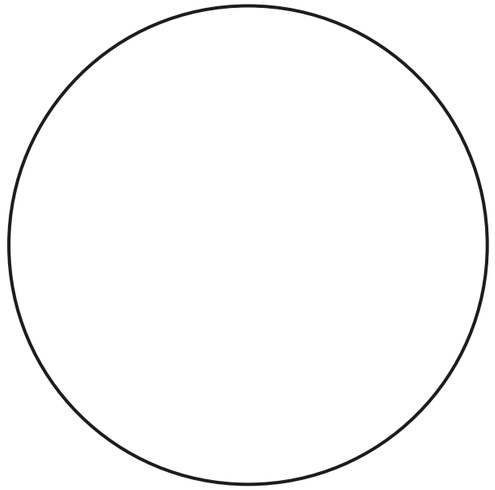
Investigate area of a circle

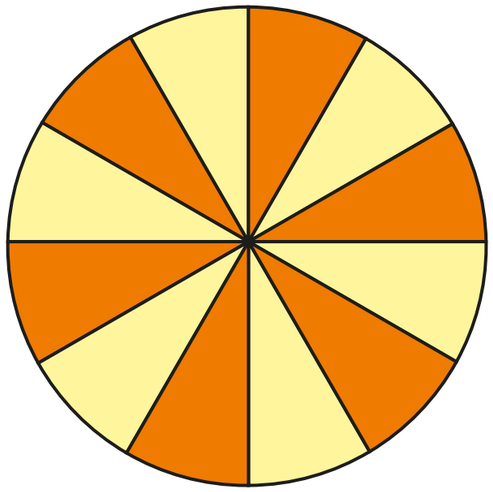
1 Ron is investigating how to find the area of a circle.

Follow Ron's steps and do this for yourself.

He draws a circle.



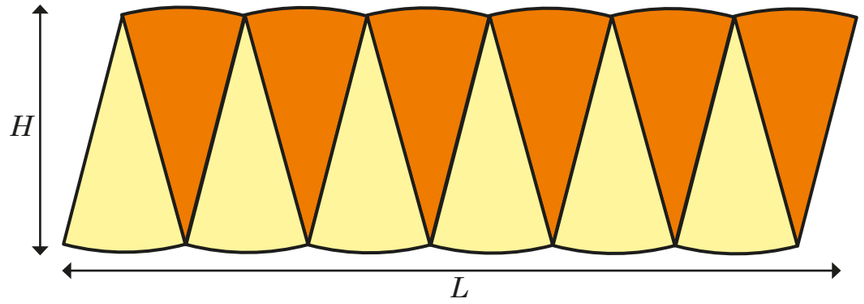
He then divides the circle into 12 equal sectors.



a) What is the angle of each sector?

30 °

Ron cuts out the sections and sticks them together next to each other.



b) What is the length of the shape, marked L, approximately equal to?
Tick the correct answer.

the diameter of the circle	☐
the radius of the circle	☐
the circumference of the circle	☐
half the circumference of the circle	☑

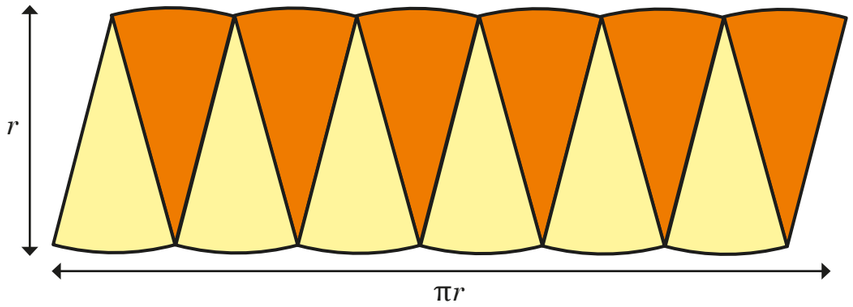
Explain your reasoning.

The full circumference is made up of the arc lengths of 12 sectors, so 6 sectors is half.

c) What is the height of the shape, marked H, approximately equal to?
Tick the correct answer.

the diameter of the circle	☐
the radius of the circle	☑
the circumference of the circle	☐
half the circumference of the circle	☐

Ron marks these measurements on the diagram.

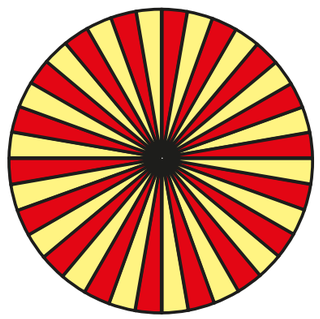


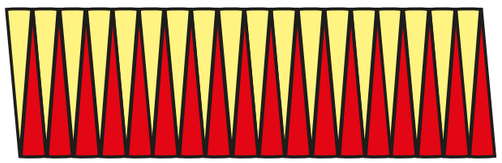
Use these measurements to explain why the area of the circle is equal to πr^2

$\pi r \times r = \pi r^2$

2 Aisha is also investigating the area of a circle, but wants to do it more accurately.

She divides her circle into 36 sectors.

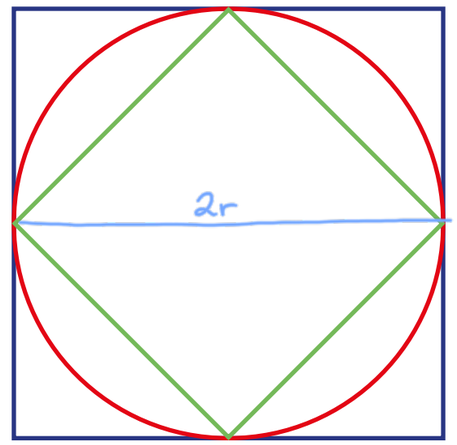




What is the same and what is different about Ron and Aisha's methods?

3 The diagram shows two squares and a circle.

The area of the smaller square is half the area of the larger square.



a) Use the diagram to explain why the area of the circle must lie between $2r^2$ and $4r^2$

Area of larger square $= 2r \times 2r = 4r^2$

Area of smaller square $= \frac{4r^2}{2} = 2r^2$

Area of smaller square < Area of circle < Area of larger square

$\therefore \quad 2r^2 <$ Area of circle $< 4r^2$

Compare answers with a partner.

b) How does knowing that the area of the circle lies between $2r^2$ and $4r^2$ support the fact that the area of a circle is given by $A = \pi \times r^2$?

$2 < \pi < 4$

$\pi \approx 3.14$