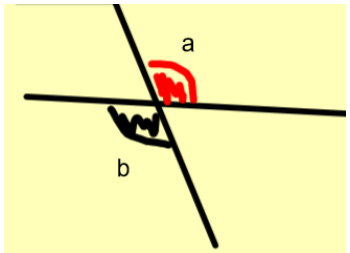
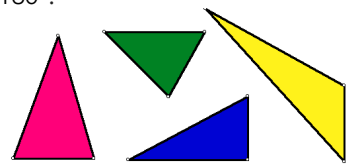
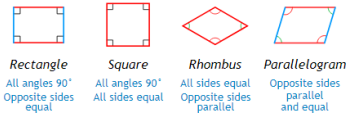
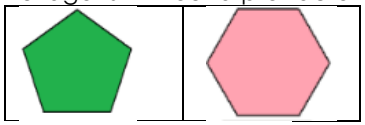
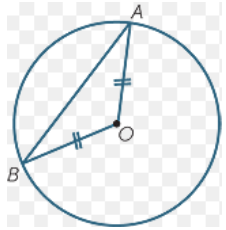
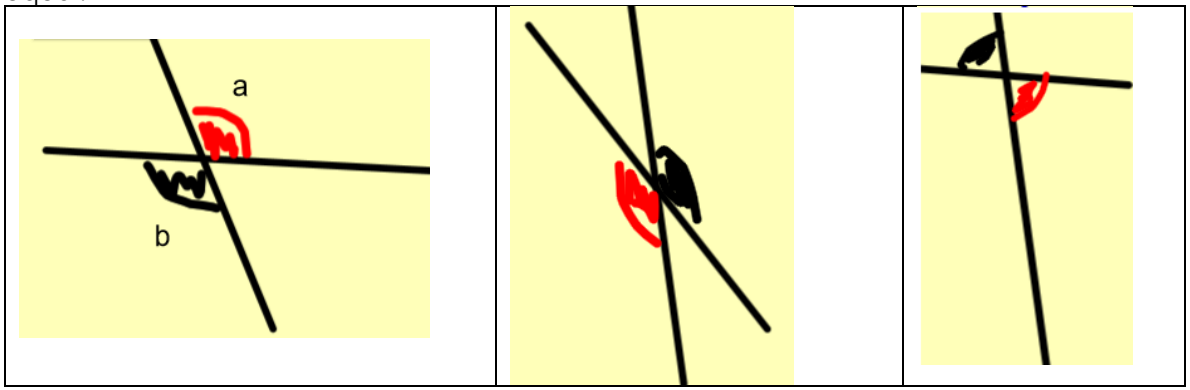
Year 6 maths – Week Beginning 04.05.20

Theme	Geometry lesson 1 Investigating opposite angles	Geometry lesson 2 Investigating angles in triangles	Geometry lesson 3 Investigating angles in quadrilaterals	Geometry lesson 4 Solving problems involving angles in triangles and quadrilaterals	Geometry lesson 5 Investigating circles
Factual fluency (to aid fluency)	Measure angles using a protractor here	Find missing angles here	Find missing angles (2) here	Find missing angles (3) here	Find missing angles (4) here
Problem/ activity of the day	**(Lesson 1 resources below)** **MAKING LINKS:** In year 5, we investigated angles on a line see here and at a point see here **THINK: (support below)** My friend says that when 2 straight lines cross, it creates opposite angles that are equal  Do you agree/disagree? Can you prove it? **SEE: (model below)** Watch lesson video here. **DO:** Use what you have learned today to solve the problems	**(Lesson 2 resources below)** **MAKING LINKS:** In year 4 and 5, we learnt the properties of different types of triangles. Use this link as a reminder **THINK: (support below)** My friend says the angles in a triangle always add up to 180°.  Do you agree/disagree? Can you prove it? **SEE: (model below)** Watch lesson video here. **DO:** Use your knowledge of isosceles triangles and what you have learned today to solve the problems	**(Lesson 3 resources below)** **MAKING LINKS:** In year 4 and 5, we learnt the properties of quadrilaterals. Use this link as a reminder **THINK: (support below)** My friend says the angles in a quadrilateral always add up to 360°.  Do you agree/disagree? Can you prove it? Tip: Yesterday we learnt that the sum of the angles in a triangle is 180°. Does this help? **SEE: (model below)** Watch lesson video here. **DO:** Use your knowledge of isosceles triangles and what you have learned today to solve the problems. Remember: parallelograms have 2 pairs of opposite angles that are equal. See here for more	**(Lesson 4 resources below)** **MAKING LINKS:** on Tuesday and Wednesday, we solved problems involving angles in triangles and quadrilaterals **THINK: (support below)** My friend thinks she can work out the size of angles in regular pentagons and hexagons without a protractor  Do you agree/disagree? Can you do it? Tip: pentagons and hexagons are made up of triangles and quadrilaterals **SEE: (model below)** Watch lesson video here. **DO:** Use what you have learned today to solve the problems Remember: the sum of the angles in a triangle is 180° Remember: the sum of the angles in a quadrilateral is 360°	**(Lesson 5 resources below)** **MAKING LINKS:** In year 4 and 5, we learnt the properties of shapes **THINK: (support below)** A circle has a diameter, a radius and a circumference. See below or click here for more  What is the relationship between the diameter and the radius?  What kind of triangle is created in the circle above? How do you know? **SEE: (model below)** Watch lesson video here. **DO:** Use what you have learned today to solve the problems
Time to check	**Day 1 resources and answers (below)**	**Day 2 resources and answers (below)**	**Day 3 resources and answers (below)**	**Day 4 resources and answers (below)**	**Day 5 resources and answers (below)**

DAY 1 RESOURCES:

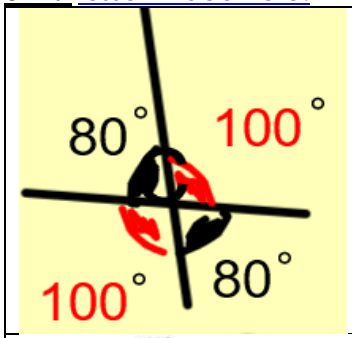
Quality First Education Trust

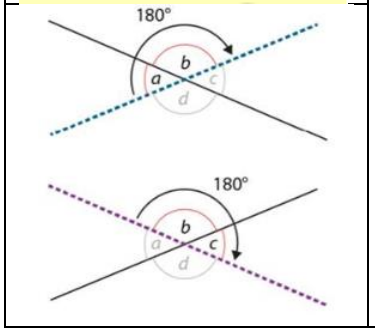
THINK: My friend says that when 2 straight lines cross, it creates opposite angles that are equal.



Get two pencils (or anything straight) and make them cross at a point. Move the pencils to see how the angles change. What do you notice? After drawing lots of straight lines that cross you could cut along one of the lines and rotate it 180° so that it points in the opposite direction and lay it on top of its opposite angle. Can you work out why they are equal? You can rotate intersecting lines to see why here

SEE: lesson video here.





When I rotate my figure, I see that both sides of the straight lines **HAVE EQUAL ANGLES**

When I use a protractor to measure the opposite angles, I find **THEY ARE EQUAL**

The diagram to the left (bottom) shows a + b = 180 and angle b + c = 180 so angle a = angle c

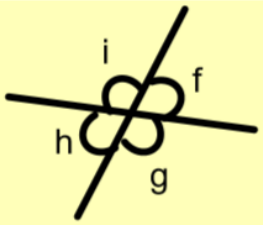
KEY POINT: Straight lines that cross create two pairs of equal opposite angles

MAKING CONNECTIONS:
I can see that all 4 angles add up to 360°.
100 + 100 + 80 + 80 = 360

I can see that angles on a straight line add up to 180°.
80 +100 = 180 and 100 + 80 = 180

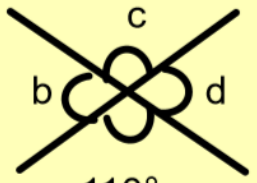
DO: ***Solve these problems***

1. Which angles are equivalent?



angle ☐ = angle ☐ and angle ☐ = angle ☐

2. Find the missing angles

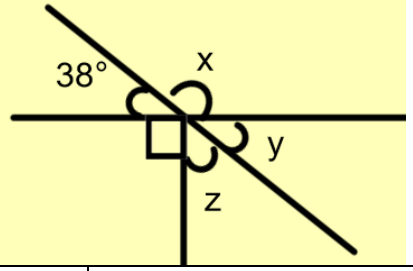


angle b =

angle c =

angle d =

3. Find the missing angles

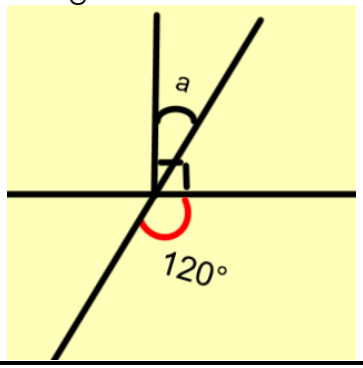


angle x =

angle y =

angle z =

Find angle a

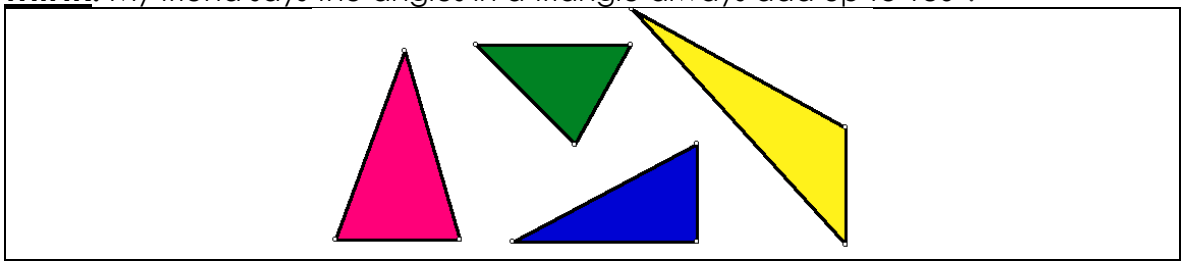


Challenge: create (and solve) 3 missing angle problems.
One that is easy for you to solve
One that is hard for you to solve
One that is impossible to solve without a protractor

DAY 2 RESOURCES:

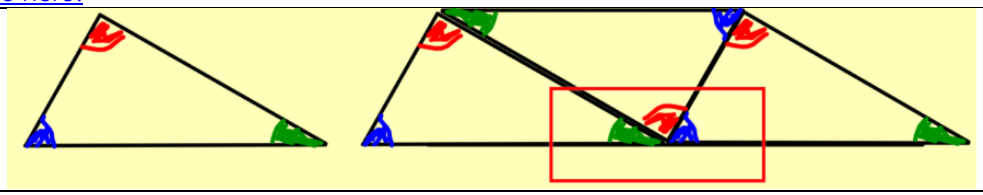
Quality First Education Trust

THINK: My friend says the angles in a triangle always add up to 180°.

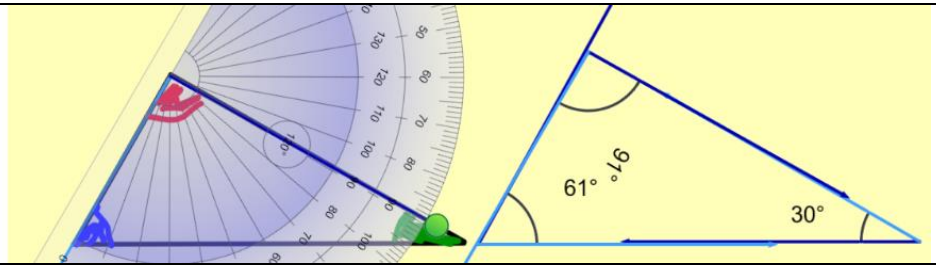


After drawing **several different triangles**, you should cut the angles out and arrange them on a straight line to see if they add up to 180°. You could also use a protractor (if you have one).

SEE: lesson video here.



When I cut the angles out and put them next to each other they make a straight line angle **WHICH IS 180°.**



When I use a protractor to measure the angles in a triangle, I find **THEY ADD UP TO 180° (if you are wrong by one or two degrees, that is very normal - 178° to 182° is accurate enough to show that the angle add up to 180°)**

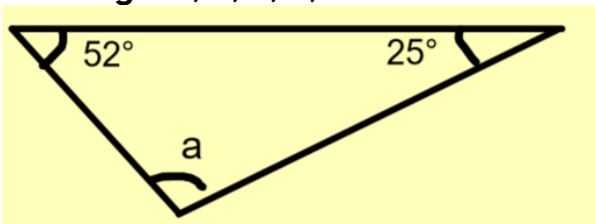
MAKING CONNECTIONS:

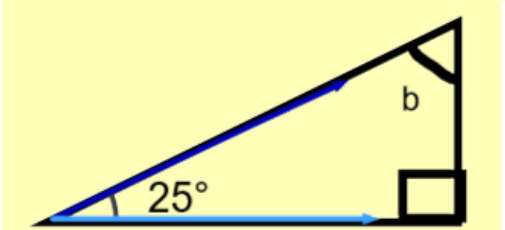
- **Isosceles triangles** have two sides of equal length and two equal angles so I only need to know one angle to work out the others. See here for more
- **Equilateral triangles** have sides of equal length and equal angles so each angle in an equilateral triangle must be 60° because 180 ÷ 3 = 60
- **Scalene triangles** have no sides of equal length and no equal angles so each angle must be different. A right angled triangle is scalene and I need to know two angles to work out a missing angle

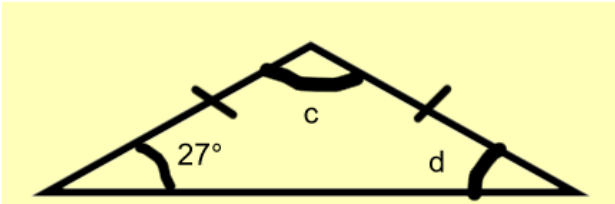
Explore this website for more information about triangles

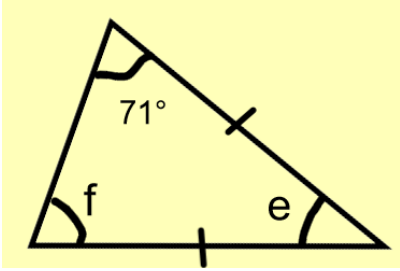
DO:

Find angle a, b, c, d, e and f





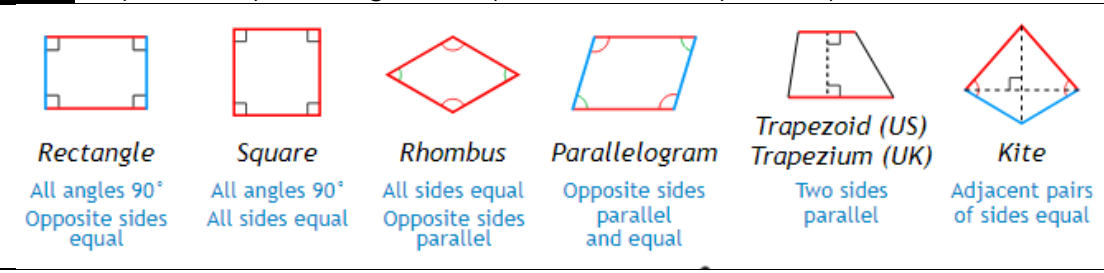




Challenge: create (and solve) 3 missing angle problems involving triangles.
One that is easy for you to solve
One that is hard for you to solve
One that is impossible to solve without a protractor
Note: without a protractor, you will have to draw your triangles 'not to scale' and make an estimate of the angles as you draw them.

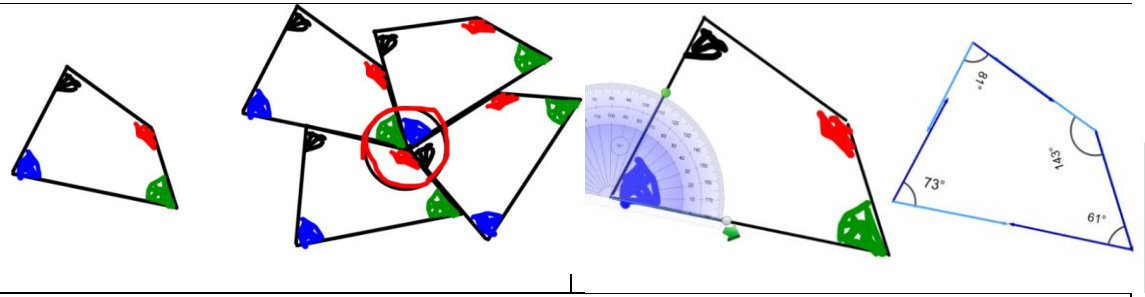
DAY 3 RESOURCES:

THINK: My friend says the angles in a quadrilateral always add up to 360°.



After drawing **several different quadrilaterals,** you could cut the quadrilaterals into triangles using one cut and you could also use a protractor (if you have one).
Tip: Yesterday we learnt that the sum of the angles in a triangle is 180°. Does this help?

SEE: lesson video here.



I can see that quadrilaterals can be split into two triangles by drawing a straight line from one vertex to another. If the angles in a triangle add up to **180°** then quadrilaterals (two triangles) must have interior angles adding up to **360°.**

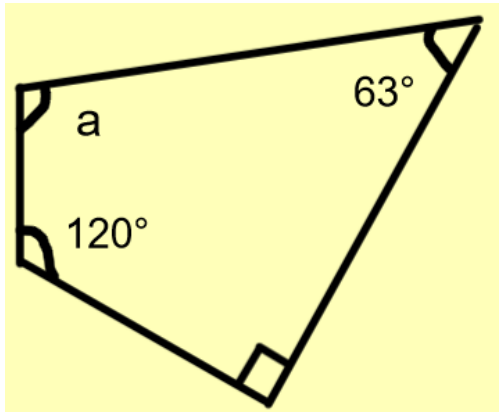
When I cut the angles out and join them together they make a full circle **WHICH IS 360°.**

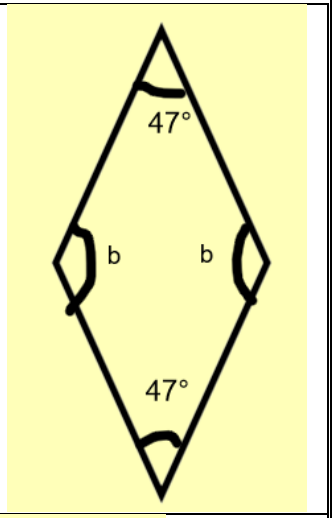
When I use a protractor to measure the angles in a quadrilateral, I find **THEY ADD UP TO 360°. (if you are wrong by one or two degrees, that is very normal - 358° to 362° is accurate enough to show that the angle add up to 360°)**

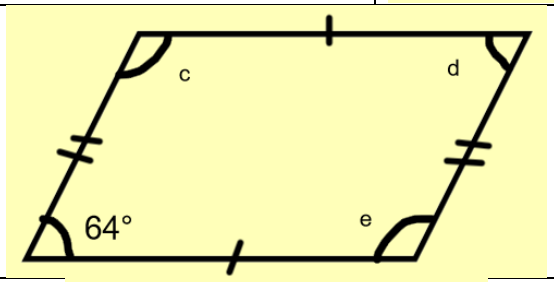
MAKING CONNECTIONS:
Squares have 4 equal angles and each angle is 90° because 360 ÷ 4 = 90

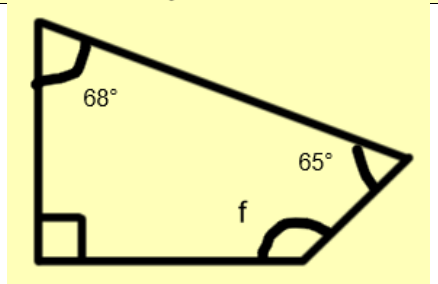
Parallelograms have opposite angles which are equal so I only need to know one angle to find them all see here to explore this further.

DO: ***Find angle a, b, c, d, e and f***





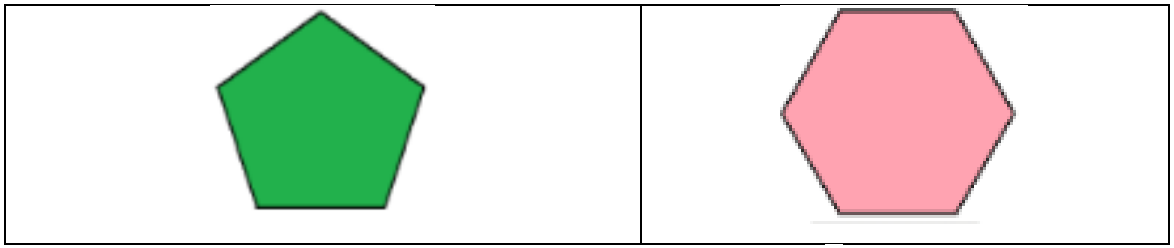




Challenge: create (and solve) 3 missing angle problems involving quadrilaterals.
One that is easy for you to solve
One that is hard for you to solve
One that is impossible to solve without a protractor
Note: without a protractor, you will have to draw your quadrilaterals 'not to scale' and make an accurate estimate of the angles as you draw them.

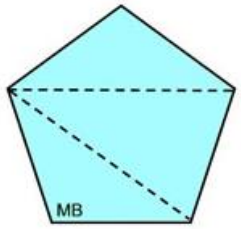
DAY 4 RESOURCES:

THINK: My friend thinks she can work out the size of angles in regular pentagons and hexagons without a protractor



Yesterday, we learnt that the sum of the angles in a quadrilateral is 360°.
Tuesday, we learnt that the sum of the angles in a triangle is 180°.
Tip: Try drawing regular pentagons and hexagons using triangles and quadrilaterals.

SEE: lesson video here.



5-sides
3 triangles

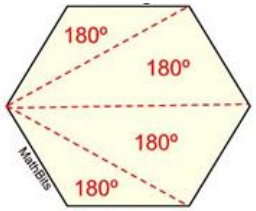
A pentagon is made up of **3 triangles**

Angles in a triangle **ADD UP TO 180°.**

180 x 3 = 540 so the angles in a pentagon must add up to 540°.

If the angles in a pentagon add up to 540° and there are 5 equal angles in a regular pentagon then each angle must be 120° because **540 ÷ 5 = 108**

When I use a protractor to measure the angles in a reglular pentagon, I find **are all 108°.**



A hexagon is made up of **4 triangles** and angles in a triangle **ADD UP TO 180°.**

4 x 180 = 720 so the angles in a hexagon must add up to 720°.

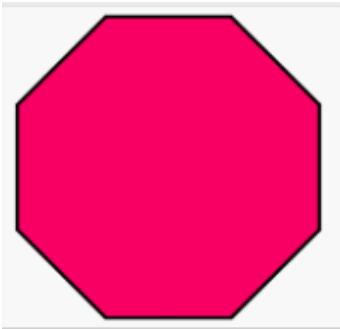
If the angles in a hexagon add up to 720° and there are 6 equal angles in a regular hexagon then each angle must be 120° because **720 ÷ 6 = 120**

When I use a protractor to measure the angles in a reglular hexagon, I find **are all 120°.**

Making connections:
- I can also see that a hexagon is made up of two quadrilaterals (which is the same as 4 triangles) and a pentagon is made up of 1 **quadrilateral and one triangle (which is the same as 3 triangles)**
- Shapes with more than three sides can all be divided into triangles.
the number of sides minus 2 = the number of triangles
- Explore more here

DO:

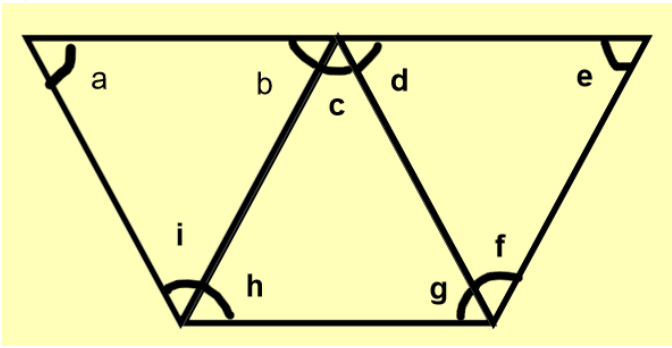
Solve these problems



1. Find the sum of the interior angles of a regular octagon

2. Find the size of each interior angle in a regular octagon

Q) 3, 4 and 5



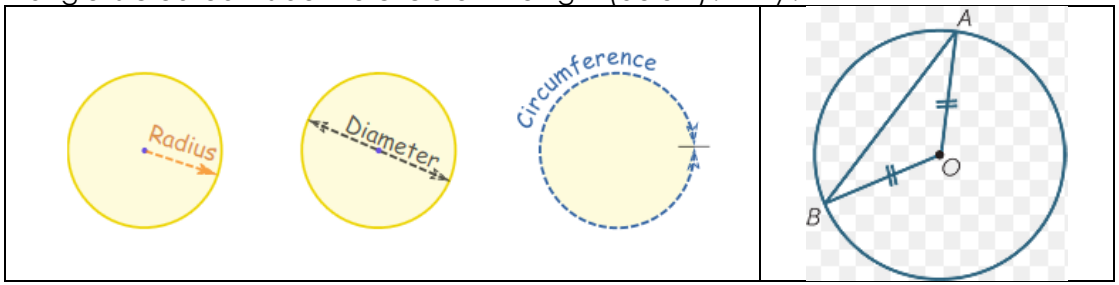
Find:
3) d + e + f
4) b + c + d
5) a + b + c + d + e + f + g + h + i

Challenge: Create a poster showing other shapes can be made using triangles.

Show how this can help to work out missing angles

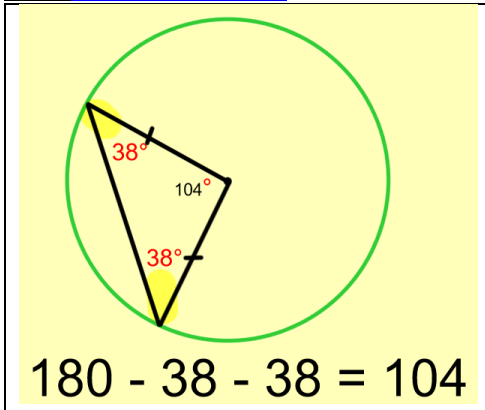
DAY 5 RESOURCES:

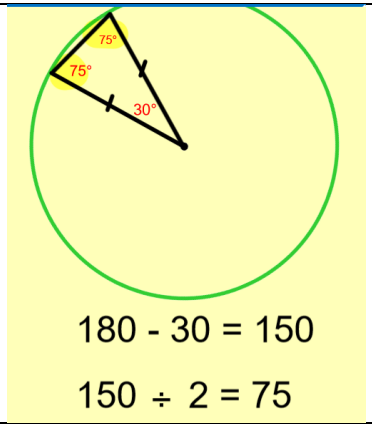
THINK: What is the relationship between the diameter and the radius? What kind of triangle is created inside the circle on the right (below)? Why?



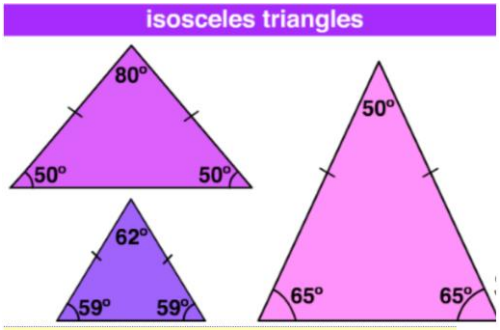
Tip: An isosceles triangle is a triangle with two equal sides and two equal angles. What is the connection to the circle above (on the right)?

SEE: lesson video here. and further information here



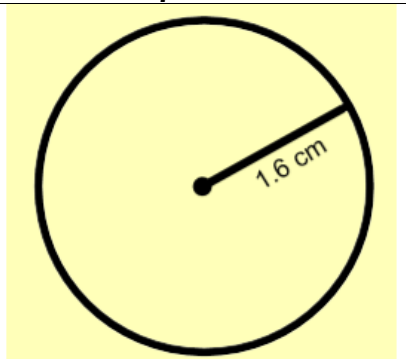


- The **Radius** is the distance from the centre outwards.
- The **Diameter** goes straight across the circle, through the centre.
- The diameter is always double the length of the radius
- The triangle is an isosceles triangle because two of the sides are the same length (because they are radii). Because of this, two of the angles are the same. See more here
- Knowing this can help us to solve problems involving circles

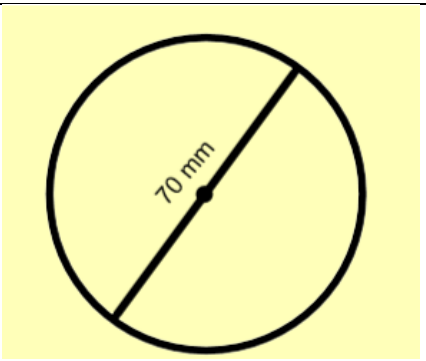


DO:

Solve these problems

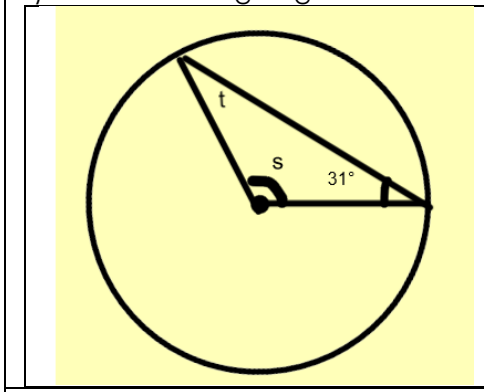


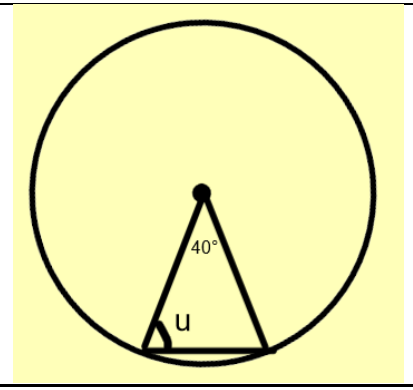
1. Find the diameter



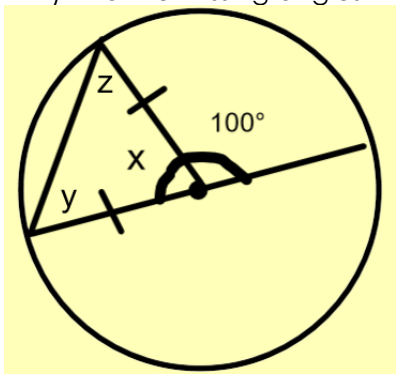
2. Find the radius

3) Find the missing angles





4) Find the missing angles



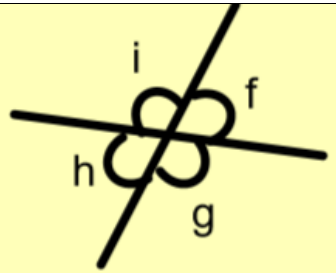
Challenge: Find circular objects in your house.

Estimate then measure the radius, diameter and circumference (if you can) of the circles

ANSWERS:

Day 1

1. Which angles are equivalent?



angle i = angle g

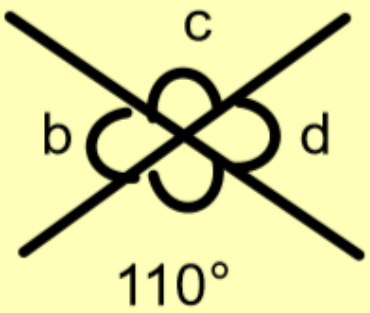
angle h = angle f

2. Find the missing angles

angle b = 70°

angle c = 110°

angle d = 70°

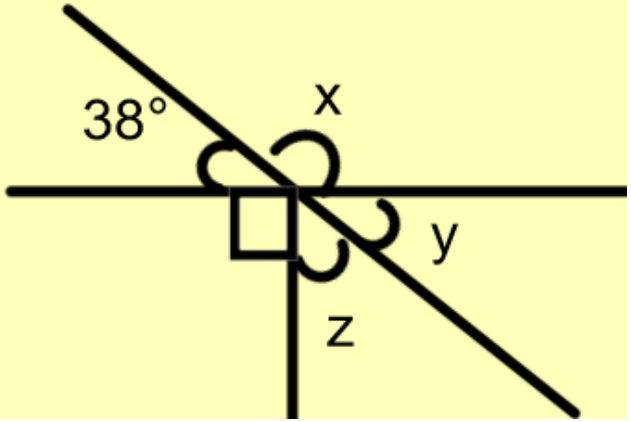


3. Find the missing angles

angle x = 142°

angle y = 38°

angle z = 52°

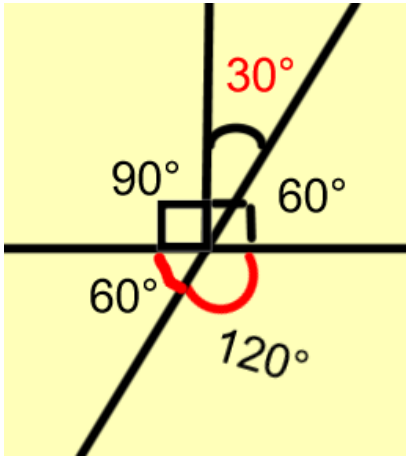


Angle y is opposite the angle marked 38° so angle y must be 38°

Angle x and y are on a straight line so must add together to make 180° (180 – 38 = 142)

Angle z and Angle y add together to make 90° (90 – 38 = 52)

4. Find angle a. 30°



ANSWERS:

Day 2	Day 3	Day 4	Day 5
a = 103° b = 65° c = 126° d = 27° e = 38° f = 71°	a = 87° b = 133° c = 116° d = 64° e = 116° f = 137°	1) 1080° - An octagon is made up of 6 triangles. 180 x 6 = 1080 2) 135° - An octagon has eight equal angles so 1080 ÷ 8 = 135 3) 180° 4) 180° 5) 540°	1) 3.6cm 2) 35mm 3) t = 31° s = 118° u = 70° 4) x = 80° y = 50° z = 50°