

Wrenn School Mathematics Department

## Investigating Circles

This pack of worksheets gives you some activities to help you to discover some properties of circles using *The Geometer's Sketchpad*.

Take your time.

Do not move onto the next card until you are sure that you have found out as much as you can from the Activity you are working on.

Use any of the SketchPad tools that you want to, even if the worksheet does not tell you to!

**Experiment with this powerful software!**

**For each Activity:**

Use the **Text** tool  to:

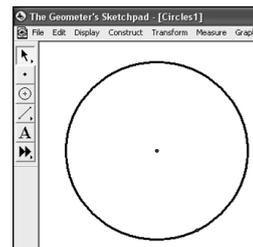
Include your name.

Record any conjectures that you have made.

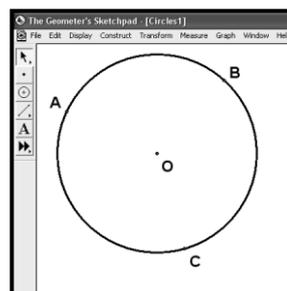
Use *Save As* from the **File** menu to save each sketch you create.

## Activity One

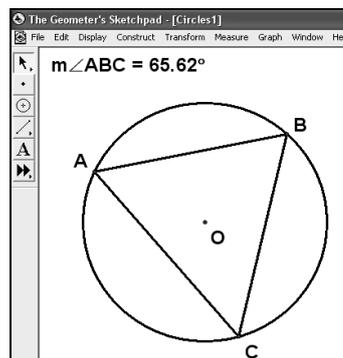
- Use the **Compass** tool  to construct a circle.
- Click on the **Selection Arrow**  and click in a blank sketch area to deselect the circle.
- There will be a point at the centre and one on the circumference.



- Use the **Point** tool  to create 2 more points on the circumference of the circle (the circle changes colour when the arrow is over it).
- Click on the **Selection Arrow**  and select all 4 points (including the centre). From the **Display** menu choose **Show Labels**.
- Double click on the labels to re-label the centre O and the other three A, B and C.



- Use the **Straightedge** tool  to join ABC to form a triangle.
- Click on the **Selection Arrow**  and click in a blank sketch area.
- Select points A, B and C (in that order) with the **Selection Arrow** and then from the **Measure** menu choose **Angle**. Click in a blank sketch area. The size of the angle ABC will be displayed.
- **Measure** the other 2 angles.
- From the **File** menu choose **Save As** to save your sketch – you will need it later.



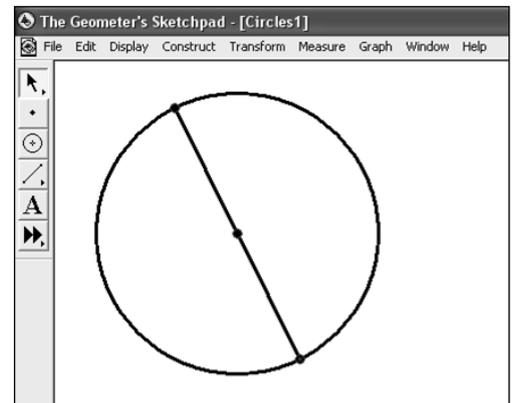
❖ Investigate what happens to the angles when you move the points around the circumference.

- Use the **Text** tool  to record any conjectures you make.
- Save and print your work.

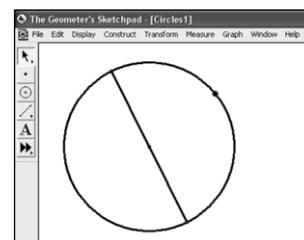
## Activity Two

- From the **File** menu choose **New Sketch** to start a new sketch.
- Construct a circle.

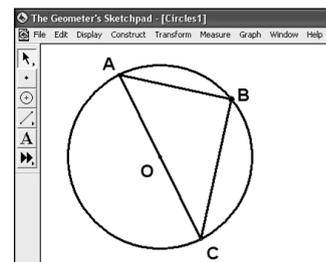
- Use the **Selection Arrow**  to select the point at the centre and the one on the circumference.
- From the **Construct** menu choose **line**.
- Select the circle as well as the line you have just constructed.
- From the **Construct** menu choose **intersections** and then click in a blank sketch area to de-select all objects.
- Select the line and then from the **Display** menu choose **hide line**.
- Select the two points on the circumference and then from the **Construct** menu choose **segment**.
- Click in a blank sketch area to de-select all objects.



- Use the **Point** tool  to create one more point on the circumference of the circle and then click on the **Selection Arrow** .



- Label the 4 points as shown in the diagram.
- Use the **Straightedge** tool  to construct AB and BC to complete a triangle.
- Click on the **Selection Arrow**  and click in a blank sketch area.



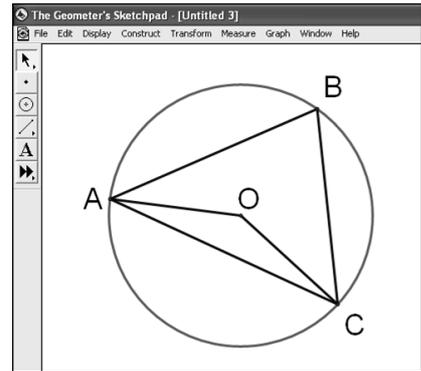
- Estimate the size of angle ABC.
- **Measure** all the angles.

❖ **Investigate what happens to the angles when you move the points around the circumference.**

- Use the **Text** tool  to record any conjectures you make.
- Save and print your work.

## Activity Three

- From the **File** menu choose **Open** to go back to the sketch from Activity One.
- Construct the lines OA and OC.
- **Measure** the new angles created.



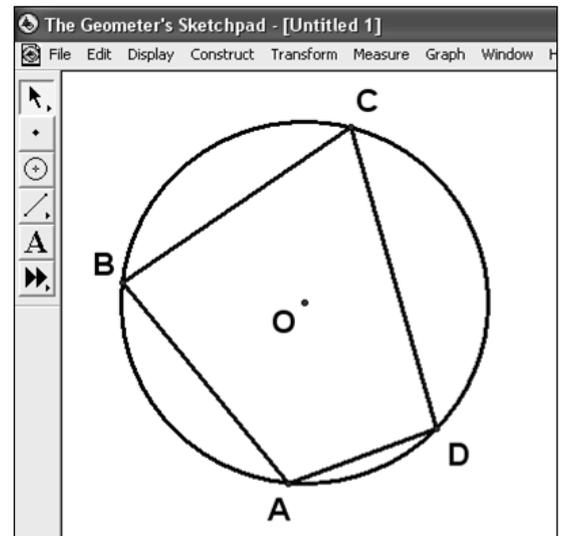
❖ What do you notice?

❖ Investigate what happens to the angles when you move the points around the circumference.

- Use the **Text** tool  to record any conjectures you make.
- Save and print your work.

## Activity Four

- From the **File** menu choose **New Sketch** to start again.
- Construct a circle.
- Click on the **Selection Arrow**  and click in a blank sketch area to deselect the circle.
- There will be a point at the centre and one on the circumference.
- Construct 3 more points on the circumference of the circle.
- Label all the points as shown.
- Construct the line segments needed to make a quadrilateral ABCD.



A quadrilateral whose vertices all lie on the circumference of a circle is called a  
**Cyclic Quadrilateral**

- **Measure** all the angles created

❖ **What do you notice?**

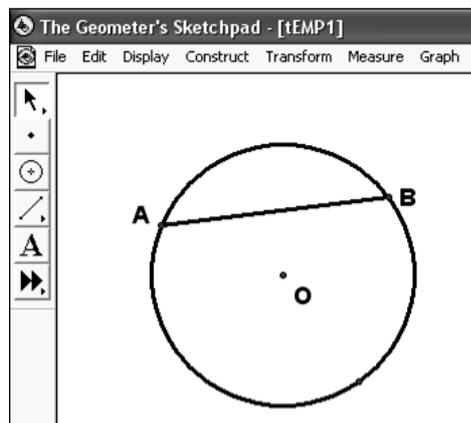
❖ **Investigate what happens to the angles when you move the points around the circumference.**

- You might want to try using the *Calculate* option from the **Measure** menu.
- Use the **Text** tool  to record any conjectures you make.
- Save and print your work.

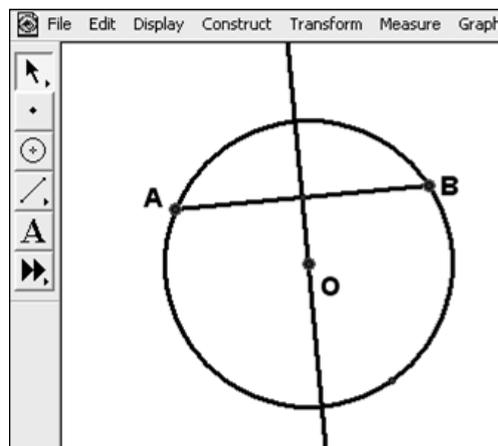


## Activity Five

- Construct a circle.
- Construct a chord, AB.



- Click on the **Selection Arrow**  and select the Chord AB. From the **Construct** menu choose **Midpoint**.
- Select the midpoint of the chord and the chord itself and then from the **Construct** menu choose **Perpendicular Line**.
- You have now constructed the perpendicular bisector of the chord AB.



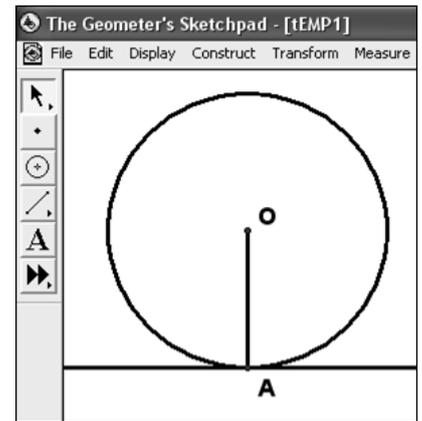
### ❖ What do you notice?

#### ❖ Investigate what happens when you move the points around the circumference.

- Use the **Text** tool  to record any conjectures you make.
- Save and print your work.

## Activity Six

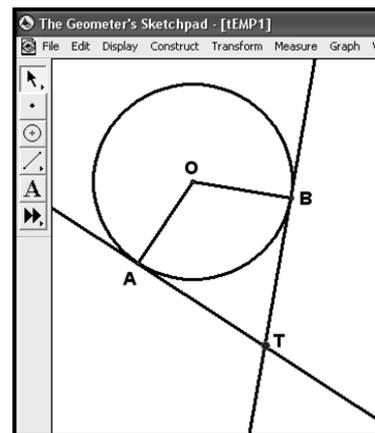
- Construct a circle and label the centre **O**.
- Construct a radius and label the point where it meets the circumference **A**.
- Construct the perpendicular to the radius at the point **A**.



The perpendicular line is called a **tangent** to the circle.

A **tangent** is a line that just touches the circle.

- Construct a second radius
- Construct the tangent at **B**.
- Construct the point of intersection of the two tangents and label it **T**.



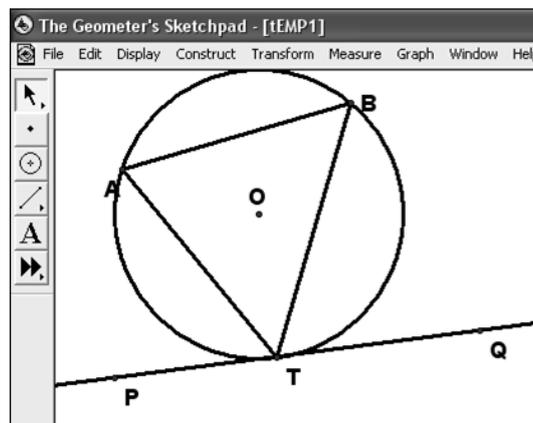
❖ What do you notice?

❖ Investigate what happens when you move the points around the circumference.

- Use the **Measure** tools to test your ideas
- Use the **Text** tool  to record any conjectures you make.
- Save and print your work.

## Activity Seven

- Construct a triangle **ABT** whose vertices are all on the circumference of a circle.
- Construct the tangent to the circle at **T**.
- Construct two points **P** and **Q** on the tangent, one either side of **T**.



### ❖ What do you notice?

- Use the **Measure** tools to test your ideas.
  - ❖ Investigate what happens when you move the points around the circumference.
- Use the **Text** tool  to record any conjectures you make.
- Save and print your work.

## Activity Eight

Using *Geometer's SketchPad* to help you, for each of these shapes say whether it is:

*always* a cyclic quadrilateral

*sometimes* a cyclic quadrilateral

*never* a cyclic quadrilateral

- a) Square
- b) Rhombus
- c) Rectangle
- d) Parallelogram
- e) Trapezium
- f) Kite

If it is *always*, explain why.

If it is *sometimes*, construct one that is and one that isn't.

If it is *never*, explain why not.