What are the key features of a smartphone?

This exercise highlights the components of a modern smartphone, from the various radios that enable connectivity through to the different input methods that allow a user to interact with a phone.

1 Speakers

Speakers are used for all sound emission including:

- the phone ringing
- a call being played at a volume suitable for placement by your ear
- louder sound from videos and games.

2 Radios and connectivity

There are several different types of radio-based connectivity in a phone:

- **Mobile data** is supplied by a modem that connects to phone networks, over protocols such as '4G' (4th generation).
- **Wifi** connects to wireless networks for faster, but less mobile, connectivity.
- **Bluetooth** is a short-range radio technology for connecting to peripheral devices - from headphones and car stereos to fitness devices and more.
- **NFC (Near-Field Communication)** is a very short-range radio that's commonly used to act as a contactless bank card.

3 Rechargeable battery

The battery is key to the phone's portability. There is a tension between the features and functionality of a phone, the size of the phone, and how long its battery can last. Screens and radios in particular are a drain on the battery life.

A physically larger battery will last longer, but also makes a phone thicker. Offering powerful, thin phones that can last for at least a day on a charge, is a complex balancing act.

4 GPS

A GPS (Global Positioning System) connects to a network of satellites in the sky to accurately calculate the phone's location.

5 Buttons

There are always still a few physical buttons on a phone. These are usually used for locking and unlocking the device, and controlling the volume.

6 The touchscreen

A high-resolution display, capable of detecting multiple finger pushes and gestures. You'll find out about the touchscreen in more detail in the next step.

7 Physical cable connectivity

A connection on the phone, usually USB, or sometimes a proprietary type such as the Lightning connector, which is used for charging and connection on an iPhone. This connection is used for charging the device’s battery when plugged into a charger, as well as sharing data with computers and other devices.

8 Cameras

A modern phone usually has at least two cameras - one on the front, and one on the back. Some phones may use multiple cameras to cover a range of focal lengths.

9 Light

Most phones have a high-intensity white light that serves as both a camera flash and torch, as well as sometimes having app-specific uses.

10 Gyroscope/magnetometer/accelerometer

- A **gyroscope** works out which 'up' a phone is.
- A **magnetometer** detects the strength of the Earth's magnetic field, and is primarily used as a compass
- An **accelerometer** works out how fast the phone is moving in any direction.

The three are used together to calculate the phone's position and orientation in space, as well as to detect motion and movement (such as shaking it).

11 Vibrate motor

A tiny component that is incredibly cheap, vibration motors are used to silently alert users to calls. They can also be used to provide forms of haptic feedback (feedback that you feel), such as acting as feedback when on-screen buttons are pressed.