Circle Features
Teacher Notes

TI-Nspire CAS   Investigation   Student   30min

Aim

The aim of this investigation is to learn the various features of a circle such as radius, diameter, circumference and area.

National Curriculum Statement: Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area (ACMMG197)

Equipment

For this activity you will need:

- TI-Nspire CAS (or TI-Nspire)
- TI-Nspire file – Circles

Introduction – Setting up the calculations

During this activity, students will need to use the TI-Nspire file: "Circles". This file can be distributed using TI-Navigator, the TI-Nspire docking station or the teacher/student software. To distribute the file using the Teacher software, use the **Tools** menu and select the **Transfer Tool.** Locate the TI-Nspire file on your computer and then start the transfer. Once the file is transferred to the first handheld, unplug the handheld and continue plugging in each student's handheld device. Once all the students have the file, stop the transfer. Note that students can also transfer files from one handheld device to another from within the **My Documents** folder. Note also that multi-port USB connectors can be used to transfer files to several computers at the one time.

This activity requires access to the "Circles" TI-Nspire file. This file should be loaded on your device before proceeding.

Once the file is on your handheld, press **home** and select **My Documents**. Locate the "Circles" file and press **enter** to open.
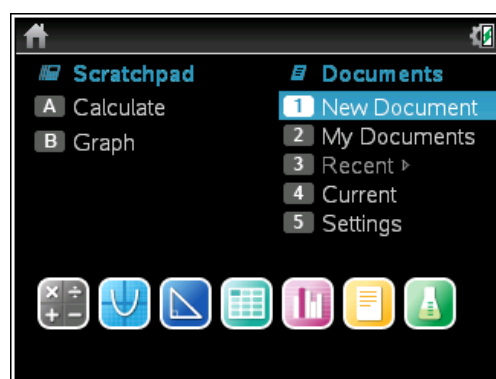
The location of the file depends on the selected location during the file transfer.

Author: Neale Woods

Part of in this investigation requires calculations to be performed. The Scratchpad is a place where calculations can be computed and then discarded. To access the Scratchpad press **home** and select **Scratchpad** (or press **A**). Alternatively, press the ⌨ key (this key is not available on a Clickpad).
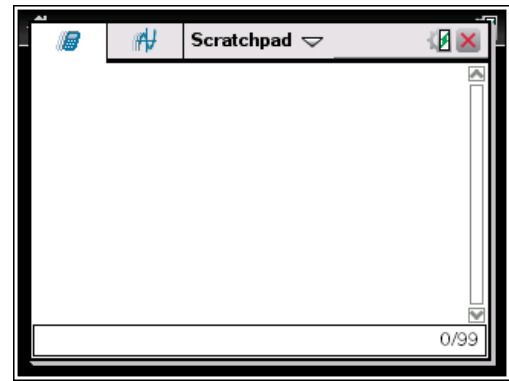
Definition of a Circle

A **circle** is a set of all points on a plane that are the same distance from a given point known as the **centre**. In this activity, we will be learning about the following features of a circle.

- **radius** – the distance from the centre to the outside of the circle.
- **diameter** – the distance across the circle that passes through the centre.
- **circumference** – the distance around the outside of the circle
- **area** – the inside of the circle

These circle features are labelled in the diagram below.
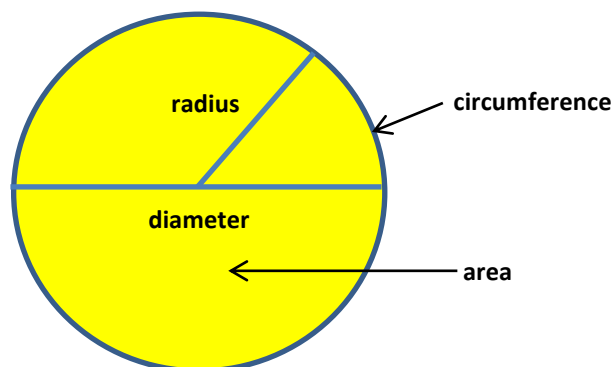
Open the TI Nspire **Circles** document and go to page **1.2**. Adjust the size of the circle by changing the slider. Observe the corresponding changes to the radius and the diameter.
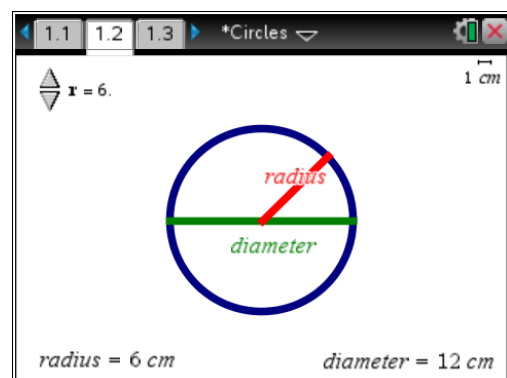
What is the relationship between the radius and the diameter? The diameter is twice the value of the radius.

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Circumference of a Circle

The **circumference** is the distance around the outside of a circle. The formula for finding the circumference of a circle is:

$$\text{Circumference} = 2 \times \pi \times \text{radius}$$
$$= 2 \cdot \pi \cdot r \qquad (\pi \approx 3.14)$$

Because the diameter is twice the radius, you can also use the following formula:

$$\text{Circumference} = \pi \times \text{diameter}$$
$$= \pi \cdot d$$

Go to page **1.4** of the TI Nspire **Circles** document. Adjust the size of the circle by changing the slider.
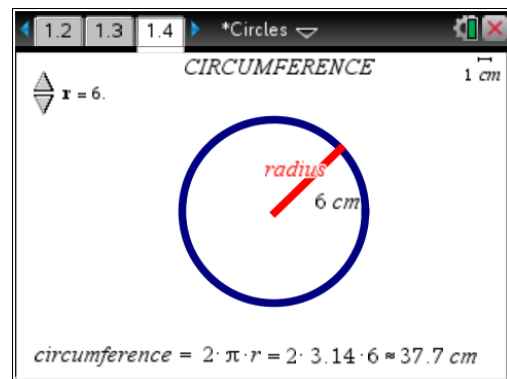
Using the slider, scroll through each value of *r* from 1 to 8 and record the circumference of the corresponding circle in the table below. Use the **Scratchpad** to calculate the circumference of the circles when *r* = 9 and 10. Let π = 3.14. The entry when *r* = 6 from the screen above has been entered for you.

radius (cm)	1	2	3	4	5	6	7	8	9	10
circumference (cm)	6.28	12.6	18.8	25.1	31.4	37.7	44	50.3	56.52	62.8

Looking through this table, approximately how many times bigger is the circumference to the radius? The circumference is around 6 times the value of the radius.
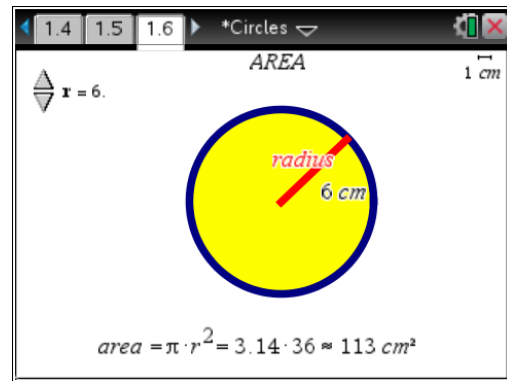
Explain your answer. Since 2 × 3.14 = 6.28, it makes sense that the circumference will be a little more than 6 times the radius.

Area of a Circle

The **area** is the number of square units inside a circle. The formula for finding the area of a circle is:

$$\text{Area} = \pi \times \text{radius} \times \text{radius}$$
$$= \pi \cdot r^2 \qquad (\pi \approx 3.14)$$

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Go to page **1.6** of the TI Nspire **Circles** document. Adjust the size of the circle by changing the slider.

Using the slider, scroll through each value of *r* from 1 to 8 and record the area of the corresponding circle in the table below. Use the **Scratchpad** to calculate the area of the circles when *r* = 9 and 10. Let π = 3.14. The entry when *r* = 6 from the screen on the previous page has been entered for you.

radius (cm)	1	2	3	4	5	6	7	8	9	10
area (cm²)	3.14	12.6	28.3	50.3	78.5	113	154	201	254.34	314

Looking through this table, can you see a relationship between the radius and the area? Yes, but students may not see it.

If so, describe the relationship. The area is approximately equal to the radius squared multiplied by 3.

Hint for finding the Circumference and Area of a Circle

The following hint may help you remember the difference between the circumference and area formulas.

Circumference = π × **radius doubled**

Area = π × **radius squared**

In the example where *r* = 6, we get the following results.

Circumference = π × **6 doubled** = π × **12** ≈ 37.7 *cm*

Area = π × **6 squared** = π × **36** ≈ 113 cm^2

Use this hint to find the circumference and area of the following circles. Use the Scratchpad to complete the table. The first entry has been completed for you.

radius	12	15	20	30	50
radius doubled	24	30	40	60	100
circumference (units)	75.36 (24×3.14)	94.2	125.6	188.4	157
radius squared	144	225	400	900	2500
area (square units)	452.16 (144×3.14)	706.5	1256	2826	7850

Note – in this activity, 3.14 has been used as an approximation for π. This was done to ensure that students obtained decimal answers. You are encouraged to use the π symbol to get more accurate answers. Any of the following measures will ensure that the students obtain decimal answers when using the π symbol.

- Set the mode to **Approximate**.
- Include a decimal point when inputting the radius.
- Press **ctrl + enter**.

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