Government of **Western Australia**
School Curriculum and Standards Authority

Technologies: Digital Technologies

Teaching, learning and assessment exemplar

Year 7

Using spreadsheets to visualise data

Acknowledgement of Country

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

Background

This teaching, learning and assessment exemplar (the exemplar) has been developed by the School Curriculum and Standards Authority (the Authority) as part of the *School Education Act Employees (Teachers and Administrators) General Agreement 2017* (Clause 61.1–61.3).

Disclaimer

Any resources, such as texts and websites, that may be referred to in this document are provided as examples of resources that teachers can use to support their learning programs. Their inclusion does not imply that they are mandated or that they are the only resources relevant to the course. Teachers must exercise their professional judgement as to the appropriateness of any resources they may wish to use.

This resource utilises electronic web-based resources, such as videos and image galleries. Teachers should be present while an electronic resource is in use and close links immediately after a resource, such as a video has played to prevent default 'auto play' of additional videos. Where resources are referred for home study, they should be uploaded through Connect, or an equivalent system, that filters advertising content.

Contents

The Western Australian Curriculum

The *Western Australian Curriculum and Assessment Outline* (the *Outline* – https://k10outline.scsa.wa.edu.au/) sets out the mandated curriculum, guiding principles for teaching, learning and assessment, and support for teachers in their assessment and reporting of student achievement. The *Outline* recognises that all students in Australian schools, or international schools implementing the Western Australian Curriculum, are entitled to be given access to the eight learning areas described in the *Alice Springs* (*Mparntwe*) *Education Declaration*, December 2019.

The Technologies curriculum

The mandated curriculum is presented in the year level syllabus documents.

The Technologies curriculum delivers a sequential and age-appropriate progression of learning with the following key elements:

- a year level description that provides an overview of the context for teaching and learning in the year
- a series of content descriptions, populated through strands and sub-strands, that sets out the knowledge, understanding and skills that teachers are expected to teach and students are expected to learn
- an achievement standard that describes an expected level that the majority of students are achieving by the end of a given year of schooling. An achievement standard describes the quality of learning (e.g. the depth of conceptual understanding and the sophistication of skills) that would indicate the student is well placed to commence the learning required in the next year.

This exemplar

This Technologies exemplar articulates the content in the *Outline* and approaches to teaching, learning and assessment reflective of the Principles of Teaching, Learning and Assessment. This exemplar demonstrates a sequence of teaching and learning, including suggested assessment points, for 16 lessons.

Catering for diversity

This exemplar provides a suggested approach for the delivery of the curriculum and reflects the rationale, aims and content structure of the learning area. When planning the learning experiences, consideration has been given to ensuring that they are inclusive and can be used in, or adapted for, individual circumstances. It is the classroom teacher who is best placed to consider and respond to (accommodate) the diversity of their students. Reflecting on the learning experiences offered in this exemplar will enable teachers to make appropriate adjustments (where applicable) to better cater for students' gender, personal interests, achievement levels, socio-economic, cultural and language backgrounds, experiences and local area contexts.

Using this exemplar

This teaching, learning and assessment exemplar provides suggestions to support the delivery of the mandated curriculum content. The exemplar provides:

- a teaching and learning sequence
- the mandated curriculum content to be taught at each point of the teaching and learning sequence, suggested resources, sample assessment tasks and marking keys
- the number of lessons to deliver the teaching and learning experiences
- learning intentions and support notes that may provide focus questions and additional information and/or examples to assist with the interpretation of curriculum content
- support notes to assist teachers to unpack the content and support teaching and learning experiences
- teaching and learning experiences that outline the structure of the lesson. These explicitly state each activity that the lesson will progress through and the key focus area for that activity.

Links to electronic resources

This sequence of lessons may utilise electronic web-based resources, such as videos and image galleries. Teachers should be present while an electronic resource is in use and close links immediately after a resource, such as a video, has played to prevent default ‘auto play’ of additional videos. Where resources are referred for home study, they should be uploaded through Connect, or an equivalent system, that filters advertising content.

Best practice

Teaching and learning

The teaching and learning opportunities offered in this exemplar are not exhaustive. Thus, teachers are encouraged to make professional decisions about which learning experiences, and the sequence in which they are delivered, are best suited to their classroom context, taking into account the availability of resources and student ability.

This sample may prove a useful starting point for amplifying creativity in the classroom, while presenting the embedded expectations of the Western Australian Curriculum: Technologies.

Teachers may find opportunities to incorporate the General Capabilities and the Cross-curriculum Priorities into the teaching and learning program.

Ways of teaching – teachers can locate additional information on the Ways of teaching from the School Curriculum and Standards Authority (the Authority) website https://k10outline.scsa.wa.edu.au/home/wa-curriculum/learning-areas/technologies/digital-technologies/p-10-digital-technologies-teaching/digital-technologies-ways-of-teaching.

Assessing

Assessment, both formative and summative, is an integral part of teaching and learning. Assessment should arise naturally out of the learning experiences provided to students. In addition, assessment should provide regular opportunities for teachers to reflect on student achievement and progress. As part of the support it provides for teachers, this exemplar includes suggested assessment points. It is the teacher's role to consider the contexts of their classroom and students, the range of assessments required, and the sampling of content descriptions selected to allow their students the opportunity to demonstrate achievement in relation to the year level achievement standard. Teachers are best placed to make decisions about whether the suggested assessment/s are used as formative or summative assessment and/or for moderation purposes.

Ways of assessing – a range of assessment strategies that can enable teachers to understand where students are in their learning is available on the Authority website https://k10outline.scsa.wa.edu.au/home/wa-curriculum/learning-areas/technologies/digital-technologies/p-10-digital-technologies-assessing/digital-technologies-ways-of-assessing.

Reflecting

Reflective practice involves a cyclic process during which teachers continually review the effects of their teaching and make appropriate adjustments to their planning. The cycle involves planning, teaching, observing, reflecting and replanning.

This exemplar supports reflective practice and provides flexibility for teachers in their planning. The exemplar shows how content can be combined and revisited throughout the year. Teachers will choose to expand or contract the amount of time spent on developing the required understandings and skills according to their reflective processes and professional judgements about their students' evolving learning needs.

Using spreadsheets to visualise data

The teaching and learning sequence will develop students' understanding about data and how to acquire, store and visualise data using spreadsheets. They start by learning how computers are able to represent text using binary and then learn how to store data in a spreadsheet. Students learn how to format data and use formulas to help extract meaningful information from that data. They also learn how to create simple charts to visualise that data.

Students demonstrate their understanding of spreadsheets and data by acquiring data from the internet and using a spreadsheet to format that data in a meaningful way. They then create charts to help visualise the data and draw relevant conclusions from any trends they observe.

Year level description

In the early adolescence phase of schooling, students align with their peer group and begin to question established conventions, practices and values. Learning and teaching programs assist students to develop a broader and more comprehensive understanding of the contexts of their lives and the world in which they live.

Digital Technologies further develops student understanding and skills in computational and design thinking, such as decomposing problems, and engages students with a wider range of information systems. Students begin to develop an interest in particular fields of knowledge.

In Year 7, students create a range of digital solutions. They explore the properties and hardware devices of networked systems. Students acquire, store and visualise data from a range of sources using spreadsheets. They further develop their understanding of the vital role that data plays in their lives.

When defining problems, students identify the key elements, factors and constraints at play. They design and develop increasingly complex algorithms. Students predict and evaluate their developed and existing solutions, considering time, tasks, data and the safe use of information systems. They plan and manage individual and team projects with some autonomy. Students consider ways of managing the exchange of ideas, tasks, files and feedback.

Achievement standard

By the end of the year:

Students identify the ways different types of networks, including wired, wireless and mobile networks, and their hardware components, transmit data. They identify how digital systems represent data using binary. Students acquire, store and visualise data from a range of sources using spreadsheets. They design algorithms involving control structures (iteration and selection). Students represent these algorithms using flow charts, pseudocode and correct terminology, and use them to implement, modify and debug programs. Students identify issues relating to a user's digital footprint and the permanence of data, while outlining ways of protecting accounts with multifactor authentication.

In Digital Technologies, students use project management processes and skills to plan, develop and communicate solutions, while considering time and available resources, and identify the purpose for a given digital task. Students use a range of techniques, technologies and appropriate terminology to design, develop, review and communicate ideas, plans and processes. They implement agreed protocols when using a range of technologies, components and/or equipment to produce designed solutions.

Lessons 1–16

Using spreadsheets to visualise data

Lessons 1–2: What is data?

The Western Australian Curriculum content addressed in these lessons is below.

Data representation

Digital systems use binary to represent data in text

Lesson outline

Learning intentions
Students will: • explain the purpose of data and how it is used in everyday life • describe how digital systems represent text using binary • develop the ability to convert characters into binary using an ASCII and Unicode table.

Preparation for the lesson

- Prepare a simplified ASCII table.

Support notes

- Data is raw facts and figures that can be collected for reference and analysis. Data can be processed and organised to provide meaningful information and help inform decisions.
- Computers are machines that process electrical signals that are either on or off.
- These electrical signals are presented in binary (1s and 0s); thus binary forms the foundation of all digital systems.
- Computers cannot understand letters or images – all information must be represented in binary.
- Use the video How Computers Work: Binary & Data to explain how the binary number system and the electrical signals in the circuits behind them make computers work.

Teacher

- What is data? Activate prior knowledge with a class activity. Allocate one side of room to ‘Data’ and the other side to ‘Not data’. Read each example to students. They decide if it is data or is not data, moving to the corresponding side of the room. After students have finished moving, explain which side is correct and why.

Example	Answer	Explanation
The number of steps your smartwatch counted today	DATA	It’s a measurable value the device recorded.
Your favourite colour	DATA	It’s information about you that can be stored or used.
A random scribble on a piece of paper	NOT DATA	It doesn’t represent meaningful information.
The temperature outside	DATA	It’s measurable and recorded by sensors.
A photo stored on your phone	DATA	It’s stored as digital information.

Example	Answer	Explanation
The sound of someone clapping	DATA	It can be recorded and stored.
A secret password	DATA	It's information used for access and stored securely.
A cloud in the sky	NOT DATA	The cloud itself isn't data unless it is recorded.
The score in a video game	DATA	It's tracked and updated by the system.

Table 1: What is data? activity

- Students' key takeaway should be that data is information that can be collected, stored or recorded.
- Facilitate a class discussion to introduce binary code, covering the following:
  - Computers are machines that use electricity, which has two states – on or off.
  - These two states are represented using binary numbers 1 (on) and 0 (off).
  - All data can be represented using binary.
  - ASCII is a system that assigns each letter a number which can then be represented in binary. For example, the letter 'A' is assigned the decimal number 65, which is 01000001 in binary. Note: The letter 'a' is assigned the decimal number 97, which is 01100001 in binary. Hence, a computer is unable to recognise that 'A' and 'a' are in fact the same letter.
- Explain the limitations of ASCII and the need for more characters to be represented by a computer, thus the introduction of Unicode.
- Show students the video from Code.org (see Teacher information for link). The video discusses how computers can represent different types of information using binary.

Students

- Binary name tags: Provide students with a simplified ASCII table. Students choose three different letters from their name and find the decimal and binary representation for each letter. Students create a binary 'name tag' by colouring squares – one colour for 1, another colour for 0. They then swap tags with another student and decode each other's letters.
- Extension: Convert short words to/from binary, using both upper-case and lower-case letters.

Lesson conclusion

- Students give one example of data that was used in class.
- Students describe why computers use binary to represent information.
- Students convert a letter to binary using an ASCII conversion table.

Lesson 3: Understanding spreadsheets

The Western Australian Curriculum content addressed in this lesson is below.

Data representation

Digital systems use binary to represent data in text

Acquiring, managing and analysing data

Acquire, store and visualise data from a range of sources using spreadsheets

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Lesson outline

Learning intentions
Students will: • explain the purpose of a spreadsheet • identify key components of a spreadsheet: cell, row, column, worksheet.

Preparation for the lesson

- Students do not need a computer for this lesson – paper-based and physical activities can be used to build understanding of foundational concepts.
- Prepare a large grid and tape to secure on the floor.
- Print copies of a blank spreadsheet grid for students to label the spreadsheet components.

Support notes

- Spreadsheets help people organise, store and analyse data.
- A spreadsheet is made up of:
  - cells
  - rows
  - columns
  - work sheets.
- Each row (numbers) and column (letters) is labelled, and each cell can be identified using the column and row. For example, the top left cell is referred to as cell A1.

Teacher

- Activate prior knowledge by reviewing the concept of binary and ASCII from the previous lesson.
- Facilitate a class discussion to answer the question ‘What is a spreadsheet?’
- Ask students where they have seen tables or grids used in real life. Examples include school timetables, sports ladders, game statistics, budgeting apps or rosters.
- A spreadsheet is a digital grid that can be used to organise, store and work with data. It is especially useful for organising and performing calculations on large sets of numbers.
- Structure of a spreadsheet demonstration:
  - Draw a 6 * 6 grid on the board. Explain that the grid is organised into rows and columns. Each box is called a cell.
  - Label each column with letters (A, B, C, D, E, F) and each row with numbers (1, 2, 3, 4, 5, 6).

- Explain how each cell is named by giving the column first and then the row. For example, column C and row 5 is cell C5.
- Ask students to identify different cells.

- Structure of a spreadsheet activity:
  - Mark out a large grid on the floor using tape. Give each student a card with a cell reference. Students find the correct position on the grid and stand in their cell.
  - Once all students have found the correct position, pose actions or questions such as:
    - Everyone in column C, wave your hand.
    - Everyone in row 4, sit down.
    - Who is standing in cell E2?
  - Give students new cards and repeat the activity. Repeat until students understand the structure of a spreadsheet.

Students

- Provide students with a printout of a blank spreadsheet grid. Students identify components of a spreadsheet by:
  - labelling the columns with letters
  - labelling the rows with numbers
  - shading one cell and writing its reference
  - circling a row
  - drawing a box around a column.
- Extension: Students create a mini table with some relevant data (e.g. a favourite fruit survey).

Lesson conclusion

- Students perform the following tasks:
  - explain the purpose of a spreadsheet
  - describe a difference between a row and a column
  - identify a cell.

Lesson 4: Formatting matters

The Western Australian Curriculum content addressed in this lesson is below.

Acquiring, managing and analysing data

Acquire, store and visualise data from a range of sources using spreadsheets

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Lesson outline

Learning intentions
Students will: • navigate a simple spreadsheet using rows, columns and cell references • identify important components of spreadsheet software • apply basic formatting techniques to a spreadsheet.

Support notes

- The focus of this lesson is to familiarise students with spreadsheets and how to format existing data so that they can easily find information.

Teacher

- Display two versions of the same table: one messy (no borders, narrow columns, random colours) and the other neatly formatted (clear headings, appropriate column widths, consistent colours).
- Ask students to comment on the readability of each table.
- Discuss that formatting allows people to find and understand information more easily.

Students

- Students open a blank spreadsheet. Help them to locate:
  - the grid
  - rows
  - columns
  - work sheet tabs
  - the formula bar
  - the toolbar.
- Students complete some quick navigation tasks, including:
  - clicking on cell A6
  - moving to cell C2
  - selecting a whole row
  - selecting a whole column
  - selecting a range of cells (e.g. B3:E7).

- Students enter the following sample data in a blank sheet:

	A	B	C
1	Name	Team	Score
2	Alex	Jets	12
3	Mia	Hurricanes	15
4	Jordan	Jets	9
5	Akshay	Bluebirds	11

Table 2: Sample data activity

- Guide students through how to apply the following formatting to their spreadsheet.
  - Adding bold and italics:
    - make the header row bold
    - place the word 'Team' in italics
  - Adding colour:
    - change the colour of the text in the header row
    - add a light colour fill to the header row
  - Adding borders:
    - add borders around the cells of the whole table
    - make the border around the header row thicker
  - Adjusting row and column size:
    - increase the size of the text in the header row
    - widen the Team column
    - increase the row height for the header row
  - Extension:
    - centre the text in the header row
    - experiment with other formatting features to make the table look 'professional'.
- Students open a new work sheet and create a small table of their own choice. Topics could include favourite sports, pets, video games or types of food. Each table must include:
  - a header row with at least four columns
  - at least five rows of data
  - bold and italics text
  - text and fill colours
  - borders
  - adjusted text size, column width and row height.

Lesson conclusion

- Students describe why formatting is important for spreadsheets.
- Students identify at least one formatting tool used during the lesson and its purpose.

Lesson 5: Formulas

The Western Australian Curriculum content addressed in this lesson is below.

Acquiring, managing and analysing data

Acquire, store and visualise data from a range of sources using spreadsheets

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Lesson outline

Learning intentions
Students will: • understand what formulas are and why spreadsheets use them • apply basic formulas to a range of cells (SUM, AVERAGE, COUNT).

Support notes

- A formula is an instruction that tells the spreadsheet to perform a calculation on a set of data.
- Advantages of using a formula are that:
  - they automatically update when data changes
  - they help people to quickly analyse large sets of data.
- Formulas start with =
- Common formulas used in a spreadsheet are listed in Table 3.

Formula	Meaning
SUM	Add a set of numbers
AVERAGE	Find the average of a set of numbers
COUNT	Count the number of cells in a range that contain numbers

Table 3: Common spreadsheet formulas and definitions

- Students can use the data in Table 4 for the lesson's activities.

Owner name	Pet name	Species	Age	Weight (kg)	Gender	Vaccinated	Breed	Vet visits
Alice	Max	Dog	5	22.5	M	Yes	Labrador	3
Ben	Bella	Cat	3		F	Yes	Siamese	
Chloe	Rocky	Dog	2	18	M	No	Beagle	1
Daniel	Coco	Bird	1	0.3	F	Yes	Budgerigar	2
Ella	Daisy	Rabbit	4	2.1	F	Yes	Lop	1
Finn	Oscar	Dog	7	25	M	No	Labrador	4
Grace	Molly	Cat	6	5	F	No	Persian	2
Harry	Charlie	Dog	3		M	Yes	Border Collie	
Isla	Luna	Cat	2	3.8	F	Yes	Persian	2

Owner name	Pet name	Species	Age	Weight (kg)	Gender	Vaccinated	Breed	Vet visits
Jack	Ruby	Rabbit	5		F	No	Netherland Dwarf	1
Katie	Toby	Dog	4	19.5	M	Yes	Poodle	3
Liam	Polly	Bird	2	0.4	F	Yes	Cockatiel	2

Table 4: Students' pet data

Teacher

- Activate prior knowledge with a class discussion answering the question 'What is a formula?'
- Demonstrate how to enter a formula into a spreadsheet to students by entering = into the formula bar.
- Using the pets data, demonstrate using:
  - SUM to calculate the total weight of all pets
  - AVERAGE to find the average age of the pets
  - COUNT to count how many pets have a weight recorded.
- Demonstrate what happens when one of the numbers is changed – formulas should update automatically.

Students

- Provide students with a copy of the data. They can either enter the data manually or be provided with a copy of a spreadsheet to save time.
- Students use formulas to find the:
  - total number of vet visits
  - average weight of the pets
  - number of pets who have visited the vet.
- Students format the spreadsheet to make it easy to find information, adding colour and headings for the different categories of information.
- Students use formulas to extract other information from the data.

Lesson conclusion

- Students explain the purpose of a formula.
- Students describe which formula they found easiest to use and which they found hardest to use.

Lesson 6: Sorting data

The Western Australian Curriculum content addressed in this lesson is below.

Acquiring, managing and analysing data

Acquire, store and visualise data from a range of sources using spreadsheets

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Lesson outline

Learning intentions
Students will: • organise data using sort and filter tools within a spreadsheet • apply conditional formatting to highlight specific information.

Support notes

- Sorting and filtering allow us to find specific information within large datasets.
- Conditional formatting allows us to highlight patterns or important values within data.
- The exact process of sorting, filtering and applying conditional formatting will vary depending on the spreadsheet software being used, but the ideas are the same.
- Students can use the following *Activity Tracker* data for the activities below:

Student	Activity	Hours per week	Location	Cost per term ($)
Alex	AFL	4	Local oval	120
Mia	Netball	3	Sports centre	150
Jordan	Cricket	2	School grounds	80
Ruby	Soccer	5	Local oval	110
Noah	Basketball	1	Sports centre	140
Isla	Swimming	4	Aquatic centre	200
Ethan	AFL	2	Local oval	120
Zoe	Dance	6	Studio	180
Liam	Cricket	3	School grounds	80
Ava	Soccer	2	Local oval	110

Table 5: Activity Tracker activity

Teacher

- Activate prior knowledge with a class discussion about the question ‘Why do we organise data?’ Prompt students towards the idea that it is easier to find information in organised data.
  Examples of ways to organise data could include:
  - sorting sports scores into a ladder
  - filtering a shopping website
  - sorting a playlist by song ratings

- highlighting overdue assignments.
- Using the *Activity Tracker* dataset, demonstrate sorting and filtering by:
  - adding a filter to the work sheet
  - sorting the data based on the sport from A to Z
  - sorting the data based on hours per week from largest to smallest
  - filtering the data to only show cricket students
  - filtering the data to only show sports that cost less than $100.
- Some focus questions to ask students include:
  - What changed when the data was sorted and/or filtered?
  - Why might someone want to sort the data?
  - Why might someone want to filter the data?
  - What other information might you want to find by sorting and/or filtering?

Students

- Provide students with a copy of the *Activity Tracker* data. They can either enter the data manually or be provided with a copy of the spreadsheet to save time.
- Students format the data to make it more presentable, which could include adding colours and bold to the headings or adjusting the column widths.
- Students add a filter to the work sheet.
- Students sort the data based on:
  - cost per term (lowest to highest)
  - location (descending order).
- Students filter the data based on:
  - sports played at the local oval
  - sports that take up are more than three hours per week.
- Using the *Activity Tracker* dataset, demonstrate how to apply conditional formatting to highlight:
  - any student who spends four or more hours per week on their sport (green fill with dark green text)
  - any student who spends three or less hours per week on their sport (purple fill with dark purple text)
  - any activities that cost over $150 (make text blue)
  - all AFL students (yellow fill with dark yellow text).
- Students apply conditional formatting to an entire column, then discuss what happens to the conditional formatting when the data changes. Students explore this by updating multiple cells to change formatting, e.g. change number of hours from less than four to more than four.
- Using the *Activity Tracker* data, students apply the formatting from the demonstration.
- Students apply at least three different conditional formatting rules to the data.

Lesson conclusion

- Students explain the difference between sorting and filtering data.
- Students describe why conditional formatting is useful.

Lesson 7: Cell referencing

The Western Australian Curriculum content addressed in this lesson is below.

Acquiring, managing and analysing data

Acquire, store and visualise data from a range of sources using spreadsheets

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Lesson outline

Learning intentions
Students will: • understand the difference between relative and absolute cell references • apply relative and absolute cell references when copying formulas across cells.

Support notes

- When copying formulas across multiple cells, ensure that the formulas point to the correct cells.
- Relative references change when a formula is copied to a new location.
- Absolute references stay the same when a formula is copied to a new location.
- Absolute references are needed when a formula must always point to the same cell to use the correct data, e.g. tax rate.

Teacher

- Activate prior knowledge with a class discussion answering the question 'What happens when formulas move?'
- Write a simple formula on the board, e.g. =A1 + B1. Ask students:
  - What happens when this formula is copied down one row?
  - Will it stay the same or change?
  - What should it change to?
- Guide students to the correct answer, i.e. the formula will change to =A2 + B2.
- Students enter the following data in a blank spreadsheet.

	A	B
1	13	25
2	14	26
3	15	27

Table 6: Formula activity

- In cell C1, type the formula =A1 * B1.
- Copy the formula down to C2 and C3.
- Important information to draw students' attention to includes:
  - The formula changes automatically.
  - The cell references change *relative* to their new position, known as a relative reference.
  - Relative references are the default behaviour.

Absolute references

- In cell A6 insert the label GST rate. In cell B6, insert the interest rate of 0.13. In cell D1, add the formula =C1 * B6. Copy the formula down to cells D2 and D3.
- Important information to draw students' attention to includes:
  - One part of the formula changes each time (A1 → A2 → A3).
  - The second part of the formula stays the same (B6).
  - The formula always points to the correct cell for interest rate when copied.
  - This is known as an absolute reference.
  - The symbol '$' indicates an absolute reference.

Mixed references

- In cell E5, add the formula =$A1 + B$1.
- Copy the formula to cells F5 and G5.
- Copy the formula down to rows 6 and 7 in columns E, F and G.
- All cells in the range E5 to G7 should now have formulas.
- Students analyse what has changed and what has stayed the same in the original formula.
- Important information to draw students' attention to includes:
  - $ indicates which part of the cell reference is absolute.
  - $A1 – the column is absolute, i.e. will not change.
  - A$1 – the row is absolute, i.e. will not change.

Students

- Students create a new work sheet and enter the following data.

	A	B	C	D	E
1	Item	Price	Quantity	GST	Total
2	Pencil	1.50	3		
3	Notebook	4.00	2		
4	Folder	2.50	5		
5					
6	GST rate	0.10			

Table 7: Referencing activity

- In cell D2, calculate the GST payable using an absolute reference for the GST rate.
- In cell E2, calculate the total payable i.e. (Price * Quantity) + GST.
- Copy the formulas down to rows 2, 3 and 4 in the GST and Total columns.
- Check that the GST formula always uses the correct rate.
- Extension: To their table, students add formatting to make it easier to read; conditional formatting; and more rows of data.

Lesson conclusion

- Students explain the difference between absolute and relative referencing.
- Students describe when absolute referencing should be used.

Lesson 8: Charts

The Western Australian Curriculum content addressed in this lesson is below.

Acquiring, managing and analysing data

Acquire, store and visualise data from a range of sources using spreadsheets

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Lesson outline

Learning intentions
Students will: • create charts (pie, bar, line) to represent data visually • choose appropriate chart types for different types of data • interpret patterns and trends shown in charts.

Support notes

- Charts make it easier to see trends in data.
- Simple chart types can be used to visualise different types of data:
  - bar charts: comparing size of categories
  - pie charts: comparing proportions
  - line charts: showing change over time.
- The exact process of creating charts will vary based on the type of software being used, but the types of visualisations available and what they show are the same.

Teacher

- Activate prior knowledge with a class discussion about the question, 'Why do we visualise data?'
- Show students the following dataset.

Activity	Number of students	Hours per week
AFL	18	3.5
Netball	14	2.8
Soccer	22	3.2
Basketball	12	2.1
Swimming	10	4.0
Dance	16	3.7
Cricket	15	2.9

Table 8: Student participation in sport

- Ask students to consider: Is it easy to compare the number of students per activity? Or the amount of time per activity? How could we make these comparisons easier to understand?
- Show students a bar chart of the hours per week against each activity.
- Show students a pie chart of the number of students per activity.
- Discuss the following question with the class: How does a chart make it easier to compare data?

Students

- Students to enter the following data into a new work sheet.

Day	Screen time (hours)
Monday	2
Tuesday	3
Wednesday	1
Thursday	2
Friday	4
Saturday	5
Sunday	4

Table 9: Weekly screen time

Bar chart

- Students select the table and then insert a matching bar chart.
- Important information to draw students' attention to includes:
  - Bar charts are used to compare categories.
  - The horizontal axis shows the categories i.e. days.
  - The vertical axis shows the values i.e. screen time hours.
- Students add labels to each axis and a title to the chart.
- Ask students 'Which day has the most screen time?' and 'Which days are similar?'

Pie chart

- Students once again select the original table of data, this time inserting a pie chart.
- Important information to draw students' attention to includes:
  - Pie charts show proportions of a whole.
  - In this case, each slice represents a portion of the total weekly screen time.
- Students add labels on each slice to show percentages and a title to the chart.
- Ask students 'Which day has the most screen time?' and 'Which chart is more effective for this data – the bar or pie chart? Why?'

Line chart

- Students once again select the original table of data, this time inserting a line chart.
- Important information to draw students' attention to includes:
  - Line charts show change over time.
  - They are useful to see trends and/or patterns over time.
- Students add labels to the vertical and horizontal axes and a title to the chart.
- Ask students 'What trend do you notice across the week?' and 'Why is a line chart better for time-based data?'

Lesson conclusion

- Students explain why it is useful to visualise data.
- Students give an example of when to use each type of chart and explain why they would use it.

Lessons 9–10: Visualise data

The Western Australian Curriculum content addressed in these lessons is below.

Acquiring, managing and analysing data

Acquire, store and visualise data from a range of sources using spreadsheets

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Lesson outline

Learning intentions
Students will: • acquire data from the Australian Bureau of Statistics • organise and clean raw data to make it more useful • create charts to visualise data and allow data to be interpreted.

Support notes

- Data very rarely comes ready to use; instead, it needs to be found and manipulated.
- Lots of data can be found online. It then needs to be downloaded and the key variables selected.
- Data needs to be cleaned before it can be used in visualisations.
- The data for this activity is based on data for the Greater Perth region that can be found on the Australian Bureau of Statistics website.

Teacher

- Activate prior knowledge with a class discussion on using real-world data. Ask students to discuss how we find data and how we make data usable.

Students

- Students navigate to the Data by region page on the Australian Bureau of Statistics website.
- For data on Greater Perth, students either:
  - type ‘Greater Perth’ into the Enter a location text box on the Search by map section
  - browse to the data by opening:
    - Greater Capital City Statistical Areas
    - Western Australia.
- Students click on the View data link.
- They then scroll to bottom of the page and download the XLSX file.
- Students save the file to an appropriate folder.
- They then open the saved Excel spreadsheet.
- Students navigate to the POP work sheet.
- They then filter the data in the Measure Description column so that it only shows the data for the number of persons in each age range. For example, Persons 0–4 years (no.).
- Students copy the relevant data to a new spreadsheet.
- They then clean the data by:
  - ensuring that the headings have been copied across
  - deleting any empty columns

- adding a heading to the spreadsheet data of Age
- creating a column for the age ranges
- adding some formatting to make it easier to read the table of data
- adding rows to the end of the table to show the total and average number of people.

- When finished, students should have a dataset that looks something like the following.

Age	2019	2020	2021	2022	2023	2024
0–4	137469	137388	136589	136034	135814	135443
5–9	137805	140004	141878	143548	146254	148881
10–14	132887	137650	141080	142670	145495	149091
15–19	124746	126136	127804	132597	140405	146205
20–24	141387	141944	139122	139721	149585	156580
25–29	155047	154286	151480	153163	168019	179493
30–34	168168	169086	168338	168169	176797	183454
35–39	158901	165438	170112	173836	181000	187464
40–44	139044	142588	147631	153608	163109	172361
45–49	143482	144341	143258	141848	143456	146443
50–54	131086	134754	139658	143740	146512	147063
55–59	125833	128632	129620	129759	130497	132527
60–64	110198	114909	117424	119968	123272	125616
65–69	95977	99843	102378	104244	106488	108910
70–74	80589	85960	90044	90517	91977	93615
75–79	55141	58339	61413	67085	72387	76527
80–84	38551	40615	42520	44596	46049	48251
> 85	37873	39648	41489	42917	44513	46447
Total	2114184	2161561	2191838	2228020	2311629	2384371
Average	117454.7	120086.7	121768.8	123778.9	128423.8	132465.1

Table 10: Australian Bureau of Statistics activity

- Students create appropriate charts to visualise the data and analyse trends.

  Line chart 1: Overall population

  - Students select the data for the Total population across the six years and create a line chart.
  - Ask students:
    - Is the population increasing or decreasing?
    - Are there any sudden changes? If so, when?

  Line chart 2: Population by age group

  - Students select the data for each age group across the six years and create a line chart with a line for each age range.

- Ask students:
  - Is there a single age group that has increased or decreased more than the others?
  - Is there a consistent trend across all the age groups?
  - Do some age groups have different trends?

Pie chart and bar chart

- Students select the data for each age group in 2024, and create a pie chart and a bar chart.
- Ask students:
  - Which age group has the greatest population?
  - Which age group has the smallest population?
  - Is there a pattern in the population across the different age ranges?

- Students analyse the charts that they have created and identify any trends in the data. Encourage them to draw conclusions from the trends in the data.

Lesson conclusion

- Students describe the steps they took to find and clean the data so they could use it.
- Students describe the most interesting trend or insight they found in the data.

Lessons 11–12: Digital footprint

The Western Australian Curriculum content addressed in these lessons is below.

Privacy and security

Issues relating to a user's digital footprint and the permanence of data

Protecting accounts with multifactor authentication

Lesson outline

Learning intentions
Students will: • define the term 'digital footprint' and explain its significance • identify ways that data can be permanent online • describe the risks associated with sharing information online • understand how multifactor authentication protects accounts.

Support notes

- A digital footprint is the record of everything a user does online, including posts, comments and account activity.
- Data posted online can be permanent, even if deleted, due to backups, screenshots and sharing.
- Sharing personal information online can have long-term consequences.
- Multifactor authentication (MFA) adds extra layers of security beyond passwords, making accounts harder to compromise.
- Some key focus questions for future follow-up could include:
  - What is a digital footprint?
  - Why is data online often permanent?
  - What are the risks of sharing too much online?
  - How does multifactor authentication protect you?

Teacher

- Activate prior knowledge with a class discussion answering the question 'What is a digital footprint?'
- Ask students to consider:
  - What types of things can we do online? e.g. sharing photos, making comments, gaming, shopping
  - What happens to data once it is posted online? Who looks after it?
- Show the video Digital DNA.
- Read out scenarios e.g. posting a photo, sending a private message or deleting a post. Students decide if the data is permanent or temporary, and explain their reasoning.
- Discuss how even 'deleted' data can be permanent due to backups, screenshots or sharing.
- Conduct a class discussion on the risks of sharing data online.
- Discuss examples of oversharing e.g. posting home address, school or holiday plans.

- Explore possible consequences of sharing inappropriately e.g. cyberbullying, identity theft, loss of privacy or future impact on job applications.

Students

- Students list their online activities over a week.
- Create a ‘footprint map’ showing what information is left behind.
- Ask students to discuss which activities leave the most permanent traces.

Teacher

- Discuss the importance of protecting information online, particularly user accounts.
- Discus common methods of authentication, including:
  - passwords
  - fingerprints
  - PINs (personal identification numbers).
- Ask students to consider how they protect their school account, as well as other accounts they may have.
- Introduce multifactor authentication (MFA), which can include something you know (password), something you have (phone) or something you are (fingerprint).
- Explain how MFA works and why it is important.
- Demonstrate enabling MFA on a sample account e.g. Google®, Microsoft®.
- Discuss what happens if someone tries to access an account without MFA as additional security.
- Extension: Students research a real-world example of issues stemming from someone’s digital footprint e.g. viral posts or data leaks.
- Students create a poster on ‘How to protect your digital footprint’.

Lesson conclusion

- Students define ‘digital footprint’ and give examples of permanent data.
- Students explain why MFA is important and describe how to enable it.
- Students reflect on one change they could make to protect their privacy online.

Lessons 13–16: Assessment task

See Appendix B: Assessment task – Analysis of data from the ABS

Appendix A

Resources

Software

Students will need to use appropriate spreadsheet software to complete this unit of work. Appropriate software includes Microsoft Excel, Apple® Numbers or Google Sheets.

Websites and videos

Lessons	Resource	Link/information
1–2	How Computers Work: Binary & Data	Code.org. *How Computers Work: Binary & Data* [Video file]. https://www.youtube.com/watch?v=USCBCmwMCDA&t=6s
9–10, Appendix B	Region summary: Greater Perth	Australian Bureau of Statistics. *Region summary: Greater Perth*. https://dbr.abs.gov.au/region.html?lyr=gccsa&rgn=5GPER
	Data by region	Australian Bureau of Statistics. *Data by region*. https://dbr.abs.gov.au/index.html
11–12	Digital DNA	eSafety. *Digital DNA* [Video file]. https://www.esafety.gov.au/media/digital-dna

Useful websites for sample data

- Gapminder: Bubble charts comparing different factors for countries of the world over time. For example, life expectancy against GDP per capita. https://www.gapminder.org/tools/#$chart-type=bubbles&url=v2
- Data Explorers – Our World in Data: Data about a range of topics from across the world. https://ourworldindata.org/explorers

Appendix B

Assessment task

Analysis of data from the ABS

Task details

Title	Analysis of data from the ABS
Description	Students compare data from the Australian Bureau of Statistics (ABS) about two local government areas (LGAs) and draw conclusions based on that data. They start by acquiring the relevant data from the ABS website, before using a spreadsheet to clean the data and create visualisations. They then create a short report using a word processor to present their conclusions.
Ways of assessing	Practical tasks, visual representations, work samples
Evidence to be collected	Formatted spreadsheet with data and charts presented appropriately Formatted report created using a word processor that contains conclusions and copies of charts
Suggested time	Four one-hour lessons
Differentiation	Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged. Where appropriate, teachers may either scaffold or extend the scope of the assessment tasks.

Content descriptions

Acquiring, managing and analysing data

- Acquire, store and visualise data from a range of sources using spreadsheets

Design thinking skills

Investigating and defining

- Investigate and define the problem and requirements of a given design brief

Designing

- Design processes and solutions with given technologies and techniques, using appropriate technical terms

Producing and implementing

- Implement agreed protocols and use a range of technologies, components and/or equipment to produce designed solutions

Evaluating

- Use given contextual criteria to evaluate design processes and solutions

Resources

- Access to the Data by region page on the ABS website: https://dbr.abs.gov.au/index.html
- Access to appropriate spreadsheet software
- Access to appropriate word processing software

Instructions for teacher

- Students can use any appropriate spreadsheet and word processing software.
- Inform students they will work independently on their spreadsheets and reports. However, students should collaborate to seek feedback from peers and provide constructive feedback to others.
- Discuss examples of data students can compare based on the different data they can download for each LGA. Strongly encourage students to go beyond the basic population data that they used in the learning phase of this unit.
- Show students copies of sample spreadsheets and reports, which have been provided in Appendix C.
- Extensions to this assessment include:
  - asking students to investigate and use different types of charts
  - comparing more than two LGAs.

Instructions to students

In this task, you will use your spreadsheet skills to acquire and compare data from two local government areas (one of which should be your own).

Tasks:

1. **Data acquisition (2 marks)**
    a. Go to the Australian Bureau of Statistics (ABS) website: https://dbr.abs.gov.au/index.html
    b. Open the Local Government Areas expander under the Browse region panel, and select data from your own local government area (LGA). Download the data (preferably as a spreadsheet) and save it to your computer.
    c. Select data from a different LGA and download that data to your computer.
    d. Choose a category to use to compare the LGAs e.g. population, employment or education.
    e. Extract the relevant data about each LGA and place it in a new spreadsheet.
2. **Data organisation and cleaning (3 marks)**
    a. Remove any unnecessary or irrelevant data from your spreadsheet.
    b. Organise your spreadsheet so that data is clearly labelled and easy to understand, adding clear headings for each column and row.
3. **Spreadsheet formulas (4 marks)**
    a. Use appropriate formulas (e.g. SUM, AVERAGE, COUNT) to provide summary information about the data.

    Note: You should use multiple different types of formulas, making use of both relative and absolute referencing where applicable.
4. **Spreadsheet formatting (2 marks)**
    a. Format your spreadsheet to improve readability:
        i. Use colours, borders and adjusted column widths.
        ii. Ensure headings stand out and data is easy to locate.
5. **Charts and visualisations (4 marks)**
    a. Create at least two different types of charts (e.g. bar chart, pie chart, line chart) to compare the LGAs.
    b. Label your charts clearly (titles, axis labels, legends).
    c. Ensure charts are formatted and suit the data.
6. **Report and analysis (4 marks)**
    a. Write a report using a word processor to compare the two LGAs.
        i. Include copies of your charts.
        ii. Briefly describe what each chart shows and why you chose those chart types.
        iii. Analyse the differences between the two LGAs based on your data and visualisations.
        iv. Draw conclusions supported by your data.

Marking key

Description	Marks
1. Data acquisition	
Chooses an appropriate category, accurately acquires relevant data for LGAs and places it into a new spreadsheet	2
Acquires some data for LGAs but this may not be relevant to category chosen and/or is incomplete	1
Subtotal	**/2**
2. Data organisation and cleaning	
Organises all acquired data well with clear headings and removes all unnecessary data	3
Organises data with minor organisational issues and/or includes some unnecessary data	2
Organises data poorly and/or removes minimal unnecessary data	1
Subtotal	**/3**
3. Spreadsheet formulas	
Uses a range of different formulas correctly to summarise data	3
Uses some formulas to summarise data, possibly with minor errors	2
Uses minimal and/or inconsistent formulas to summarise data	1
Subtotal	**/3**
Uses relative and absolute cell referencing efficiently	1
Subtotal	**/1**
Total	**/4**
4. Spreadsheet formatting	
Formats spreadsheet clearly to make data clear and easy to understand (includes headings, colours, borders, adjusted column widths etc.)	2
Incorporates inconsistent or unclear formatting	1
Subtotal	**/2**
5. Charts and visualisations (2 × 2)	
Creates at least two appropriate charts that can be used to compare the LGAs. Charts are well-labelled, formatted and suit the data	2
Creates one appropriate chart or charts unclear and/or unsuitable for the data	1
Subtotal	**/2**
Total	**/4**

6. Report and analysis	
Creates clear report with charts, thoughtful analysis and conclusions supported by data	4
Creates report with charts and partial analysis	3
Creates basic report with limited analysis	2
Creates report with missing and/or incomplete charts	1
Subtotal	**/4**
Total	**/19**

Appendix C

Task sample documents

Sample spreadsheet

The following image shows a sample spreadsheet that can be shown to students.

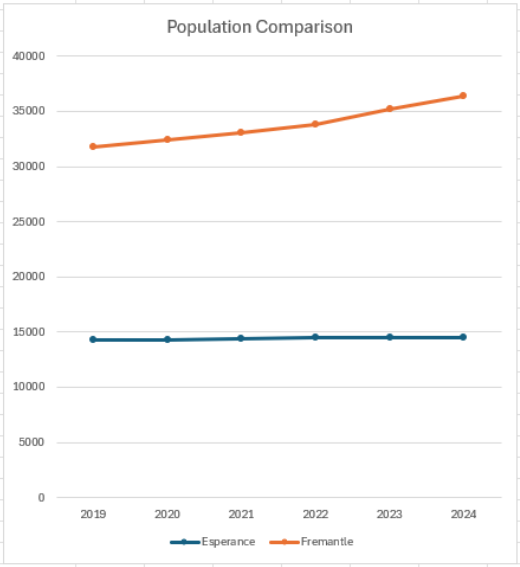
Population Figures - Esperance vs Fremantle

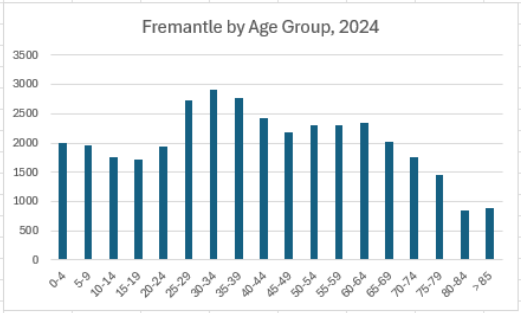
Esperance

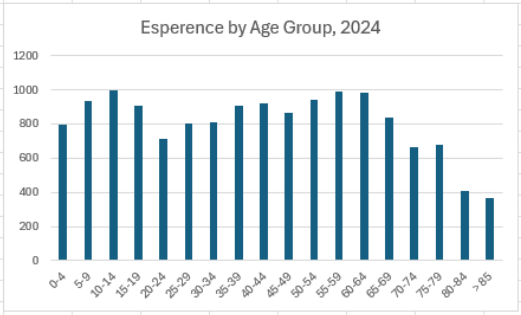
Age	2019	2020	2021	2022	2023	2024
0-4	887	856	858	858	856	796
5-9	988	983	983	975	948	936
10-14	1004	1010	1016	1012	989	1000
15-19	897	865	855	910	951	908
20-24	746	753	703	704	709	713
25-29	770	751	777	743	754	804
30-34	890	861	853	809	829	809
35-39	839	866	886	954	921	911
40-44	865	840	827	832	880	925
45-49	977	968	946	896	890	870
50-54	1037	1020	1020	1045	958	943
55-59	1021	1015	1004	988	996	992
60-64	867	906	948	972	980	983
65-69	720	749	755	768	830	841
70-74	729	726	754	735	695	668
75-79	500	528	561	615	639	683
80-84	324	343	360	365	380	410
> 85	268	285	290	320	346	366
TOTAL	**14329**	**14325**	**14396**	**14501**	**14551**	**14558**
AVERAGE	**796**	**796**	**800**	**806**	**808**	**809**

Fremantle

Age	2019	2020	2021	2022	2023	2024
0-4	1658	1704	1781	1890	1954	2005
5-9	1449	1464	1508	1648	1812	1957
10-14	1495	1521	1520	1548	1634	1769
15-19	1421	1468	1499	1563	1639	1717
20-24	1833	1864	1856	1805	1907	1951
25-29	2238	2271	2272	2286	2517	2734
30-34	2555	2506	2500	2537	2760	2912
35-39	2397	2484	2501	2534	2706	2774
40-44	2041	2050	2170	2295	2362	2428
45-49	2230	2224	2152	2051	2054	2179
50-54	2174	2171	2316	2440	2418	2313
55-59	2316	2393	2409	2333	2308	2306
60-64	2021	2118	2172	2272	2357	2349
65-69	1835	1879	1951	1938	1999	2013
70-74	1535	1637	1693	1762	1742	1762
75-79	1016	1099	1160	1189	1332	1450
80-84	770	768	803	844	824	845
> 85	798	818	849	853	870	885
TOTAL	**31782**	**32439**	**33112**	**33788**	**35195**	**36349**
AVERAGE	**1766**	**1802**	**1840**	**1877**	**1955**	**2019**







Sample report

The following image shows a sample report that can be shown to students.
Note that this report provides minimal explanations and should be improved upon by students.

Esperance vs Fremantle

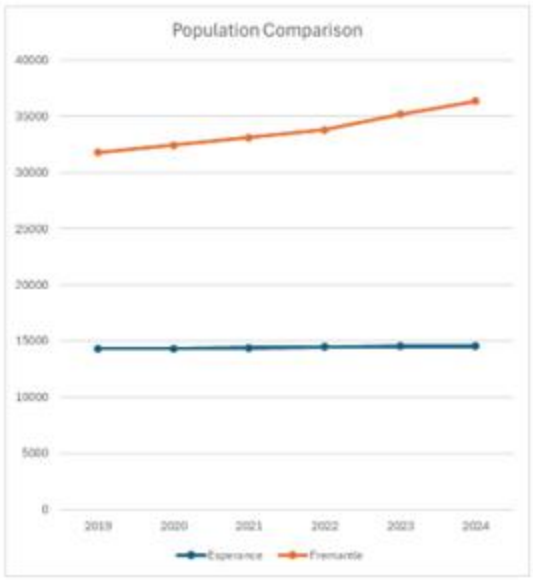
Introduction

In this study I am going to compare the populations of the Esperance and Fremantle Local Government Areas.

Population Growth

The following line chart shows the total population of Fremantle and Esperance from 2019 to 2024. I have chosen to show this using a line chart and it clearly shows the change in total population over time.

As can be seen in the chart, the population of Fremantle has increased significantly over the time period shown, whilst the population of Esperance has remained fairly stable.



Population by Age Group

I have chosen to show the population of both Fremantle and Esperance for 2024 by age group in the following bar charts. Bar charts were chosen to compare distinct groups of people, based on their age group.

Chart 1 (Fremantle) shows that there is a high proportion of people aged between 25 and 45 living in Fremantle, whereas Chart 2 shows that in Esperance there is a high proportion of people aged between 0 and 19.