# Circle Features
## Teacher Answers

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.

## Equipment

For this activity you will need:

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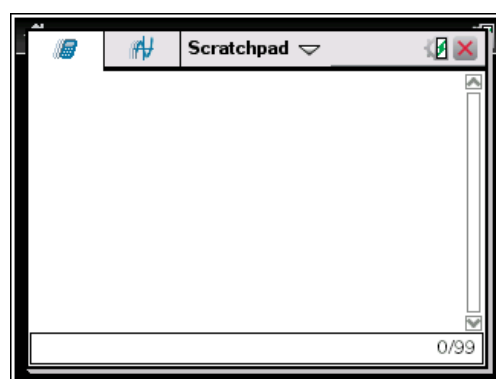- TI-Nspire file – Circles

## Introduction – Setting up the calculations

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.

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).

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# 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.
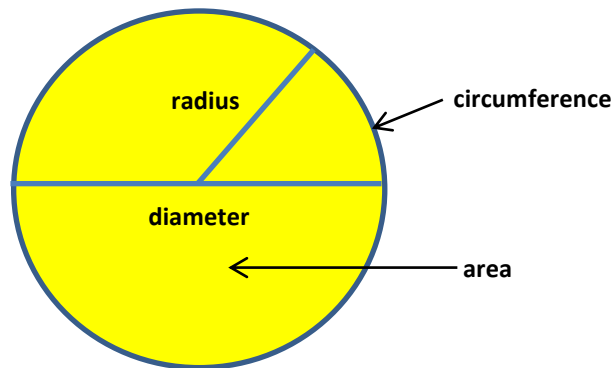


Open the TI Nspire **Circles** document and go to page **1.2**. Adjust the size of the circle by changing the slider. Observe the corresponding changes to the radius and the diameter.
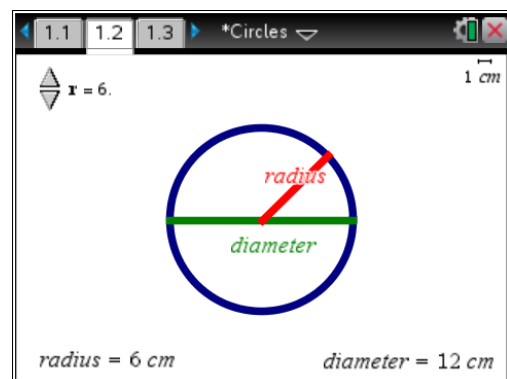


What is the relationship between the radius and the diameter? The diameter is twice the value of the radius.
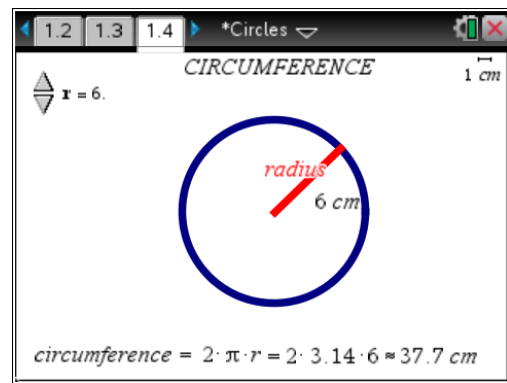
# Circumference of a Circle

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:

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

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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 $\pi$ = 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.
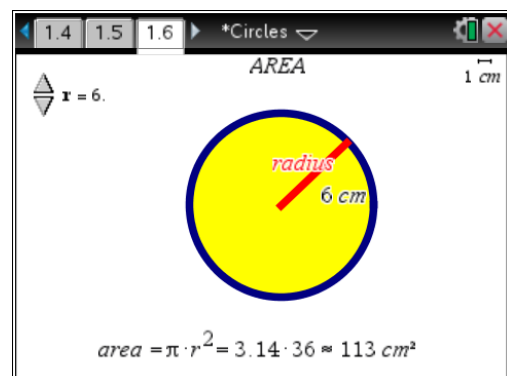
Explain your answer. Since 2 × 3.14 = 6.28, it makes sense that the circumference will be a little more than 6 times the radius.

## 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:

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

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

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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 $\pi$ = 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 = $\pi$ × **radius doubled**

Area = $\pi$ × **radius squared**

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

Circumference = $\pi$ × **6 doubled** = $\pi$ × **12** ≈ 37.7 *cm*

Area = $\pi$ × **6 squared** = $\pi$ × **36** ≈ 113 *cm²*

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 |