

# Digital Technologies – 7 and 8\_ Digital Systems



Sequence of Lessons / Unit	Approx. time req'd	Year A or B	Digital Systems		Data and Information					Creating Digital Solutions														
			CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #				
Networks and performance	10	8	<input checked="" type="checkbox"/>	1, 2	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	

Years 5 and 6 Achievement Standard	Years 7 and 8 Achievement Standard	Years 9 and 10 Achievement Standard
<p>By the end of Year 6:</p> <ul style="list-style-type: none"> <li>Students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. (1)</li> <li>They explain how digital systems use whole numbers as a basis for representing a variety of data types. (2)</li> <li>Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. (3)</li> <li>They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. (4)</li> <li>They explain how information systems and their solutions meet needs and consider sustainability. (5)</li> <li>Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols. (6)</li> </ul>	<p>By the end of Year 8</p> <ul style="list-style-type: none"> <li>Students distinguish between different types of networks and defined purposes. (1)</li> <li>They explain how text, image and audio data can be represented, secured and presented in digital systems. (2)</li> <li>Students plan and manage digital projects to create interactive information. (3)</li> <li>They define and decompose problems in terms of functional requirements and constraints. (4)</li> <li>Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. (5)</li> <li>They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability. (6)</li> <li>They analyse and evaluate data from a range of sources to model and create solutions. (7)</li> <li>They use appropriate protocols when communicating and collaborating online. (8)</li> </ul>	<p>By the end of Year 10</p> <ul style="list-style-type: none"> <li>Students explain the control and management of networked digital systems and the security implications of the interaction between hardware, software and users. (1)</li> <li>They explain simple data compression, and why content data are separated from presentation. (2)</li> <li>Students plan and manage digital projects using an iterative approach. (3)</li> <li>They define and decompose complex problems in terms of functional and non-functional requirements. (4)</li> <li>Students design and evaluate user experiences and algorithms. (5)</li> <li>They design and implement modular programs, including an object-oriented program, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities. (6)</li> <li>They take account of privacy and security requirements when selecting and validating data. Students test and predict results and implement digital solutions. (7)</li> <li>They evaluate information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise. (8)</li> <li>They share and collaborate online, establishing protocols for the use, transmission and maintenance of data and projects. (9)</li> </ul>

Topic: Digital systems

Units

Year 7

Year 8

<p><b>Get connected</b> 12 hours</p> <p>Discuss types of networks, simulate a network and discuss security requirements</p>	<p><b>Networks and performance</b> 10 hours</p> <p>Develop a basic understanding of network performance and ways to connect wirelessly or by wired connections</p>
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**Networks and performance**

Develop a basic understanding of the terms speed, bandwidth, throughput and latency to enable students to discuss network performance. Explore instances when wireless and wired connections are used and discuss the advantages and disadvantages. Explore ways smartphones and tablets, use a combination of wireless communication methods to connect to different devices. Create a *how to guide* to tether your phone and consider online security

Flow of activities				
Short text	Network performance Develop a basic understanding of the factors that impact network performance	Wired or wireless Explore the two ways to connect devices: wired or wirelessly	Smartphones and tablets Use a combination of wireless communication methods to connect to different devices	Tethering your phone Create a 'How to ...' guide to tether your phone and consider online security
Questions to guide exploration	<i>How is network performance measured?</i>	<i>What is better, wireless or cabled networking?</i>	<i>How are signals sent via a mobile network?</i>	<i>How do you safely and securely hot spot your phone?</i>
What's this about?	<p>Networks can vary greatly in their performance and reliability. Network performance can be measured by speed, bandwidth, throughput and latency.</p> <p>'Bandwidth' refers to how much data a network can carry. Internet speed is measured in bits per second. 'Throughput' is the amount of data you get in a certain amount of time. 'Latency' refers to the delay from when you asked for the data to when you received the data.</p> <p>On networks, each byte of data is transmitted one bit at a time. Network bandwidth, or data transfer rate, is expressed in bits per second. For example, a one megabit (1,000,000 bits) connection means that data can be in theory transmitted at one megabit per second (1 Mb/s).</p> <p>If internet speed is an issue, an internet speed test can provide a fairly accurate indication of how much bandwidth is available at that point in time.</p>	<p>There are two ways to connect devices: wired or wirelessly. The reliability and speed of transmitting data through wireless and wired networks varies.</p> <p>Devices may be connected through cables for example Ethernet (like the blue networking cables). These are useful for transmission of data over short distances. Fibre optic cables that use light are used to send data over long distances all around the world.</p> <p>For connecting wirelessly, we use Wi-Fi. It enables electronic devices to be connected to a computer network wirelessly, typically using radio waves.</p> <p>Bluetooth enables a user to use wireless devices with their smartphone over a short range. Devices include Bluetooth headsets, headphones, a hands-free system in your car, audio speakers and fitness trackers.</p>	<p>Smartphones and tablets, use a combination of wireless communication methods to connect to different devices.</p> <p>When making a voice call from one smartphone to another, a cellular connection is used to connect the two. Cellular connections use radio waves that carry voice and data between devices and a wireless network. Smartphones can also access data from the internet using a 3G or 4G networks.</p> <p>A cellular (mobile phone) network is made up of a large number of signal areas called cells. These cells join or overlap each other to form a large coverage area. A mobile base station sends/receives radio signals and is responsible for forming the cell area. The positioning of these towers is important for network reliability.</p>	<p>There are occasions when you may need internet access for your laptop or tablet.</p> <p>Tethering (or hotspotting) allows a user to connect a computer or tablet using their phone's connection to the cellular data network so they can access the Internet. This can be done via a USB cord or by enabling access and connection to the phone's Wi-Fi network.</p>
The focus of the learning (in simple terms)	<p>Develop a basic understanding of the terms 'speed', 'bandwidth', 'throughput' and 'latency' to enable students to discuss network performance.</p> <p>Discuss the students' internet experiences and the performance of their home network or one that they often use. Find out their understanding of current issues in relation to access, network connections and internet speed. Look for, and group, common themes.</p> <p>Ask students to conduct a speed test using a free internet speed test site on their home network and bring the data back to share as a class.</p> <p>Make cards up with the details: browse Facebook; stream a 2-hr movie; download a 2-hr movie; email a 3 MB photo; stream music (Spotify); talk via a two-way Skype call; download updates for game files. In groups, order the cards based on the heaviest demand on your bandwidth, least to most. Share students' reasoning behind their chosen order. Discuss the impact on a family's internet experience when all users are connected to the internet.</p> <p>Look at some home internet packages and discuss value for money and what each package offers.</p>	<p>Explore instances when wireless and wired connections are used. In small groups, students come up with relevant examples.</p> <p>Discuss and identify the use of Bluetooth to connect over a short range, for example, wireless headsets, hands-free calling through your car, and wireless file transfers. Invite students to test the distance that their Bluetooth devices operate to gather meaningful data. How does distance impact reliability and quality? Students will require relevant devices.</p> <p>Make a table to match connections Ethernet, fibre optic and wireless to particular uses and requirements.</p> <p>If you have BBC micro:bit use the 'Radio' service to connect micro:bit to micro:bit and send a data as a 'string' from one device to another using Bluetooth Low Energy (BLE). Transfer the program from the computer to the micro:bit using BLE.</p> <p>Link to Robotics and embedded systems. Provide opportunities to program and control robotic devices or embedded systems integrating wireless or wired technologies.</p>	<p>In small groups brainstorm a list of functions a smartphone can carry out. Create a 'How does ...' poster.</p> <p>How does a smartphone:</p> <ul style="list-style-type: none"> <li>• send SMS messages</li> <li>• connect to the internet</li> <li>• know and use my location</li> <li>• use a voice assistant</li> <li>• use touch screen capabilities</li> <li>• use fingerprint or other recognition for log-in</li> <li>• use mobile apps</li> <li>• store and stream music</li> <li>• connect to other devices.</li> </ul> <p><b>Mobile phone towers</b></p> <p>Use a relevant site to search for Australian mobile phone base stations in your local area. Create a map to show the locations. Take photos of local phone towers and add them to your digital map.</p>	<p>Ask students to create a digital 'How to ...' guide to tether a computer or tablet device to a smartphone.</p> <p>Provide relevant resources to support students' inquiry.</p> <p>Ask students to describe their network and steps they have taken to make it secure.</p>
Supporting resources and tools and purpose/context for use.	<p>Lesson ideas</p> <p><a href="#">Computer chatter 2: Network performance</a></p>	<p>Learn about</p> <p><a href="#">The story of WiFi!</a></p> <p>A great video to explain Wi-Fi created by CSIRO.</p>	<p>Learn about</p> <p><a href="#">Mobile Telephone Networks Explained</a></p>	<p>Learn about</p> <p><a href="#">FAQ: Tethering and Personal Hotspots</a></p>

	<p>Students build on and extend their knowledge of networks and discuss an inquiry question about Wi-Fi speeds and handling bulk of data transfer needs.</p> <p><b>Learn about</b></p> <p><a href="#">BBC Bandwidth</a> Use this course to learn more about bandwidth and related networking concepts.</p> <p><a href="#">How Much Internet Speed do I REALLY need?</a> Use this article to discuss how much internet speed is enough.</p> <p><b>Online tools</b></p> <p><a href="#">Type of internet connection in Australia</a> Use this tool that displays data visually to look at trends of internet connection type and speeds across Australia based on 2011 census data. How might that have changed since? What might have led to that expected change?</p> <p><a href="#">Australian Bureau of Statistics</a> Refer to this data about internet connections in Australia from 2017 census.</p>	<p><a href="#">The story of Wi-Fi</a> This article and supporting video show how a team of Australian radio astronomers solved the problem of high-speed wireless internet.</p> <p><a href="#">The Internet: Wires, Cables &amp; Wifi'</a> Discusses pros and cons of signals that travel via Ethernet wire, fiber optic cable or wireless.</p> <p><a href="#">Using the 'Radio' service to connect micro:bit to micro:bit</a></p> <p><a href="#">BBC micro:bit – Network</a> This tutorial describes how to connect BBC micro:bit devices together to send and receive messages to and from each other as part of a network.</p>	<p>Provides information about mobile networks including base stations, cell coverage, capacity and a search to locate your local base stations.</p> <p><a href="#">Village Network</a> This computational thinking challenge involves students placing network towers to deliver the signal across an area to all villagers. The challenge can be used to discuss positioning of mobile communication base stations to efficiently cover wide areas. <a href="#">Answers</a> on page 24.</p> <p><a href="#">Careers poster: Coding</a> View the Upwardly mobile poster to help students understand their smartphone capabilities.</p>	
Assessment	<p><b>Suggested approaches may include:</b> Labelled diagram</p> <p><b>Achievement standard</b> Distinguish between different types of networks and defined purposes.</p> <p><b>Explain</b> how digital systems use whole numbers as a basis for representing a variety of data types.</p>	<p><b>Suggested approaches may include:</b> Presentation or demonstration</p> <p><b>Achievement standard</b> Distinguish between different types of networks and defined purposes.</p> <p><b>Explain</b> how digital systems use whole numbers as a basis for representing a variety of data types.</p>	<p><b>Suggested approaches may include:</b> Presentation or demonstration Labelled diagram</p> <p><b>Achievement standard</b> Distinguish between different types of networks and defined purposes.</p> <p><b>Explain</b> how digital systems use whole numbers as a basis for representing a variety of data types.</p>	<p><b>Suggested approaches may include:</b> Presentation or demonstration</p> <p><b>Achievement standard</b> Distinguish between different types of networks and defined purposes.</p>

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