Digital Technologies

Victorian Curriculum F–10 Version 2.0

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# Introduction

## Rationale

Digital Technologies empowers students to shape change by influencing how contemporary and emerging information systems and practices are applied to meet current and future needs. A deep knowledge and understanding of information systems enables students to be safe, respectful, creative and discerning decision-makers when they select, use and manage data, information, processes and digital systems to meet needs and shape preferred futures.

Digital Technologies provides students with practical opportunities to use design thinking and to be innovative developers of digital solutions within an ethical framework, considering Safety by Design principles. Digital Technologies can also have an important role in responding to the diversity of learners and in ensuring the participation of all students in the learning process. The study of Digital Technologies helps students to become innovative creators of digital solutions, effective users of digital systems and critical consumers of information conveyed by digital systems.

Digital Technologies gives students authentic learning challenges that foster curiosity, confidence, persistence, innovation, creativity, respect and cooperation. These are all necessary when using and developing information systems to make sense of complex ideas and relationships in all areas of learning. Digital Technologies helps students to be innovative learners who are active, ethical citizens capable of being informed members of the community.

The Digital Technologies curriculum has been designed to provide practical and authentic opportunities for students to explore the capacity of information systems to systematically and innovatively transform data into digital solutions through the application of computational, design and systems thinking.

## Aims

Digital Technologies aims to develop the knowledge, understanding and skills to ensure that, individually and collaboratively, students:

* use computational thinking (decomposition, pattern recognition, abstraction, modelling and algorithms) to create digital solutions
* use design thinking to design, create, manage and evaluate sustainable and innovative digital solutions to meet and redefine current and future needs
* apply systems thinking to monitor, analyse, predict and shape the interactions within and between information systems and the impact of these systems on individuals, societies, economies and environments
* confidently and responsibly use digital systems to efficiently and effectively automate the transformation of data into information and to creatively communicate ideas in a range of settings
* apply protocols and legal practices that support the ethical collection and generation of data through automated and non-automated processes, and participate in safe and respectful communications and collaboration with audiences.

## Structure

Digital Technologies comprises 3 related strands:

* Digital Systems and Security
* Data, Information and Privacy
* Creating Digital Solutions.

### Digital Systems and Security

The Digital Systems and Security strand focuses on the components of digital systems: hardware, software and networks.

In Foundation to Level 2, students learn about a range of hardware and software and progress to an understanding of how data is transmitted between components within a system, and how the hardware and software interact to form secure access to data in networks.

Students learn the importance of effective security protocols. They effectively access school or personal accounts. Students progress from using simple usernames and passwords in Foundation to Level 2 to using unique passphrases, multi-factor authentication and considering cyber security threats.

### Data, Information and Privacy

The Data, Information and Privacy strand focuses on how data is represented and structured symbolically for use by digital systems.

Students explore the properties of data, including types of data, and how data is acquired and interpreted using a range of digital systems and peripherals, and they analyse data when creating information. They progress from exploring data acquisition strategies and looking for patterns to validating the data and data integrity.

Students develop the ability to create, locate, communicate and share ideas and content. They negotiate roles and responsibilities and interact safely using appropriate information system protocols and agreed behaviours to independently and collaboratively manage projects to create interactive solutions. Students are progressively guided by trusted adults to account for risks when working individually and collaboratively.

Students develop appropriate techniques for managing personal data, and effectively implement security protocols. They investigate how online applications and networked systems curate their data, and explore strategies to manage their digital footprint and consider privacy.

### Creating Digital Solutions

The Creating Digital Solutions strand focuses on the interrelated processes and associated skills by which students create digital solutions to solve problems and meet needs.

Students define problems by identifying appropriate needs and requirements. These define and communicate a problem precisely and clearly as an important part of specification.

Students create algorithms that clearly define steps that may lead to creating a digital solution. They progressively move from following algorithms in their daily activities to designing algorithms and validating these against test cases. Students make choices, weigh up options and consider alternatives.

When designing, students consider how users will interact with the solutions, and check and validate their designs to increase the likelihood of creating working solutions. Students identify errors that may occur within an algorithm and how control structures can improve the flow through a program.

Students use critical and creative thinking strategies to generate, evaluate and document design ideas to meet needs or opportunities that have been identified by an individual, a group or a wider community. They use modelling and prototyping to accurately develop simple and complex models that support the production of successful digital solutions. Students consider the implications and consequences of actions and decision-making.

Students implement their algorithms as a program through digital systems to solve problems and meet specific user needs. Students develop the capacity to select and use appropriate digital tools and equipment, and use techniques that respect the need for sustainability. They determine effective ways to test their digital solutions.

Students evaluate the design process, and the quality and effectiveness of their digital solutions.

### Achievement standards

Achievement standards describe what students are typically able to understand and do, and they are the basis for reporting student achievement.

In Digital Technologies, students progress along a learning continuum that provides the first achievement standard at Level 2, and then at Levels 4, 6, 8 and 10.

### Content descriptions

In Digital Technologies, content descriptions sequence and describe the knowledge, understanding and skills that teachers need to teach and students are expected to learn.

### Elaborations

Elaborations are examples that provide guidance on how the curriculum may be transformed into a classroom activity or learning opportunity. They are provided as advisory material only.

## Learning in Digital Technologies

In Digital Technologies, students are actively engaged in the interrelated problem-solving processes of analysing problems, needs and opportunities; designing, implementing (developing) and evaluating digital solutions; and creating and sharing information that meets a range of current and future needs. Students learn to safely and ethically use the capacity of information systems to create digital solutions. These solutions and information are created through the application of computational, design and systems thinking skills.

### Key concepts

Underpinning the learning in the Digital Technologies curriculum are the key concepts (outlined below) that establish ways of thinking about solving problems, looking for opportunities for enterprise and looking at the impact of solutions.

The key concepts of abstraction, data acquisition, representation and interpretation, specification, algorithms and implementation are included within the key elements of computational thinking. Collectively these concepts span the key ideas about the organisation, representation and automation of digital solutions and information. The concepts can be explored in digital or non-digital contexts and are likely to underpin the future impact of digital systems and provide a language and perspective that students and teachers can use when discussing Digital Technologies.

| Key concept | Description |
| --- | --- |
| **Abstraction** | Abstraction involves reducing complexity by hiding details so that the main idea, problem or solution can be defined, and focus can be on a manageable number of aspects. Abstraction is a natural part of communication: people rarely communicate every detail, because many details are not relevant in a given context. The idea of abstraction can be acquired from an early age. For example, when students are asked how to make toast for breakfast, they do not mention all steps explicitly, assuming that the listener is an intelligent implementer of the abstract instructions. Central to managing the complexity of information systems is the ability to ‘temporarily ignore’ the internal details of the subcomponents of larger specifications, algorithms, systems or interactions. In digital systems, everything must be broken down into simple instructions. |
| **Data acquisition, representation and interpretation** | The data concepts focus on the properties of data, how they are acquired and represented, and how they are interpreted in context to produce information using software.* Data acquisition describes the acquisition or calculation of numerical, categorical or structured values to create information in digital systems.
* Data representation describes how data is represented and structured symbolically for storage, use and communication, by people and in digital systems.
* Data interpretation involves extracting meaning from data.

The Digital Technologies curriculum provides opportunities to acquire deep knowledge of the nature of data and its representation, and computational thinking skills for interpreting data. |
| **Specification, algorithms and implementation** | The concepts of specification and algorithms focus on the precise definition and communication of problems and their solutions. This begins with the description of tasks and concludes in the accurate definition of problems and their algorithmic solutions.* Specification describes the process of defining a problem precisely and clearly, identifying the requirements, and breaking the problem into smaller problems.
* An algorithm is the precise description of a sequence of steps and decisions needed to solve a problem, often involving iterative (repeated) processes.
* Implementation describes the automation of an algorithm, typically by writing a computer program or using appropriate software.
 |
| **Digital systems** | The digital systems concept focuses on the components of digital systems, and involves:* processing data in binary
* using hardware components
* control using software
* connection to form networks.
 |
| **Privacy and security** | The key concept of privacy and security focuses on the protection of data when it is stored by or transmitted through digital systems. |

### Safety

When students are problem-solving, and creating and communicating information, they will apply skills using common conventions and following agreed behaviours to meet their legal, safety, cultural and ethical obligations and responsibilities. For example, conventions such as using acceptable language, acknowledging different cultural practices, and using passwords and privacy settings on social media sites are applied to increase the security of personal data and to respect partnerships in online communities.

Identifying and managing risk in Digital Technologies involves addressing the safe use of digital tools as well as risks that can affect project timelines. It covers all necessary aspects of health, safety and injury prevention and, in any Digital Technologies situation, the use of potentially dangerous materials, tools and equipment. It includes ergonomics, online safety, and ethical and legal considerations when communicating and collaborating online.

When planning to incorporate immersive technologies – augmented reality, virtual reality, mixed reality or extended reality – in learning experiences, teachers should consider the manufacturer’s guidelines as well as other issues including the physical, cognitive, linguistic, emotional, social and moral developmental stage of learners. See explicit advice on the risks of immersive technologies use in the [eSafety Commissioner's position statement](http://www.esafety.gov.au/about-us/tech-trends-and-challenges/immersive-tech).

The use of drones (remotely piloted aircraft) or model aircraft for educational purposes at education institutions is considered ‘flying for fun’ under Civil Aviation Safety Authority (CASA) guidelines; however, teachers should also consider their relevant education sector’s governance standards. The [CASA ‘Drones at school’ information](http://www.casa.gov.au/drones/drones-at-school) lists requirements and tips for teachers and educators on issues such as health, safety and privacy for any drone operation. See the [Victorian Department of Education guidance on drones in schools](https://www2.education.vic.gov.au/pal/drones/guidance) for further and more detailed advice.

### Privacy and security

Identifying and managing the implications of and concerns related to the collection and generation of data through automated and non-automated processes addresses the risks that can affect secure engagement with digital systems.

Privacy includes recognising the risks that are faced online and the mitigation strategies involved in managing them. In Australia, guidance on best practice for privacy is informed by the [Australian Privacy Principles](http://www.oaic.gov.au/privacy/australian-privacy-principles), the cornerstone of the privacy protection framework in the Privacy Act 1988. In Victoria, guidance on how Victorian public sector organisations must handle personal information is informed by the Privacy and Data Protection Act 2014. For more information, see the [Office of the Victorian Information Commissioner](http://www.ovic.vic.gov.au/privacy/for-the-public/your-privacy-rights/).

Security covers the development of appropriate technical, social, cognitive, communicative and decision-making skills to address online and network security risks. It includes data security, and ethical and legal considerations when working with and designing digital systems. When engaging with and designing digital systems, identifying and managing security threats and mitigation in a data-intensive world are paramount.

In Australia, guidance on best practice for cyber security is informed by the [Australian Signals Directorate](https://www.cyber.gov.au/). This Australian Government organisation provides strategic guidance on how individuals and organisations can protect their systems and data from cyber threats.

### Copyright

Identifying and managing the implications of copyright and intellectual property in the Digital Technologies curriculum area involves addressing the ethical and legal responsibilities around ownership and repurposing of designs and digital content. It covers all necessary aspects of plagiarism, copyright, fair use and licensing and, in any Digital Technologies context, the respect of intellectual property rights.

In Australia, copyright law is contained in the Copyright Act 1968. Further copyright information and resources are available from [Smartcopying](https://smartcopying.edu.au/), the [Australian Copyright Council](http://www.copyright.org.au/), the [Australian Digital Alliance](https://digital.org.au/), [Creative Commons Australia](https://creativecommons.org.au/) and the [Department of Infrastructure, Transport, Regional Development, Communications and the Arts](http://www.infrastructure.gov.au/media-centre/publications/short-guide-copyright).

### Intellectual property

Intellectual property laws include protection for registered designs and products and should be respected when students are designing solutions (including digital systems and repurposing computer code).

Further information and resources are available from [IP Australia](https://ipaustralia.gov.au/).

[Smartcopying](https://smartcopying.edu.au/contact-us) includes contact details for local copyright managers to assist with school enquiries about specific copyright issues.

For more information about relevant guidelines for safety, cyber security, copyright and intellectual property, teachers should contact their Victorian education sector authorities.

### Designing for safety and equity

Students have opportunities in Digital Technologies to apply [Safety by Design principles](https://www.esafety.gov.au/industry/safety-by-design/principles-and-background) and universal design principles when designing solutions.

Safety by Design focuses on the ways designers of digital solutions can minimise online threats by anticipating, detecting and eliminating online harms before they occur. This proactive and preventive approach focuses on embedding safety into the culture of the design process. It emphasises accountability and aims to foster more positive, civil and rewarding online experiences for everyone.

More information is available from the Office of the eSafety Commissioner, including the [eSafety Toolkit for Schools](http://www.esafety.gov.au/educators/toolkit-schools) and the [Safety by Design vision for young people](https://www.esafety.gov.au/sites/default/files/2019-10/SBD%20-%20Vision%20for%20young%20people.pdf).

The [8 Goals of Universal Design](https://universaldesignaustralia.net.au/) were developed to guide the design of environments, products and communications. The universal design principles provide an opportunity to create solutions that respond to the changing circumstances of people and to changes in technologies. When students apply the principles, they create products that change and adapt for everyone. In Digital Technologies, the 8 goals may be applied to evaluate existing designed and digital solutions, guide students through the design process and provide them with guidance on the characteristics that support products, services and environments so they are more accessible and usable by consumers.

### Integrating the strands

Students draw on the content of the Digital Systems and Security, and Data, Information and Privacy strands when applying processes and technical skills pertaining to the Creating Digital Solutions strand. Within this strand, students apply the problem-solving processes of analysing, designing, implementing (developing) and evaluating to create digital solutions. The processes can be applied using a sequential or an iterative approach.

As problems become more complex, and solutions more sophisticated, it becomes increasingly necessary for students to develop skills in abstraction. Solutions may be developed using combinations of readily available hardware and software applications, and/or specific instructions provided through programming. Students may also engage in learning activities that do not require the full use of all of the processes. This means there is greater flexibility about when different content descriptions are introduced into the learning program within a band.

# Curriculum

## Foundation to Level 2

### Band description

In Foundation to Level 2, students develop systems thinking by exploring a range of purposes for using digital systems and their components. They have opportunities to experience and develop their skills in using different hardware components, such as a touchpad and keyboard. Students protect the security of their own data on their school account using their own username and password.

Students begin to recognise patterns in data and represent data as objects, pictures, symbols, numbers and words. They use digital tools to create, share and collaborate on content, for example each student in a class writing a message and adding an image to a class document. Students develop an awareness that some websites and apps store their personal data online.

Students apply computational thinking by investigating simple problems and by describing and representing algorithms that include sequences of instructions, decisions and iteration. They become aware of design thinking by exploring and discussing how the needs of different people are met through the use of digital systems.

### Achievement standard

By the end of Level 2, students access and show familiarity with digital systems and use them for a purpose.

Students identify patterns and represent data in different ways. They use the basic features of common digital tools to create, locate and share content for an audience. Students share content and collaborate following agreed behaviours. They recognise and explain how digital tools may store their personal data online.

Students explain and solve simple problems. They follow and represent basic algorithms involving a sequence of steps, branching and iteration. Students explain how digital systems meet the needs of known users.

### Content descriptions and elaborations

#### Strand: Digital Systems and Security

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| identify and explore digital systems including hardware and software components for a purposeVC2TDI2S01 | * taking photos using a tablet device, with permission, to share with other students, for example close-up photos of Aboriginal and/or Torres Strait Islander Peoples’ cultural artefacts, such as woven mats or baskets, that reveal intricate detail
* recognising digital systems that they interact with at home and school, for example a smartphone, laptop or programmable toy
* making a model of a digital system, using it in a role-play scenario and describing its features, for example a cardboard box with a keyboard and screen with app icons
* naming and using digital systems that they interact with at home and school, for example using a touchpad to move the cursor on a laptop, or a keyboard to type a simple message on a tablet
* using different digital systems to explore what these do and how to use them; for example, selecting the camera icon allows students to take photos of different types of objects in a classroom
 |
| identify some data that is personal and access their school account with a recorded username and passwordVC2TDI2S02 | * listing things that contain personal and public data, for example photos of themselves with their family (private) and photos of local community areas (public)
* identifying apps and websites they use where their personal data could be made visible, for example photos of themselves on parents’ or carers’ social media, or their username being shown to others in online games
* using a username and password recorded in a private place to access a digital system, for example logging into a school computer using details given on a card by a teacher
 |

#### Strand: Data, Information and Privacy

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore patterns in data and represent data as objects, pictures, symbols, numbers and wordsVC2TDI2D01 | * using a symbol to represent an idea, but knowing that the symbol is not the data itself, for example the symbols and colours on both the Australian Aboriginal flag and the Torres Strait Islander flag
* drawing a picture representing each of their family members and their interests, for example drawing one family member with a surfboard and another reading a book
* using coloured blocks to represent an attribute of people, for example representing students and their sports houses, birthdays, pets or favourite ice-cream flavours
* recognising the equivalence of different representations of numbers, including words, digits and tally marks
 |
| explore and use the basic features of common digital tools to create, locate and communicate content for a diverse audienceVC2TDI2D02 | * finding digital images of (local) Australian flora and fauna or places for use in a story and including Aboriginal and/or Torres Strait Islander Peoples’ language names for the items
* using familiar digital systems to create content to present to the class, for example using presentation software to retell a story
* taking, storing safely and presenting photos of class work, for example locating photos they took of their work to show to parents or carers or for a teacher to upload to the class shared folder
* using a digital camera or drawing app to create a picture, for example making a card for a family member that includes a photo and short message
* creating individual pieces of work that contribute to a group task; for example, each student contributes a recipe and photo of their favourite food to create a digital class recipe book
 |
| explore and use the basic features of common digital tools to share content and collaborate, demonstrating agreed behaviours and supported by trusted adultsVC2TDI2D03 | * taking photos of class work and sharing with other students in the class using classroom messaging software with teacher guidance
* applying agreed standards of behaviour when sharing content with other class members, for example using language that is considered by all students and the teacher to be appropriate when they are writing messages to each other
* considering the need for online safety when sharing information, for example recognising that personal information such as a photo could be used inappropriately
 |
| recognise and discuss that some websites and apps store their personal data onlineVC2TDI2D04 | * identifying apps and websites they use where their personal data could be made visible, for example photos of themselves on parents’ or carers’ social media, or their username being shown to others in online games
* sharing examples of the data collected by apps and websites they commonly use, for example usernames and email addresses used by school websites and games to log in
* discussing the importance of asking permission from a parent or carer before entering personal details online such as address, phone number and date of birth
 |

#### Strand: Creating Digital Solutions

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| investigate simple problems for known users that can be solved with digital systemsVC2TDI2C01 | * investigating internet-based translation tools and how similar digital tools could promote the use of Aboriginal and/or Torres Strait Islander Peoples’ languages or assist communications, for example responding to cultural stories of Aboriginal and/or Torres Strait Islander Peoples
* investigating familiar and easily understood problems with a few steps needed to solve them, for example deciding what to wear to school by checking the forecast on a weather app
* identifying how digital systems are used to solve problems at school, for example taking class attendance or borrowing a library book
* exploring how a familiar problem could be solved using a digital solution, for example creating a model robot using cardboard boxes and explaining how it could be used to move around tables on the classroom floor
 |
| follow, describe and represent algorithms involving a sequence of steps, branching (decisions) and iteration (repetition) needed to solve simple problemsVC2TDI2C02 | * rearranging into the correct order a series of mixed-up pictures that describe a story, for example stories authored and published by Aboriginal and/or Torres Strait Islander people
* following a short, ordered sequence of steps and making decisions to solve a simple problem, for example following a recipe or directions to reach a location
* describing the steps and decisions (in the correct order) needed to solve a simple problem, for example writing, saying, drawing or photographing the steps needed to make a sandwich
* identifying and representing the decisions needed to solve a problem and the next steps to follow in each case, for example ‘If it is raining, take a raincoat, otherwise take a hat’
* following algorithms that repeat a single step a fixed number of times (iteration), for example ‘Practise spelling a word 5 times’ or ‘Throw and catch a ball with a partner 10 times’
 |
| discuss how existing digital systems satisfy identified needs for known usersVC2TDI2C03 | * discussing how digital systems are used to store and access information, and how that information helps us learn about our environments, interactions and leisure activities, for example how interactive versions of stories authored and published by Aboriginal and/or Torres Strait Islander people preserve important cultural expressions
* describing how familiar digital systems meet the needs of individuals, for example how different family members use a tablet for different needs – to play videos, read the news or follow a recipe
* sharing ideas about how digital systems are used at school for learning, for example sharing a student’s work with the class on an interactive display screen to provide class feedback on their writing
* discussing how a range of digital systems support personal needs and impact on others, for example text-to-speech software, which can be used to meet the communications needs of people with impaired or no vision
 |

## Levels 3 and 4

### Band description

In Levels 3 and 4, students progress in their systems thinking by considering the connections between digital systems and peripherals to meet specific purposes, such as using a headset to participate in an online class discussion. They explore how digital systems interact by transmitting data, such as using a class laptop to stream videos from an online news service. Students secure their personal data by creating passwords that are hard to guess.

Students expand their understanding of data representation by exploring how and why the same data can be represented in different ways to meet different purposes. They use software tools to collect, organise and present data so as to create information. Through frequent practice when completing tasks and projects, students increase their confidence and fluency in using core features of common digital tools to create content individually, and apply agreed behaviours when working with groups. Students consider the positive actions and behaviours they display when engaging with others online. They begin to understand the risks associated with storing and sharing personal data online, and learn about the importance of protecting private data.

Students have the opportunity to broaden their computational thinking by creating simple digital solutions, individually and in groups, that involve defining problems, and designing and implementing solutions as visual programs. They practise defining problems using teacher-provided requirements. Students apply design thinking techniques to generate multiple ideas for the design of their solutions. They compare their ideas with other ideas, such as those of other class members. Through practice, students improve the precision of their algorithms and implement them as visual programs. They determine the success of their implemented solutions against teacher-provided requirements. Students judge how well digital systems that are used by the public meet the public’s needs.

### Achievement standard

By the end of Level 4, students securely access and use digital systems and their peripherals for a range of purposes. They explain how data is transmitted between digital systems.

Students represent different types of data for different purposes. They organise and present different types of data using software tools. Students use the core features of common digital tools to create, locate and communicate content for an audience. They use digital tools to plan tasks, share content and collaborate following agreed behaviours. Students identify and recognise the risks to their personal data in online accounts.

Students describe simple problems and list requirements. They describe and represent simple algorithms involving branching and iteration. Students design simple user interfaces and compare their designs. They implement simple algorithms as visual programs. Students describe how student-created solutions meet the provided requirements.

### Content descriptions and elaborations

#### Strand: Digital Systems and Security

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore and describe a range of digital systems and their peripherals for a variety of purposesVC2TDI4S01 | * experimenting with a range of peripherals to perform input, output and storage, for example a keyboard, touch screen, mouse, camera and microphone; a monitor, projector, printer or 3D printer; a speaker; or a USB drive
* adding peripherals to a digital system to expand its functionality, for example connecting a headset to a digital system to participate in online class activities more effectively
* exploring how they can use digital systems differently depending on the task; for example, a student can use a tablet to take photos, record audio and find information to create a presentation
 |
| explore transmitting different types of data between digital systemsVC2TDI4S02 | * exploring how data for a video call can be transmitted from a rural or remote community to a city location, for example looking at how many Aboriginal and/or Torres Strait Islander communities in areas classified as rural or remote have network coverage that may be unreliable, limiting the use of video calls
* using different digital devices to display information to others, for example using a tablet device or laptop, interactive whiteboard or a smart TV to present information
* exploring examples of different types of data that can be transferred between digital systems, for example making a video call to a relative using a digital device or connecting a digital device to a Bluetooth speaker to amplify the volume of a presentation
* explaining the differences in data transmission over a mobile network when comparing sending a text-based message and streaming an online video, for example file size and download speed
 |
| access their school account using a memorised password and explain why it should be easy to remember, but hard for others to guessVC2TDI4S03 | * recalling their school username and password from memory to log in to a school laptop or desktop
* explaining how keeping a password secret prevents others from accessing their data, for example how their work is saved in their account and can only be accessed using their secret password
* exploring techniques to create a password that is easy to remember and hard to guess, for example creating a password using 3 unrelated but easy-to-remember words
 |

#### Strand: Data, Information and Privacy

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| recognise different types of data and explore how the same data can be represented differently depending on the purposeVC2TDI4D01 | * identifying rock paintings and other cultural expressions to understand that images are used to encode and represent ethnobotanical knowledge, for example the representation of plant use in Aboriginal and/or Torres Strait Islander Peoples’ cave paintings and ancient engravings including important data on classification of medicinal and food plants, and their usable parts
* describing different types of data and how they can be used, for example numbers, letters, symbols and pictures
* explaining how the same data can be represented in different ways and why some representations are better than others in certain contexts, for example the variations of four, 4, IV, |||| and quatre, and that numbers are better for calculation than words
 |
| collect, organise and present different types of data using software tools to create information and solve problemsVC2TDI4D02 | * exploring different online sources to access data, for example using a keyword search to select and retrieve data from an online database such as a library catalogue or weather records
* recognising that all types of data are stored in digital systems and may be represented in different ways such as in files and folders with names and icons
* selecting appropriate formats or layout styles to present data as information depending on the type of data and the audience; for example, charts suit data that shows trends or comparisons, lists suit text data that needs to be presented in alphabetical order, and animations suit images that show actions and relationships
* improving the appearance and usability of data, for example using colour, headings and labelling of images to organise and accurately identify data
 |
| use the core features of common digital tools to create, locate and communicate content, following agreed conventions for a diverse audienceVC2TDI4D03 | * discussing and creating as a class a set of steps they need to follow to safely find information online
* using an online search engine to find suitable sources to create and communicate information, following agreed steps, for example creating a presentation
* grouping, naming and itemising folders and files using a logical hierarchy and agreed conventions, for example creating a folder for Digital Technologies
* using familiar digital systems to create content to be shared with the class, for example using presentation software for each student to add a paragraph to a class story
* using autocomplete features in text authoring tools, for example using text predictions or suggestions in a word processor to complete words, phrases or sentences, or using predictive text in SMS or messaging apps
 |
| use the core features of common digital tools to share content, plan tasks and collaborate, demonstrating agreed behaviours, supported by trusted adultsVC2TDI4D04 | * demonstrating safe sharing of content with a select audience, for example sharing a holiday adventure without revealing exact dates, specific names or other personal information
* listening to others when participating in online environments to share content, for example respecting the rights of others by taking turns to suggest and add words or images to a factual slide deck to share with a teacher
* interacting cooperatively in a group in an online environment to plan and complete a task, for example writing and responding to others’ views on school canteen items
* using digital tools to plan an event as a class, for example jointly creating a class survey to help plan an end-of-year party, where responses conform to the class’s agreed behavioural expectations
 |
| identify what personal data is stored and shared in their online accounts and discuss any associated risksVC2TDI4D05 | * identifying the personal data stored in accounts they use at school and at home and who has access to it; for example, documents in their school cloud storage are accessible by the teacher, or their nickname in their online gaming accounts is visible to all players
* discussing how personal data stored in online accounts forms a person’s digital identity and can reveal detailed information about people, for example looking at photographs of themselves, friends or fictional characters that reveal details about a person’s location, habits or home
 |

#### Strand: Creating Digital Solutions

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| define simple problems with teacher-provided requirementsVC2TDI4C01 | * developing a problem statement for collecting and managing information on wildlife, for example how Aboriginal and/or Torres Strait Islander rangers could monitor animal populations, such as local marine turtles, using global positioning systems (GPS)
* recognising a range of familiar problems and defining achievable solutions using teacher-provided requirements, for example buying presents for family members within a specified budget
* using responses to guiding questions to write requirements, for example ‘A family member wants a way to keep track of football scores over a season’
* using teacher-provided requirements to develop a simple game, for example using arrows to control movement through a maze
 |
| follow, describe and represent algorithms involving sequencing, comparison operators (branching) and iterationVC2TDI4C02 | * explaining to others how to follow an algorithm in a teacher-developed software solution, for example identifying the sequence of steps, branching and iteration in a visual programming language
* describing algorithms that repeat steps a fixed number of times, for example calculating multiplication using repeated addition, where the sum changes in each iteration
* representing algorithms as a list of steps or a diagram, for example drawing a diagram of a recipe involving decisions
* describing algorithms that repeat steps until a condition has been met, for example a counter that increases while the total is less than 20
 |
| design a simple user interface, generate, communicate and compare the designsVC2TDI4C03 | * brainstorming possible user interface design ideas and discussing these with their peers, for example sketching different ideas for a computer game
* discussing whether the needs identified from the teacher-provided requirements are met by generated design ideas, for example comparing design ideas in pairs for making choices in a simple solution using a visual programming language
* ideating multiple design ideas and comparing them against teacher-provided requirements, for example discussing as a class the needs identified from the requirements and brainstorming multiple design ideas (accepting all suggestions as possibilities)
* designing a user interface for a simple solution using different design tools, for example creating a mock-up for the placement of icons or a storyboard to outline the levels of a game
 |
| implement simple algorithms as visual programs involving control structures and inputVC2TDI4C04 | * implementing a program that demonstrates the strict routines and techniques followed by Aboriginal and/or Torres Strait Islander ranger groups when caring for or handling specific native animals, for example using IF and THEN statements to create a training manual, such as ‘IF <insert animal name> is injured THEN the ranger will <insert action>’
* writing and editing programs to solve simple problems using branching and simple iteration in a visual programming environment, for example helping a user understand multiplication by displaying the repeated addition in order
* writing programs that take input from the user or environment, for example asking the user for their name and displaying it or sensing the temperature from the environment to make a decision
* writing programs that make decisions involving comparison, for example comparing whether the temperature is above 25 ºC to label the weather hot or cold
 |
| discuss how existing and student-created solutions satisfy the given requirementsVC2TDI4C05 | * describing the way familiar digital systems allow users to perform tasks, for example discussing how a family member could place an order online for something they cannot buy locally
* discussing how a digital solution meets the different needs of users, for example how maps help people to locate places in the community or interactive store directories help shoppers to find a particular store in a shopping centre
* making judgements on their digital solutions against the requirements, for example how high their friends score in the game they created, by determining whether they need to increase or decrease the speed or complexity of a game
* reflecting on how the systems in the school help the school to operate, for example how a librarian keeps track of books borrowed
 |

## Levels 5 and 6

### Band description

In Levels 5 and 6, students apply systems thinking when investigating the functions and purpose of each component in a digital system and its interactions with other components. They examine how data is broken up and transmitted through networks. Students protect data stored in their personal accounts by creating a separate passphrase for each account.

Students think in a more abstract way, exploring how on and off states and whole numbers can be used to represent data. They develop confidence in using digital systems to acquire, manipulate, analyse and visualise data using spreadsheets. Through frequent practice when completing tasks and projects, students develop competence in creating content that applies agreed conventions, such as heading hierarchies and labelling of charts, and they use a consistent file-naming system. When working in groups, students explore different ways of working collaboratively, such as agreeing on how tasks should be allocated and content shared. Students explain how their personal data forms their permanent digital footprint and consider privacy when collecting personal data.

Students have the opportunity to apply computational thinking by creating digital solutions that involve defining problems, designing and modifying algorithms, and implementing them as visual programs. They define problems using teacher-provided or co-developed functional requirements. Students practise different strategies to develop their capacity for abstraction, such as thinking aloud to simplify problems. They use design thinking techniques to generate multiple ideas about the design of solutions and how people interact with these. Based on the functional requirements, students select and, where appropriate, modify their preferred design ideas for further development. Students represent algorithms involving branching and iteration, and implement them using a visual programming language that includes variables and responds to input. They use requirements to evaluate their own and existing solutions, considering the impact of these solutions on their community.

### Achievement standard

By the end of Level 6, students securely access and use multiple digital systems and accounts, and describe their components. They describe how data is transmitted within networks.

Students describe how digital systems represent data. They acquire and manipulate data using spreadsheets. Students interpret and visualise data using spreadsheets. They select and use appropriate digital tools to create, locate and communicate content, applying common conventions. Students use digital tools to plan tasks, share content online and collaborate on projects, following agreed behaviours. They identify their digital footprint, recognise its permanence and consider privacy when collecting data.

Students define problems with functional requirements. They design algorithms involving complex branching and iteration. Students design and modify user interfaces and evaluate the designs. They implement algorithms as visual programs including variables and input. Students explain how student-created digital solutions meet the functional requirements of users.

### Content descriptions and elaborations

#### Strand: Digital Systems and Security

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| investigate the main internal components of common digital systems and their functionVC2TDI6S01 | * investigating the main components in a videoconferencing system and their functions, for example a telehealth system used to access imaging services by communities in areas classified as rural or remote such as those of some Aboriginal and Torres Strait Islander Peoples
* explaining how digital systems are made up of parts that perform specific functions, for example the central processing unit (CPU), memory and input/output components working together to perform calculations and manipulate data
* exploring the difference between the internal components of a range of digital systems, for example desktop computers, laptop computers and tablet devices
 |
| examine how digital systems form networks to transmit dataVC2TDI6S02 | * investigating the use of satellite phones where mobile phone networks are not available, inaccessible or unreliable; for example, rural and remote Aboriginal and Torres Strait Islander communities have limited access to mainstream communication networks
* explaining how separate systems can be connected in different ways to exchange data, for example how a laptop can be connected to a network via a cable or wireless via radio waves
* describing the way data is structured and transmitted through a network, for example broken up into packets (small pieces) and passed from the source, through multiple devices, to the destination
 |
| access multiple personal accounts using unique passphrases and explain the risks of password re-useVC2TDI6S03 | * using multiple accounts, each with different passphrases, to access each website or app used for school and home, for example having a different username and password combination for school, gaming and music accounts
* explaining why re-using a password is risky, for example how a compromised password from one social media account might be able to be used to access their bank or school account if the password is the same, which means that other details are also compromised
 |

#### Strand: Data, Information and Privacy

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explain how digital systems represent all data using numbers and explore how data can be represented using binaryVC2TDI6D01 | * making collaboratively a long thread with beads representing binary for the letters that spell the Country name in the language of the local Aboriginal People and in English, and that could be displayed as a ‘binary banner’ as an Acknowledgement of Country that they are on the Traditional Lands of the <insert name> People
* representing data using whole numbers and recognising this is how digital systems represent data, for example converting letters in a message to numbers using their positions in the alphabet
* recognising how digital systems represent data, for example converting letters in a message to Unicode or ASCII
* demonstrating that an on/off state in a circuit can represent the digits 1 and 0 and that this is how digital systems represent data
* recognising how the answer to a yes/no question can be represented using on/off states, for example switching a light in an electric circuit on or off
 |
| acquire and manipulate different types of data from a range of sources using software tools, including spreadsheetsVC2TDI6D02 | * acquiring data from a range of online sources by narrowing the focus, for example filtering data using provided options or performing queries using advanced search functions
* recognising the difference between numerical, text and date formats in spreadsheets
* using spreadsheets to sort data when solving problems, for example sorting numerical data into ascending or descending order
* using spreadsheets to automate calculations to help with interpreting data, for example using functions to make arithmetic calculations using multiple cells and summing cell ranges
* understanding how artificial intelligence (AI) uses machine learning to train algorithms to recognise patterns in data to improve decision-making, for example selecting results to include in a data set
 |
| analyse and visualise data using a range of software, including spreadsheets to create information and solve problemsVC2TDI6D03 | * exploring online resources to identify and examine the characteristics of data visualisations, for example analysing the Bureau of Meteorology’s weather planning data visualisations
* using spreadsheets to format data, for example using conditional formatting
* using data visualisation software to present information visually, for example creating a range of charts on a topic in a spreadsheet
* using AI tools in spreadsheets to assist in the creation of information, for example using AI tools to generate formulas and charts
 |
| select and use appropriate digital tools effectively to create, locate and communicate content, applying common conventions for a diverse audienceVC2TDI6D04 | * locating content through search engines and in electronic documents by revising queries and using required search terms, for example reviewing search results and modifying search terms to make the query more accurate
* creating appropriate content that reflects planning as well as new external factors, for example uploading or sharing a draft of a report on a local government issue to the teacher for feedback as part of an iterative process
* creating content for a school celebration, for example designing a collaborative spreadsheet that can be used by a small group to plan and cost their graduation party, together with a folder of tagged resources that support the planning
* naming, organising and storing files in a way that allows for easy retrieval of shared content, for example labelling the main folders by topic, such as ‘school garden project’, and then creating subfolders for each section of the project, such as ‘plans’, ‘designs’ and ‘implementation’
* understanding the tone and appropriateness for the intended audience of text generated using AI tools, for example deciding that predictive text is too formal for a conversation with a friend and rewriting it in a less formal way
 |
| select and use appropriate digital tools effectively to share content online, plan tasks and collaborate on projects, demonstrating agreed behaviours, supported by trusted adultsVC2TDI6D05 | * demonstrating agreed behaviours; following cultural protocols, including relevant permissions and attributions; acknowledging diversity, capability and strength; and addressing risks and responsibilities such as privacy, security and accuracy of data, for example when sharing images of Aboriginal and Torres Strait Islander Peoples’ cultural artefacts
* creating achievable steps and timelines and identifying digital tools needed to produce a solution to a given problem, for example planning what they need to do to create a report on the effectiveness of the school’s recycling initiatives
* following a previously created plan to report back to the class on a given problem, using digital tools, for example small groups reporting on the best location for a new skate park in the local government area
* defining and acting collectively using online community standards and valuing the work of others, for example moderating language and behaviour in an online class forum, not deleting the work of collaborators, and respecting others’ intellectual property
* using a range of communication tools to share ideas and information with other students, for example presenting content for a school celebration such as a graduation celebration
 |
| explain the creation and permanence of their personal digital footprint and consider privacy when collecting personal dataVC2TDI6D06 | * describing scenarios where data, images or both that have been posted online can lead to information reappearing at a later date, for example how a comment made on a social media post or video associates a person with both their comment and the content
* explaining why collecting the smallest amount of data needed for a purpose is important to protect someone’s privacy, for example how choosing not to collect information about someone’s birthdate when it is not necessary ensures that private data cannot be stolen in a cyber attack
* understanding the implications of how AI models are trained through the collection of data, for example the sharing of personal data increases the likelihood that private information will be collected and revealed through AI models both now and in the future
 |

#### Strand: Creating Digital Solutions

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| define problems with teacher-provided or co-developed functional requirementsVC2TDI6C01 | * developing a problem statement and co-developing functional requirements as a class activity for developing a solution for tracking the impact of feral animals on native flora and fauna that could be used by Aboriginal and/or Torres Strait Islander rangers
* describing in simple terms the nature of a problem and what a solution needs to achieve, for example what need the problem is addressing, who the solution is needed for, what data is needed and what features the solution would need to include
* using teacher-provided functional requirements to identify the features needed for a new digital solution, for example identifying what is required for a new game to be developed for children of primary school age
* using a provided stimulus to identify a need, and writing functional requirements in groups, for example developing requirements for a class app to share ideas and work collaboratively
 |
| design and represent algorithms involving multiple alternatives (branching) and iterationVC2TDI6C02 | * designing an algorithm, including branching and iteration, that responds to data, for example how Aboriginal and/or Torres Strait Islander rangers use structured procedures to respond to live tracking data that indicates feral buffalo are approaching an environmentally or culturally sensitive site
* designing an algorithm or understanding and modifying an existing algorithm to fix an error or change functionality, for example finding and fixing an error in branching involving a boundary condition
* constructing more than one sequence of steps that solve the same problem and explaining why one is better than the other, for example specifying an exact route through a maze versus using the right-hand rule, which works for all mazes
* modelling a decision that has more than 2 options to select the next step, for example selecting transport: ‘IF distance is less than 2 km THEN walk, ELSE IF distance is less than 5 km THEN ride a bike, ELSE catch the bus’
* planning algorithms that repeat until a condition is met, for example continuing to mix UNTIL ingredients are combined or subtracting a number UNTIL the result reaches zero
 |
| design and modify a user interface for a digital system, and generate, communicate and evaluate the designsVC2TDI6C03 | * designing a user interface on paper or using digital tools, for example drawing the designed layout of the landing page of an app to order lunches from the school canteen or using customisable font size and colour contrast to help users with impaired vision
* modelling how user interfaces allow people of different cultures and with different language backgrounds to access information, for example using consistent symbols to represent common actions such as copying, pasting and saving
* ideating a range of possible design ideas, discussing them and judging them against the teacher-provided or co-developed functional requirements, for example using the functional requirements to put design ideas in order of preference in a group discussion
* suggesting modifications to a preferred design idea if it does not satisfy all the functional requirements, for example modifying a game or game controller so that it can be used by a wider range of players
 |
| implement algorithms as visual programs involving control structures, variables and inputVC2TDI6C04 | * programming digital systems to perform automated tasks, such as closing gates, for example simulating the work of Aboriginal and/or Torres Strait Islander rangers attempting to lure and capture feral animals
* writing and editing programs to solve problems using branching, iteration and variables in a visual programming environment, for example writing a program to draw a shape and rotate it a given number of times
* writing programs that repeat multiple steps based on the user’s input, for example repeatedly drawing a shape a given number of times, shifting the position between each iteration
* writing programs that take input from the user or environment and storing that input in a variable for later use, for example asking the user how many shapes to draw in a circle and using that to calculate the number of iterations and the angle to rotate each time
* writing programs that make decisions involving multiple alternatives, for example an interactive quiz that checks if an answer is correct, gives feedback and updates the score, or gives a final grade based on the score
* using an AI tool with a natural language interface to convert speech to text when implementing an algorithm in a visual programming environment
 |
| evaluate existing and student-created solutions against the requirements and their broader community impactVC2TDI6C05 | * evaluating the effectiveness of their own solutions to address the identified problem from the requirements, for example checking if the information created for a local interactive history walk is relevant and meets the local council’s needs
* evaluating how an existing solution provides users with safety tools and features such as those described in the eSafety Commissioner’s Safety by Design vision for young people, for example having a clearly visible button to easily report and block inappropriate behaviour in an app or on a website
* reflecting on the many systems that are used in the wider community to address a range of needs, for example timetables to manage transport and other services, and storing licence information so that police can enforce traffic laws
* verifying the correctness of AI-generated content against information known to be factually correct, for example comparing the text generated from an AI tool with information published on an official website or other authoritative sources
 |

## Levels 7 and 8

### Band description

In Levels 7 and 8, students apply systems thinking by exploring the connections between hardware specifications and tasks that users want to perform. They investigate how data is transmitted via wired and wireless networks and explain the need for encryption to protect and secure data. Students explore personal security controls, including multi-factor authentication, to protect their data if passwords are compromised, and they understand the impact of phishing and other cyber security threats on people and data.

Students develop a deeper understanding of abstraction by explaining how and why digital systems represent data as text, image and audio data using integers and binary. They build on their skills in acquiring and interpreting data. Students are given opportunities to validate the data they acquire to ensure it is accurate and consistent. They collect and transform many types of data from a wide range of sources. Students model structured data in meaningful ways using spreadsheets and single-table databases, and analyse and visualise the data to extract meaning. They use an increasing range of the features of digital tools to improve the effectiveness and the consistency of the content they create, locate and communicate. Students plan and manage projects individually and collaboratively, improving control over the quality of their content. They investigate and manage their digital footprint in existing systems and their solutions by assessing if the data collected is essential.

Students have the opportunity to apply computational thinking by defining and decomposing real-world problems, creating user experiences, designing and modifying algorithms, and implementing them in a general-purpose programming language. They practise problem decomposition to more clearly understand a problem by describing its component parts. Students apply design thinking using mind maps and mock-ups to generate design ideas for user experiences and solution designs. They review these ideas against functional requirements and then implement them using a general-purpose programming language. Students represent and communicate their algorithmic solutions using flowcharts and pseudocode. They check that their solutions meet the specifications by testing and debugging their algorithms before and during implementation. Students evaluate their solutions against the functional requirements and constraints, and consider the future impact of their solutions.

### Achievement standard

By the end of Level 8, students select appropriate hardware for particular tasks. They explain how data is transmitted and secured in networks. Students identify and describe cyber security threats.

Students represent data using integers and binary. They acquire, manipulate and validate data using spreadsheets and single-table databases. Students interpret, model and visualise data using spreadsheets and database queries to draw conclusions. They select and use a range of digital tools to create, locate and communicate content, applying common conventions. Students use a range of digital tools to plan tasks, share content online, and manage individual and collaborative iterative projects. They manage their digital footprint and privacy when collecting data.

Students define and decompose real-world problems, and determine functional requirements and constraints. They design and trace algorithms using flowcharts and pseudocode. Students design and modify user interfaces and user experiences, and evaluate alternative designs. They implement algorithms and debug programs using a general-purpose programming language. Students evaluate digital solutions against the functional requirements.

### Content descriptions and elaborations

#### Strand: Digital Systems and Security

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explain how hardware specifications affect performance and select appropriate hardware for particular tasks and workloadsVC2TDI8S01 | * considering how Aboriginal and/or Torres Strait Islander communities in areas classified as rural or remote often share access to smartphone and internet services, and how the hardware specifications of these devices affect performance, for example when immediate and extended families share and access data through a single smartphone or device
* explaining how hardware specifications affect what tasks a digital system can perform, and how quickly they perform them, for example how different network bandwidths affect download speed and lag or how much random access memory (RAM) is needed for multimedia authoring
* selecting appropriate hardware for particular tasks, for example choosing a powerful graphics card for computer gaming or large external storage for video-editing
* comparing a range of digital systems and their specifications, for example desktop computers, laptop computers and tablet devices
 |
| investigate how data is transmitted and secured in wired and wireless networks including the internetVC2TDI8S02 | * describing networks and comparing their properties, for example the bandwidth, latency and reliability of wired, wireless and mobile networks
* explaining why cryptography is necessary for securing data, for example transmitting credit card details over the internet
* exploring simple encryption and decryption algorithms, for example ROT13 and XOR
* explaining how problems occur in network communication and how they can be solved, for example routers dropping packets, and how transmission control protocol (TCP) uses acknowledgements to confirm packets have been received
 |
| explain how multi-factor authentication protects an account when the password is compromised and identify phishing and other cyber security threatsVC2TDI8S03 | * explaining how multi-factor authentication prevents unauthorised access by prompting the account owner for a token or single-use password, for example demonstrating how a funds transfer from a bank account requires not only logging in, but also provision of a one-time password received via SMS
* identifying the common techniques used in phishing scams, for example using an email address from an unofficial domain when pretending to be an online retailer
* exploring how AI can be used to improve cyber security and how it can be used by cybercriminals, for example an organisation that uses AI tools for malware detection and cybercriminals using AI tools for the rapid generation of malware
 |

#### Strand: Data, Information and Privacy

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| investigate how digital systems represent text, image and audio data using integers and binaryVC2TDI8D01 | * explaining how digital systems represent text as a sequence of individual characters numbered using the Unicode character set, for example upper-case and lower-case letters, punctuation and emojis
* explaining how digital systems represent bitmap images (for example PNG and JPEG) as the colour of each pixel in separate RGB channels ranging from 0 to 255, and represent vector graphics such as SVG using the geometry of lines and shapes
* explaining how digital systems represent audio using whole numbers for the amplitude of the soundwave at a given sampling rate, for example –32,768 to 32,767 for 16-bit audio at 44,100 Hz
* explaining how whole numbers can be represented in binary, for example counting in binary from 0 to 31, and recognising that 1 byte = 8 bits, which can represent from 0 to 255
* explaining how digital systems represent data in binary, for example by converting a character to its Unicode or ASCII value, then converting that value to binary
 |
| acquire, store, manipulate and validate data from a range of sources using software tools, including spreadsheets and single-table databasesVC2TDI8D02 | * acquiring, storing and validating data from a reputable source, such as the Australian Bureau of Statistics, to analyse the geographic distribution of Aboriginal and Torres Strait Islander people, with the aim to highlight past and emerging trends
* acquiring data to answer questions for their own investigations, for example answering ‘Does the school canteen sell the right food?’ by designing a survey to collect food preferences data and accessing school canteen sales data
* acquiring and manipulating data using specialised and general software, for example a spreadsheet with a range of formulas and functions or a pre-defined database for filtering, queries and reports
* considering the data used to train an AI model to minimise any potential biases in its output and ensure the range of data represents the audience of interest, for example training a model on data collected from multiple demographic groups will produce more correct outputs on a diverse population rather than training a model on data collected from a single demographic group
 |
| analyse and visualise data using a range of software, including spreadsheets and simple database queries, draw conclusions and make predictions by identifying trendsVC2TDI8D03 | * making predictions about future population distribution of Aboriginal and Torres Strait Islander people based on identified trends, for example analysing and visualising data using spreadsheets and databases on their population growth in metropolitan areas
* summarising data based on its attributes to identify trends and make predictions, for example using a spreadsheet to sort census data to predict future trends
* visualising multidimensional data by choosing appropriate graphs using spreadsheets to reveal trends, outliers or other information, for example a scatter plot of food prices and sales that is coloured by each food’s sugar content, or diagrams such as a social network diagram and maps of crime rates by location
* modelling objects and events as structured data, that is, the attributes relevant to the task, for example items in the school canteen and the sale of those products, with attributes such as the product name, price, quantity and nutritional value
* interpreting and querying single-table databases using visual or simple Structured Query Language (SQL) queries with SELECT, WHERE and ORDER BY clauses, for example answering queries in a database
* exploring machine learning, a form of artificial intelligence using an AI tool where an algorithm is trained using a data set, for example to classify images
 |
| select and use a range of digital tools effectively, including unfamiliar features, to create, locate and communicate content, consistently applying common conventions for a diverse audienceVC2TDI8D04 | * locating relevant content from multiple sources, exploring advanced search functions and targeted criteria, for example using specific filters such as date range, image size, file type and usage licence
* selecting and using appropriate digital tools, for example when participating in online lessons or planning sessions
* applying common conventions consistently when creating content, for example organising content in paragraphs and within a heading hierarchy, writing captions to describe images and using gender-inclusive pronouns
* creating logical storage locations for project assets and resources together with an outline to ensure collaborators are up to date, for example creating a logical storage area for a group to share content and ideas in a timely way
* using AI tools with a progressive series of prompts to refine the output when translating text to improve its correctness, for example performing translation from one language to another and instructing an AI tool to correct any errors in the translation
 |
| select and use a range of digital tools effectively and responsibly to share content online, and plan and manage individual and collaborative iterative projectsVC2TDI8D05 | * demonstrating iterative project management skills and understanding, for example when collaborating with Aboriginal and Torres Strait Islander community groups to develop digital solutions to projects: following cultural protocols, including relevant permissions and attributions; acknowledging diversity, capability and strength; and addressing risks and responsibilities such as privacy, security and accuracy of data
* collaborating effectively online using cloud storage, for example setting up and managing a shared space in an online repository to co-develop content for an app that presents and checks safety aspects of working in a specific setting such as a kitchen, laboratory, workshop or greenhouse
* considering or displaying empathy for diverse cultural expectations when participating in teams and in online communities, for example showing sensitivity around images or names of deceased people, and valuing the intellectual property and perspectives of others
* determining and recording the tasks, responsibilities and timelines for a collaborative project, for example using a spreadsheet to record tasks and their sequence, critical dates and who is responsible for each task so a project can be finished on time
 |
| investigate and manage the digital footprint that existing systems and student solutions collect, and assess if the data is essential to their purposeVC2TDI8D06 | * reviewing and managing their digital footprints across online digital tools that they use, for example selecting their default privacy and sharing settings on social media accounts
* investigating the ethical obligations of individuals and organisations regarding ownership and privacy of data and information by researching an online platform’s privacy policy for data collection, use and storage of information, and discussing impacts on digital footprint
* assessing the appropriateness and relevance of data collected during student surveys and online surveys, for example identifying that providing your address data is not necessary for a survey asking about your food preferences, but providing your address for the Census would be appropriate
* explaining the risks associated with the sharing of personal data and how easily AI models can create new and fake content, for example the creation of deep-fake videos and audio recordings to be generated and distributed for malicious purposes
 |

#### Strand: Creating Digital Solutions

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| define and decompose real-world problems by taking into account functional requirements and constraintsVC2TDI8C01 | * asking a series of questions and sub-questions to understand a problem and breaking it down into manageable parts, for example identifying the elements of game design such as characters, movements, collisions and scoring
* framing a problem in terms of what we know, why it is important and the outcome we want, for example determining what information is to be presented on a school website
* creating a list of requirements for a digital solution, for example listing what is required for a simple payroll solution
* investigating types of environmental constraints on solutions, for example reducing energy consumption and on-screen output of solutions
 |
| design algorithms involving nested control structures and represent them using flowcharts and pseudocode, and use tracing techniques to test and identify errorsVC2TDI8C02 | * representing algorithms precisely in pseudocode (structured English) or with flowcharts for each part of a problem, for example using a flowchart to describe the movement of a character through a maze
* designing algorithms with nested control structures, including a nested IF, for example ‘IF it is raining THEN [IF parents are home THEN drive to school]’; or an IF inside a loop, for example ‘REPEAT [add 1 to the counter] UNTIL the counter is equal to 10’
* following an algorithm precisely to confirm it produces the expected output for a given input, for example performing a desk check with a table of input, variables and output
* specifying test cases and comparing the expected and actual output to determine the correctness of an algorithm, for example a test case to calculate the areas of familiar shapes
 |
| design and modify the user interface and user experience of a digital system; generate, communicate and evaluate the alternative designsVC2TDI8C03 | * using digital tools to design a user interface or experience to satisfy functional requirements and constraints, for example sketching multiple pages of a website with wireframes, storyboards and simple branding guidelines for colours and styling
* exploring the evolution of a user interface, for example comparing the design of self-service check-outs or automatic teller machines over time
* considering the reasons why a user might buy and use a digital tool, in addition to its utility, for example how aligning a brand with user values and identity contributes to its appeal
* using concept maps, mock-ups or other diagrams to record and discuss generated ideas, for example creating and discussing screens in a music app, evaluating them against the functional requirements
* reviewing and modifying a preferred design as part of the iterative development approach, for example making changes to overcome limitations of the design or to better satisfy the functional requirements
* comparing multiple user interfaces generated using AI tools, for example using AI tools to generate multiple user interfaces and selecting the user interface that best meets the user requirements
 |
| implement, modify and debug programs involving control structures and functions in a general-purpose programming languageVC2TDI8C04 | * writing and editing programs to solve problems using branching, iteration, variables and functions in a general-purpose programming language, such as Python, JavaScript or C#
* reading and interpreting an existing program, modifying the code to change functionality and debugging to fix errors, for example taking existing code for a weather forecasting app that includes temperatures and improving the output to include extra information such as rainfall, UV levels and air quality
* writing a program that receives data from the environment to change the program behaviour, for example reading moisture-level data from a soil sensor and switching on a watering system
* writing a program that contains nested control structures to perform more complicated branching and decisions, for example using an IF statement inside a loop to count the days in an array containing temperature data only for days when the temperature is more than 20 ºC
* defining and using a function that produces different output based on the argument(s) it receives, for example a function that receives the name of an actor from user input and searches a file or database to return a list of movies in which that actor appears
* implementing a simple existing algorithm using a general-purpose programming language to simulate how it would run in a programming environment
* using an AI tool to assist with the development of a module of code, for example writing a function to carry out a specific task
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| evaluate existing and student-created solutions against the requirements, constraints and possible future impactsVC2TDI8C05 | * evaluating how an existing solution ensures users can control their safety and experience online as described in the eSafety Commissioner’s Safety by Design vision for young people, for example ensuring privacy settings are comprehensive, easy to use and set to maximum protection by default
* reviewing the requirements of a solution that meets the user’s needs, for example making sure that recommendations offered by their music application are of a similar genre to the rest of the user’s library
* judging existing solutions on the basis of their possible impact on the economy, environment or society; for example, cloud computing services decrease data loss but require huge amounts of electricity to power the servers
* identifying the constraints in existing and student-developed solutions, for example economic, technical and social constraints
* discussing the risks and consequences of AI-generated solutions on a range of platforms, including social media platforms, for example the potential for the spread of misinformation due to the posting of high volumes of automatic and intentionally misleading content
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## Levels 9 and 10

### Band description

In Levels 9 and 10, students consolidate their systems thinking by exploring how the hardware and software components of digital systems interact to manage, control and secure access to data. They extend their knowledge of the importance of security by developing cyber security threat models and exploring an example of a supply chain vulnerability.

Students explore simple data compression techniques and compare their effectiveness. They explain the importance of abstraction by representing online documents in terms of content, structure and presentation. Students consolidate their skills in data acquisition and interpretation, manipulating and validating data to ensure it is accurate, consistent and domain-appropriate. They model multidimensional data in more complex spreadsheets and relational databases, filtering and querying it to give insights into its meaning, to draw conclusions and make predictions. Students visualise this data in customisable ways, allowing greater exploration of trends and outliers to support or challenge their analyses. They increasingly use advanced features of existing and emerging digital tools to create interactive content for a diverse audience. Students explore simple tools that help plan tasks, timelines and responsibilities for individual and collaborative projects. They apply the Australian Privacy Principles to critique the digital footprint created by existing information systems and their own solutions.

Students have the opportunity to apply computational thinking by defining and decomposing real-world problems, creating user experiences, designing and modifying algorithms, and implementing them, including in an object-oriented programming language. They use techniques, including interviewing and surveying stakeholders to identify needs, to increase the precision of their problem definitions and solution specifications. Students apply design thinking using multiple techniques to generate design ideas for user experiences and solutions. They prototype these ideas, considering functional and non-functional requirements, and design criteria based on current and future needs, and revise and further develop their preferred ideas based on their analysis. Students verify their solutions by validating their algorithms, represented as flowcharts and pseudocode, and using test cases to confirm the correctness of their solutions. They develop their object-oriented programming skills, and apply them to develop, modify and debug programs. Students use the functional and non-functional requirements to evaluate student solutions and their future impact as well as opportunities for enterprise and innovation.

### Achievement standard

By the end of Level 10, students explain how digital systems manage, control and secure access to data in networks. They model and evaluate cyber security threats and vulnerabilities.

Students describe a range of data compression techniques. They represent documents as content, structure and markup. Students acquire, manipulate and validate data using spreadsheets and relational databases. They interpret, model and visualise data using spreadsheets, and relational databases using queries, to draw conclusions and identify trends. Students use advanced features of digital tools to create and communicate interactive content for an audience. They use project management tools to plan and manage individual and collaborative iterative projects. Students identify and apply privacy principles to manage digital footprints.

Students decompose real-world problems, identify needs, and determine functional and non-functional requirements. They design, validate and test algorithms using flowcharts and pseudocode. Students design and prototype user interfaces and user experiences, and evaluate alternative designs against design criteria. They implement algorithms and debug programs using an object-oriented programming language. Students critically evaluate digital solutions against user needs and the functional and non-functional requirements.

### Content descriptions and elaborations

#### Strand: Digital Systems and Security

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| investigate how hardware and software manage, control and secure access to data in networked digital systemsVC2TDI10S01 | * explaining how an operating system hides the complexity of different hardware from applications; for example, applications can treat input from a mouse and touch screen in the same way
* exploring how public key cryptography works, for example Transport Layer Security (TLS) and hashing
* configuring a simple network using real or simulated hardware and observing packets moving around the network, for example monitoring packets on simulated switches and networked devices
* explaining how domain names and Internet Protocol (IP) addresses allow data to be transmitted to specific networked devices, for example domain name system (DNS) and routing tables
* investigating the Internet of Things (IoT) as part of a networked digital system, for example using sensors and digital systems to collect and share data over the internet
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| develop cyber security threat models, and explore a software, user or software supply chain vulnerabilityVC2TDI10S02 | * using a diagram to understand how private information moves through a system and when it would be the most likely target of a cyber attack, for example mapping how data moves between a user and server when using a web application and identifying that sending the data in plain text would make it susceptible to a man-in-the-middle attack
* exploring the impact of a cyber security threat by systematically following the steps involved in bypassing a known vulnerability in their own software, for example manually changing the value stored in a login cookie to that of another user to observe the impact of unauthorised access on the system
* investigating a range of real-world cyber supply chain vulnerabilities, for example ransomware, cloud security and re-use of passwords
* describing the techniques for developing cyber security threat models, for example using AI tools to develop predictive models for identifying and responding to new cyber security threats
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#### Strand: Data, Information and Privacy

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| investigate simple data compression techniquesVC2TDI10D01 | * using an algorithm to identify patterns in data and represent them in a compressed way, for example repeated pixels in an image with run-length encoding
* exploring the difference between lossy and lossless compression and the consequences of each, for example exploring audiovisual compression and the impact of different formats such as MP3, MP4, JPEG, WAV and RAW on file size and quality
* examining an image and discussing whether the image quality would be compromised if all the blue pixels of the sky in one row were to be replaced by one token, and the number of pixels it represents
 |
| represent documents online as content (text), structure (markup) and presentation (styling) and explain why such representations are importantVC2TDI10D02 | * representing documents by separating the content (the text in the document), the structure (the document structure, such as headings and paragraphs) and presentation (how the document is laid out and styled)
* creating webpages using HyperText Markup Language (HTML) for the content and structure, and Cascading Style Sheets (CSS) for styling the page, and explaining how HTML tags separate content from structure
* explaining how representing content, structure and presentation separately allows each of these to be designed, edited, manipulated and stored independently of the others, and why this is important
 |
| develop techniques to acquire, store, manipulate and validate data from a range of sources using software tools, including spreadsheets and relational databasesVC2TDI10D03 | * identifying strengths and weaknesses of collecting data using different methods, for example online surveys, face-to-face interviews, phone interviews, observations, comments in response to a social media post, phone logs, browser history and online webcam systems
* developing systems that acquire, use and protect data according to the Australian Privacy Principles, for example ensuring personally identifiable information is not publicly shared without consent and is protected from unauthorised access
* accessing, storing and manipulating data from the Australian Bureau of Statistics in a format that is useful for analysis, for example using a spreadsheet to acquire, filter, group and sort data on population growth across age groups in Australia
* developing systems that check data is correct and meaningful using automated techniques and manual analysis, for example validating movie review data using rules and user interface elements, and detecting bias and fake reviews through simple statistical analysis
* developing solutions that store, manipulate, validate and verify data in a spreadsheet or database, for example collecting Likert scale ratings and written reviews for a movie or travel review website
* considering how AI algorithms can analyse patterns in data to identify outliers, anomalies or inconsistencies; for example, a model trained with many examples of horses and no zebras in its training data is likely to classify all zebras as horses
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| analyse and visualise data interactively using a range of software, including spreadsheets and relational databases and queries, to draw conclusions and make predictions by identifying trends and outliersVC2TDI10D04 | * summarising data, its attributes and the relationships between data sets, identifying trends and outliers to draw conclusions and make predictions, for example summarising data about electorates and their demographics, historical swings and exceptions to predict an election outcome
* developing interactive visualisations for exploring complex data, for example population, life expectancy and fertility rate in motion charts
* using software to visualise and compare data to identify patterns, relationships and trends, for example investigating emerging trends in Australian industries
* exploring machine learning, a form of AI where an algorithm is trained using a data set, for example to classify images
* modelling entities and processes, their attributes and the relationships between them, for example creating database tables for a movie, a user and their movie review, where a movie has a title, genre and release date, and a review has a movie, a user and their rating and comments
* interpreting and querying multi-table databases using Structured Query Language (SQL) queries with SELECT, WHERE and simple JOIN/GROUP BY clauses and counting, for example checking that each teacher is only in one class at a time
* using an AI tool with a natural language interface to generate queries to perform analysis, for example describing a database schema and asking the tool to generate an SQL query to find results that match specified criteria
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| select and use emerging digital tools and advanced features to create and communicate interactive content for a diverse audienceVC2TDI10D05 | * locating relevant content using Boolean operators or AI search features of search engines and desktop search, for example queries with AND, OR and NOT or advanced image similarity search
* comparing the similarities and differences between augmented reality (AR), virtual reality (VR) and mixed reality (MR) as emerging technologies for creating content for a school audience
* using emerging technologies to add dynamic features to content, for example using a QR code to trigger an augmented reality (AR) overlay of how to use a tool safely in a workshop
* incorporating interactive elements into content to assist with analysis, for example adding sliders to visualisations to allow the user to control and view time series data
* ensuring content is accessible using built-in accessibility features, for example using alt tags in images inside HyperText Markup Language (HTML) to ensure screen readers can communicate content to people with partial vision
* combining the output from multiple AI tools to communicate a complex idea or narrative, for example using text, images and sound from a variety of AI tools to produce an interactive animation or video
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| use simple project management tools to plan and manage individual and collaborative iterative projects, accounting for risks and responsibilitiesVC2TDI10D06 | * accounting for appropriate project management responsibilities, for example when collaborating with Aboriginal and/or Torres Strait Islander community groups to develop digital solutions to projects: following cultural protocols, including relevant permissions and attributions; acknowledging diversity, capability and strength; and addressing risks and responsibilities such as privacy, security and accuracy of data
* planning the creation of content using project management tools to mitigate potential risks or project delays, for example incorporating project management techniques including scheduling, revision, iteration and evaluation into common collaboration tools to ensure timely delivery of effective solutions
* managing collaborative projects using appropriate platforms, for example sharing code development using a collaborative version control tool to plan, decompose and manage a project with their peers
* establishing clear lines of responsibility and tasks for all members of a project team, for example assigning roles to all team members and using a spreadsheet to sequence tasks and track progress to ensure all work is completed by a specified deadline
* using relevant legislation or guidelines to inform their solutions, for example correctly controlling and treating data collected from users by applying techniques that ensure data protection, privacy and copyright requirements are followed
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| apply the Australian Privacy Principles to critique and manage the digital footprint that existing systems and student solutions collectVC2TDI10D07 | * critiquing the extent to which online services allow them to control access to their data in line with the Australian Privacy Principles, for example assessing whether their social media accounts allow them to update their contact information if these details change, and who else can see that information on the platform
* using the Australian Privacy Principles as a reference to evaluate the steps they are taking to protect user information in their application, for example explaining how they are storing passwords using cryptographic hashing algorithms so that a data breach does not expose their users to security vulnerabilities due to password re-use
* understanding the privacy issues related to using personal data for the training, testing or deployment of AI models, for example organisations using personal data for products that train their AI models
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#### Strand: Creating Digital Solutions

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| define and decompose real-world problems, taking into account functional and non-functional requirements and by interviewing and surveying stakeholders to identify needsVC2TDI10C01 | * exploring how Aboriginal and Torres Strait Islander Peoples’ cultural stories and languages are being preserved with digital systems, for example how communities can record, animate and maintain their connections with culture and language in a contemporary format that resonates with young people to help ensure that vital practices continue
* developing a specification for a need or opportunity that contains a problem statement and a set of solution needs expressed as functional and non-functional requirements
* investigating different types of functional requirements for digital solutions, for example calculating results, increasing the speed of processing and improving the quality of reports
* investigating different types of non-functional requirements for digital solutions, for example considering how the requirements of reliability, user friendliness, portability and robustness could affect the way people use solutions
* identifying the range of stakeholders who are associated with digital solutions and using data collection techniques such as interviews and surveys to determine needs and requirements
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| design algorithms involving logical operators and represent them as flowcharts and pseudocode, and validate algorithms and programs by comparing their output against a range of test casesVC2TDI10C02 | * designing an algorithm or modifying an existing algorithm to fix, extend or improve it, for example fixing a bug in an algorithm to detect if a total calculated by a formula is correct
* describing algorithms using flowcharts or other appropriate diagram types, for example validating a range check with 2 boundary conditions
* describing algorithms precisely and succinctly using pseudocode, for example short, unambiguous statements such as ‘IF one number is greater than OR equal to another number’
* using Boolean operations (AND, OR and NOT) to express complex conditions in control structures, for example ‘IF the temperature is above 30 ºC AND people are inside the building THEN open the windows’
* tracing and debugging an algorithm by identifying when its state is unexpected, why this has occurred, and the changes needed to correct it, for example identifying that a loop has finished one iteration too early
* determining boundary test cases and testing that they are handled correctly by a program, for example checking that only a number between 1 and 10 can be entered
* generating invalid input and user errors and testing that they are handled appropriately by a program, for example checking that a program does not crash when text instead of a number is entered
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| design, modify and prototype the user interface and user experience of a digital system; generate, communicate and critically evaluate alternative designs against design criteriaVC2TDI10C03 | * designing engaging user interfaces and experiences, considering functionality, aesthetics and users’ feelings of enjoyment and satisfaction
* prototyping a user interface and experience, using simple graphical tools that support clicking on an image to change slides or views, for example using a presentation tool or a no-code user interface prototyping tool to design a simple mobile app
* considering all aspects of a product as perceived by users, for example evaluating users’ initial experience of setting up and using a digital system, or users’ emotional or cultural response to using a digital system
* using a range of ideation techniques to create multiple design ideas for a solution, for example using digital tools, role-play and mind mapping to develop and then record a range of ideas without evaluating them first
* eliminating design ideas by evaluating them against functional and non-functional requirements, and the design criteria; for example, in consultation with stakeholders, reviewing the design ideas, making modifications if necessary, and further developing the design of the preferred solution
* prototyping a user interface and experience using AI tools, for example using AI tools to generate functional prototypes and then critically evaluate the user interfaces against the design criteria
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| implement, modify and debug modular programs, applying selected algorithms and data structures, including in an object-oriented programming languageVC2TDI10C04 | * writing and editing programs to solve problems using algorithms and data structures in object-oriented programming languages such as Python, JavaScript and C#
* selecting different types of data structures such as array, record and object to model structured data
* debugging a program by locating an error, modifying the program and verifying that the changes made are correct, for example identifying the line in the code where an error occurs by reading an error message, printing out the variables to deduce the cause of the problem, and testing any fixes by entering data that could generate similar errors
* reading and interpreting programs split across files, functions or classes, and modifying them to add functionality, for example using the codebase of an existing adventure game (open source) and building new characters, levels or abilities
* writing programs that receive structured data from the user that determines program behaviour, for example processing a file that contains timestamped data captured by an altitude sensor from a plastic bottle rocket to graph the rocket’s flight path
* defining their own classes to model and define the actions that can be performed on data in their programs, for example defining a class for a book that stores information such as the author name, title and publisher, and methods that are used to track the book’s status in a library management system or store inventory
* implementing a simple existing algorithm using an object-oriented programming language to simulate how it would run in a programming environment
* exploring the use of programming languages and how they are used within AI, for example how a programming language such as Python could be used to develop a simple neural network
* using an AI tool to assist with the debugging of a module of code, for example debugging a function to ensure it is free of errors
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| evaluate existing and student-created solutions against the requirements and design criteria, user needs, possible future impact and opportunities for enterprise and innovationVC2TDI10C05 | * evaluating how an existing solution detects violations of site rules and imposes sanctions as described in the eSafety Commissioner’s Safety by Design vision for young people, for example enforcing rules using AI and human moderators to detect inappropriate behaviour, and consistently imposing consequences
* judging the quality of the output of their solution against the requirements and design criteria, for example confirming that the stock levels recorded by their inventory management application are accurate within allowed parameters
* evaluating how existing products have changed to meet the needs of a different set of users, for example how new social media applications continue to expand the types of media people share and the interactions they have online
* investigating the ethical issues impacting the future of software design using AI tools and machine learning, for example software developers introducing bias due to assumptions made when developing algorithms or in the use of training data
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