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| INVESTIGATION | **MATHEMATICS** |
|  | **Level 3** |

# A visit tothe museum

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| **rwrnah21[1]Strands** | **Topics** |
| **Measurement** | Time |
| **Space** | Location, direction and movement |
| **Outcomes M 3.2, S 3.2** | |

## Investigation

The class is planning a trip to the museum. You want to see as many displays as possible in the time you have available so you will need to plan your visit carefully.

What route can you take to the museum? How can your group make the best use of their time at the museum? Mark the route you recommend on a map. On the floor plan of the museum, show the pathway that will allow you to see all the exhibits and displays you want to see without retracing your footsteps. You could even produce a visitors’ guide to the museum using computer graphics. Develop an itinerary for the day including when the bus leaves school and its return, and how much time you can spend at each exhibit or display in the museum. You will need to gather information about the history of one exhibit to create a timeline.

## Overview

The following table shows how this investigation is organised in phases associated with **thinking, reasoning and working mathematically.**

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| Thinking, reasoning and working mathematically | | | | |
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| 1. Identifying and describing |  | 2. Understanding and applying |  | 3. Communicating and justifying |
| Focusing on the context  Students:  discuss prior knowledge of museums.  Discussing the investigation  Students:  list possible activities to be included in the excursion  discuss the requirements of the investigation.  Identifying the mathematics in the investigation  Students:  discuss the mathematical knowledge that may assist them in the investigation. |  | Interpreting and creating plans and maps  Students:  describe and create floor plans of familiar areas  become familiar with the floor plan  of the museum  decide which exhibits to visit.  Using maps  Students:  use maps of familiar areas to describe locations and pathways, and revise mapping conventions  orientate maps using four compass points  plan routes to the venue.  Reading and recording dates and times  Students:  record class events on a calendar and daily events in a class diary  calculate the duration of daily classroom events.  Planning an itinerary  estimate and record times for activities that may occur on excursion day.  Working independently  Students:  develop an itinerary and route for the excursion. |  | Presenting the plan  Students:  present their proposed itinerary and route to the museum  justify their choices to other students.  Reporting on the excursion and reflecting on the learning  Students:  consider the learning that has taken place during the investigation and the excursion  modify itineraries, plans or maps based on their experiences at the museum. |

## Core learning outcomes

This investigation focuses on the following core learning outcomes from the *Years 1 to 10 Mathematics Syllabus*:

**M 3.2** Students read, record and calculate with 12-hour time, and interpret calendars and simple timetables related to daily activities.

**S 3.2** Students interpret and create maps and plans using a range of conventions, describe locations and give directions using major compass points, angles and grids.

## Using this investigation

The sequence of activities suggested in this investigation provides opportunities for students to demonstrate learning described by core learning outcomes or aspects of core learning outcomes. The investigation may be modified to provide opportunities for students to demonstrate learning described by core learning outcomes at other levels.

## Contribution to the attributes of a lifelong learner

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| **Knowledgeable person with deep understanding** | Students learn the conventions of maps and plans, including reading and recording 12-hour time, and interpret calendars and diaries. They understand how knowledge, procedures and strategies related to location, direction, movement and time can be used in everyday situations. |
| **Complex thinker** | Students analyse information about the location of exhibits and displays at a museum. They make decisions about how much time can be spent at the different exhibits and displays, and the order in which they can be visited. Students use information about one exhibit to create a timeline showing its history. |
| **Active investigator** | Students explore ways to use floor plans and timetables to create the most efficient pathways to view the exhibits and displays in a museum. |
| **Effective communicator** | Students interpret information about time, maps, plans and grids, and use this information to create their own timetables, timelines, maps, plans and grids. They distinguish between relevant and irrelevant information. They create maps and simple timetables of a day’s events. They present their pathways and itineraries to an audience, and clarify and justify their decisions based on the procedures and strategies followed during the investigation. They also interpret other students’ pathways, itineraries and maps, and provide feedback. |
| **Participant in an interdependent world** | Students work cooperatively and collaboratively in small groups or with partners. They challenge the ideas of others. Students take increasing responsibility for their mathematical decisions. |
| **Reflective and  self-directed learner** | Students reflect on their learning by identifying new knowledge and the procedures and strategies used to make decisions. They suggest different pathways and ways of timetabling activities. They consider the usefulness of mathematics in everyday situations, and how others can make sense of situations using common mathematical knowledge, ideas, procedures and strategies. |

Core content

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| Measurement — Time: Level 3 | Space — Location, direction and movement: Level 3 |
| Units and conventions   * units * fortnight * leap year * 12-hour displays (analogue and digital) * quarter past, quarter to * five-minute intervals * timelines * timetables (e.g. school, bus, train) * diaries (e.g. personal, school, class) * calendars * abbreviations for days (e.g. M for Monday), months (e.g. Feb for February) * conventions * dates (e.g. dd/mm/yy) * ante meridiem (a.m.) * post meridiem (p.m.)   **Relationships**   * digital and analogue time * seconds and a minute * minutes and an hour * minutes and parts of hours (quarter, half) * hours and days * duration * personal referent (for seconds, minutes,  half hour) | Location and movement   * combinations of alphanumeric grids and maps (e.g. local area) * plans (e.g. school layout) * conventions * keys and legends (symbols and explanations of the symbols) * grid references (regions and/or points) * orientation to north   Direction and angle   * the four compass points (N, S, E, W) * connection between compass points and the amount of turn |

## Resources

* floor plan of the museum to be visited
* a variety of simple maps and plans that use alphanumeric grids including a map of the school, or the floor plan of classroom or library
* blank floor plan with a non-labelled grid for each student
* blank calendars (two per child)
* timetables for local public transport

1. Identifying and describing

### Focusing on the context

Students:

* discuss the excursion to the museum and identify prior knowledge of museums.

Focus questions could include:

Have you been to the museum we are going to on our excursion? What did you see there?

How long do you think it would take to get there in a bus? How do you know?

What other sorts of museums have you been to?

What sort of things do you expect to see when you go to a museum?

What examples of the ways mathematics is used would you expect to see at a museum?

How long do you think you would spend at one exhibit?

How do you make sure you see all the exhibits?

### Discussing the investigation

Students:

* brainstorm activities that may be included on the day of the excursion
* sequence the activities that will definitely occur on the day (e.g. departure from school, lunchtime)
* become familiar with the assessment tasks involved in the investigation. These might include:

a calendar of events leading up to, and including the date of, the excursion

a timetable of activities for the day of the excursion

the floor plan of the museum with their intended pathway marked

instructions that explain the pathway

a timeline illustrating the history of a selected item (e.g. the development of air transport or a chronology of the area from settlement to the present day).

### Identifying the mathematics in the investigation

Students:

* identify the mathematics involved in the investigation.

Focus questions could include:

What do you know about calendars?

How can we use a calendar to help us prepare for our trip to the museum?

What do you need to find out about before you begin your timetable of activities for the day of the excursion?

What words do you use when you are giving directions?

Have you ever had to give directions to someone before? Tell us about your experiences.

Who might you need to write directions for during this investigation? What might you be directing them to?

Have you ever used a map before? What did the map show you?

How could a map help us to get to the museum?

## 2. Understanding and applying

### Interpreting and creating plans and maps

Students:

* look at a plan of the classroom and identify items at a location (given the grid reference)   
  or describe the location of items using grid references.

Focus questions could include:

What piece of furniture is represented by the symbol at (a given grid reference, e.g. B3)?

Where is the teacher’s desk located on the plan?

Who sits closest to (a given grid reference, e.g. F5)?

What is the grid reference for (a particular student’s) desk?

* create a simple floor plan, on a blank grid, of an area with which they are familiar   
  (e.g. their bedroom, the library)
* form pairs and describe their floor plan to each other
* add the alphabet and number labels to the grid on their floor plan to create an alphanumeric grid. Floor plans may be stored in student journals
* discuss the floor plan of the museum they will visit on their excursion using a group strategy such as Think, Pair, Share to facilitate the discussion

Focus questions could include:

If you have been to the museum before, which exhibits or displays did you see?

Which parts of the museum would you like to visit on the excursion?

What icons can you recognise?

What do the numbers on the plan represent?

* mark exhibits their group would like to visit during their excursion.

**Note:** If students have little prior experience with plans and maps, it may be necessary to develop their understanding by introducing plans and maps of familiar areas before introducing those of unfamiliar areas such as the museum and the local district. The following activities provide opportunities to explicitly teach, or revise, the knowledge and strategies needed to interpret and create plans and maps.

### Using maps

Students:

* use a map of the school grounds to:

locate familiar areas on the map using an alphanumeric grid

describe how they would get from the classroom to another place on the map

draw a pathway on the map then follow it or give directions to a partner to follow

describe the angle of turn from one location to another — for example, walk to the end of the library block then turn 90º to your right

pace out an area of the school and compare it with the size of the representation on the map

* identify simple symbols used on maps and plans
* add appropriate symbols to their map of the school
* create a key and legend to explain the symbols on the school map
* mark north on the map and discuss south, east and west
* look at a map that shows the route from the school to the museum and discuss the school’s orientation to north
* in pairs, discuss other features of the map.

Focus questions could include:

Where is the school on the map?

Where is your house on the map?

What route do you take to get from home to school?

Which suburbs have you visited?

What can you see on the map that is north of the school?

What direction is the Post Office, for example?

What is the best route from school to the museum? Why?

What other routes could we take? Would we see more interesting things that way?

What will we pass on the way to the museum? Use the grid references or compass points to describe the position.

Which route does the public transport take to the museum?

### Reading and recording dates and times

Students:

* discuss calendars.

Focus questions could include:

What are calendars used for?

What could you expect to see on a calendar?

What does ‘M’ stand for on the calendar?

What is the abbreviation for Friday?

How many fortnights are there in a calendar month?

How could we use a calendar to tell if this is a leap year?

What class events could we write on the calendar?

Which part of the calendar shows the date of our visit to the museum?

What day of the week is that and how many days away from today?

* record the events they discussed using a blank calendar for this month and the next   
  (e.g. sports days, birthdays, excursions, special guests)
* record the dates of special events using the format dd/mm/yy
* discuss 12-hour displays on a clock face
* explain how long it takes for each hand to pass from one number to the next
* read the time on the classroom clock at different times of the day
* read and record time using analogue and digital displays
* record times of events during the school day in a class diary or on a timeline for several days (e.g. 9 a.m. — parade; quarter-past 10 in the morning — library; 2:30 p.m. — singing)
* use familiar events to construct a timeline showing years (e.g. their own lives from birth to present, major events in the history of the school)
* use personal referents to help them estimate the duration of events (e.g. ‘30 seconds is about how long it takes to say my 5s number facts’ or ‘A minute is about how long it takes me to tie my shoes’ or ‘half an hour is how long my favourite TV show lasts’)
* calculate how long a particular event lasts and how much time passes between one particular event and another using seconds and minutes
* suggest other ways of recording the duration of events (e.g. 90 minutes is the same as   
  1½ hours or 1 hour 30 minutes; or 24 hours is the same as one day)
* interpret timetables of local public transport.

Focus questions could include:

Have you caught a bus/train shown on this timetable? Where did you get on? How often does the bus/train pass by that stop? Where did you get off? How long did that trip take?

What time does the bus/train leave the stop nearest the school on weekdays?

Does the bus/train travel near the museum? If so, how long does it take to travel from the school to the museum?

If we caught public transport to the museum, which bus/train would we have to catch to get to the museum by 9:30 a.m.?

### Planning an itinerary

Students in groups:

* discuss the timing of events for the day of the excursion

Focus questions could include:

What time will you have to arrive at school?

What time will the bus/train leave?

How long do you think the trip will take?

What is another way of saying that amount of time?

What will we do in the morning?

What will we do after lunch?

If we have to be back at school by 2:45 p.m., for example, what time will we need to leave   
the museum?

How much time will you need at each exhibit? Can you say that using another time unit?

How long will we have for lunch and what time shall we schedule that for?

record the times for known events on a blank timetable or timeline (e.g. the time of departure, return to school, lunchtime)

* roleplay spending time at exhibits to help estimate the time to allow for the number of   
  exhibits chosen.

### Working independently

Once students can confidently work with plans and maps that use alphanumeric grids, give directions and use calendars, timetables and timelines provide them with opportunities to develop their itinerary and pathways for their day at the museum. Students may choose to present some of this information in the form of a visitors’ guide to the museum. Students create a timeline showing the history of one museum exhibit using information gathered during their excursion.

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| Assessing learning |
| Sources of evidence could include:   * discussions * maps * plans * students’ explanations of work in progress * student journals.   When making judgments, teachers consider whether the student has:   * interpreted and created maps and plans * used a range of mapping conventions * described locations using major compass points, angles and grids * given directions using major compass points, angles and grids * read, recorded and calculated with 12-hour time * interpreted calendars and simple timetables. * sequenced events by time * arranged places or objects to create simple maps and plans. |

## 3. Communicating and justifying

### Presenting the plan

Before the day of the excursion, students:

* present their proposed itinerary and describe their conclusions about the most efficient pathway to see their chosen exhibits. The audience may be other members of the group they will be with at the museum, the whole class, or the teacher. Students may choose to take the role of a museum guide, or use their visitors’ guide as part of their presentation
* challenge the efficiency of the pathway chosen by other students or the time allowed to view each exhibit
* justify choices using the knowledge, procedures and strategies used to reach their conclusions
* complete feedback sheets about the ideas presented by one or two other students.

### Reporting on the excursion and reflecting on the learning

* After the excursion students:
* complete a timeline illustrating the history of their chosen exhibit
* discuss their timelines using a group strategy such as ‘the expert’s chair’
* revisit the pathways they suggested before the excursion and modify to show improvements in the light of the visit
* describe improvements they would make to their itinerary if they were to visit the museum again
* modify their visitors’ guide to reflect improvements
* present their reports to an audience
* discuss the excursion, or complete reflection sheets, to describe the learning that has taken place.

Focus questions could include:

How was the route the bus driver took the same as or different from the route you had planned?

What problems, if any, did you have finding your way around the museum?

How did your floor plans help?

Did you have the right amount of time to see everything you wanted to see? If not, why?

What clear directions did you give to help someone in your group?

Which parts of your itinerary did you have trouble sticking to? Why?

What would you change about your itinerary if you could start the day again?

Which parts of your itinerary worked well?

When do you think it might be useful to plan an itinerary again?

Who might plan itineraries or pathways in their jobs?

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| Assessing learning |
| Sources of evidence could include:   * itineraries of excursion day * floor plans of museum showing pathway * clarification and justification of choices * reflection sheets * visitors’ guides.   When making judgments, teachers consider whether the student has:   * read, recorded and calculated with 12-hour time * interpreted calendars and simple timetables related to daily activities * interpreted and created maps and plans * used a range of mapping conventions * described locations using major compass points, angles and grids * given directions using major compass points, angles and grids. |

## Links

This investigation could be connected to core learning outcomes from another key learning area   
— for example, Studies of Society and Environment.

### Studies of Society and Environment

**Strand** Continuity and Change

**TCC 3.5** Students describe various perspectives based on the experiences of past and present Australians of diverse cultural backgrounds.

Students gather information about:

* leisure activities of past generations
* scientific and technological advances
* cultural diversity of Australia’s early settlers
* the effects of the First and Second World Wars.

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| For more information, refer to the elaborations in the *Years 1 to 10 Studies of Society and Environment Sourcebook Guidelines,* which are available online from the QSA website: www.qsa.qld.edu.au |

## Acknowledgment

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