinner' than your first one.