 Year 11 Mathematics Standard (Rhombus)

Unit title: MS-M2 Working with Time

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Duration: 2 weeks (rhombus students)

Rationale

Students develop awareness of being a global citizen and the relationships between different countries in terms of location, distance and time.

Topic focus

The principal focus of this subtopic is to understand concepts related to locations on Earth’s surface and calculation of distances and time differences using latitude, longitude and time zones.

Prior knowledge required

* MA4-15MG performs calculations of time that involve mixed units, and interprets time zones

Language considerations

* There are terminologies students will be required to understand. They will be listed/outlined within each learning outcome

Outcomes

A student:

* solves problems involving quantity measurement, including accuracy and the choice of relevant units MS11-3
* performs calculations in relation to two-dimensional figures MS11-4
* uses appropriate technology to investigate, organise and interpret information in a range of contexts MS11-9
* justifies a response to a given problem using appropriate mathematical terminology and/or calculations MS11-10

Assessment (including formative and summative)

Summative Assessment: Journey of a Lifetime

| Content | Teaching and learning strategies and evidence of learning | Resources |
| --- | --- | --- |
| * calculate times and time differences around the world AAM ◊
	+ review using units of time, converting between 12-hour and 24-hour clocks and calculating time intervals
 | Language:Show the difference in expression when talking in 12-hour or 24-hour time. Explain how to say 24-hour time e.g. 0700 is ‘oh seven hundred’ or 1530 is ‘fifteen hundred and thirty’Teaching Strategies:Explain the difference between 12-hour and 24-hour time* 12-hour time uses 1 to 12 to indicate the hour; morning or before midday is AM and evening or after midday is PM
* 24-hour time uses four digits from 0000 to 2359; add 12 to the morning time for time after midday
* the minutes in 12-hour and 24-hour time are the same

Discuss with students the differences in calculating time intervals when using 12-hour time and 24-hour by doing problems with equivalent times. * In 12-hour time, if the times are both AM or both PM, subtract to find the time difference. If one of the times is AM and one of the times is PM, use 12:00 minus the AM time, then add the number of hours/minutes after 12:00PM
	+ The time difference between 6:00AM and 8:00PM: 12:00-6:00 = 6 hours: Hours after 12:00PM = 8 hours; Total time difference = 6 + 8 = 14 hours
* In 24-hour time, subtract the earlier time from the later time as you would for numerals
	+ The time difference between 0900 and 1615: 1615 - 0900 = 715 which reads as 7 hours & 15 minutes

Important to remember - there are 60 minutes in an hour and 60 seconds in a minute. * For example, when finding the time difference between 0434 and 1000, subtract 34 minutes from 60 minutes and reduce 10 to 09 before subtracting 04. 1000 - 0434 = 526 which is 5 hours & 26 minutes
	+ Sample questions: what is the time difference from 3:00AM to 5:00PM and 0300 to 1700? Compare the methods of calculation; Calculate the time difference between 1220 and 1605.

Research or show students where both are used:* 12-hour time is used on phones, laptops (both can also be set to 24-hour time)
* 24-hour time is used for train timetables, in the military
* Discuss with students what they think are the advantages or disadvantages of both systems

Activities:* Time Tools - 24-hour to the minute: Students can use tabs along the top for practice and testing in the reading of analog clocks and converting these to 12-hour and 24-hour time.
* Calculate Time Intervals in 12-hr System and 24-hr System - Students can practise finding time interval calculations of 12-hour time and 24-hour time using the interactive website which provides instant feedback and hints.
* Movie Times - Students can apply knowledge of time intervals to lengths of movies and how they run in real time.
	+ Movie time intervals activity link on the right.
	+ Extension: Students plan a movie marathon night with their friends. They have 12-hours to watch 6 different movies of their own choice. Students can answer evaluation/explanation questions related to the activity: Can they fit in all 6 movies? Can they fit in an extra movie? Is there time to eat/sleep throughout the night? etc.
* More practice is available through Math Drills website.

Evidence of Learning:Students can complete a matching card game where they must match 12-hour times and 24-hour times. Analog clocks can also be added to this matching activity. Teacher to check completed activity.A matching card game with time interval calculations (in both 12-hour time and 24-hour time) and corresponding answers can be a secondary activity to test students’ ability to perform time calculations. | PretestAsk students to complete the following questions:How many days have you been alive? Approximately how many seconds is that?Websites to demonstrate the concept of time elapse:[Find the elapsed time](https://learnzillion.com/lesson_plans/446?card=9681): https://learnzillion.com/lesson\_plans/446?card=9681[What is elapsed time](http://study.com/academy/lesson/what-is-elapsed-time-definition-examples.html): http://study.com/academy/lesson/what-is-elapsed-time-definition-examples.htmlInteractive Website: [Time Tools: 24-hour to the minute](http://splash.abc.net.au/res/i/L9642/index.html) http://splash.abc.net.au/res/i/L9642/index.htmlInteractive Website: [Calculate Time Intervals in 12-hr System and 24-hr System](http://www.onlinemathlearning.com/time-interval.html) http://www.onlinemathlearning.com/time-interval.html[Movie Time Intervals](http://www.transum.org/Software/SW/Starter_of_the_day/starter_September9.ASP) http://www.transum.org/Software/SW/Starter\_of\_the\_day/starter\_September9.ASP[Printable Worksheets](https://www.math-drills.com/timeworksheets.php) – Math Drills https://www.math-drills.com/timeworksheets.phpWorksheets for students on time conversions and calculating time intervals of all types (scroll to points 15 to 21)[Diagrams, Teaching Strategies and Worksheets](http://www.math-salamanders.com/24-hour-clock-conversion.html) http://www.math-salamanders.com/24-hour-clock-conversion.htmlTeachers can use strategies and worksheets for students to consolidate their learning. Most appropriate for students doing the Standard 1 pathway |
| * + solve problems involving time zones in Australia and in neighbouring nations, making any necessary allowances for daylight saving (ACMEM163) Asia and Australia’s engagement with Asia icon Personal and social capability icon Civics and citizenship icon
	+ solve problems involving Coordinated Universal Time (UTC), and the International Date Line (IDL)
	+ find time differences between two places on Earth using recognised international time zones (ACMEM165) Intercultural understanding icon Personal and social capability icon
 | Language:Explain abbreviations and meanings of UTC (Coordinated Universal Time) and IDL (International Date Line) and show these using a map or globe.Explain to students that previously the UTC was known as the Prime Meridian and are still often shown on maps.Teaching Strategies:Students should have a copy of a time zone map as reference for lessons.Activities:* Time Difference Calculations - Students can use the Time Zones website to find the time difference between cities.
	+ Students need to find Sydney and write down the current time
	+ Then they can choose five cities (red dots) on the map that are in different time zones from each other and write down the current time for those cities
	+ Students then find the time difference between each chosen city and Sydney
	+ They can also find the time difference between the five cities they have chosen.
* Students can research the time difference of Australian states with reference to the UTC and explain the differences when daylight saving is applied.
	+ Some information on [Daylight Saving Time](https://www.timeanddate.com/time/dst/) https://www.timeanddate.com/time/dst/

Students can use the World Clock and the list of cities included to find which time zone a city is located with reference to the UTC.* The teacher chooses two cities for students to work out which time zone it is located using current Sydney time (UTC+10:00):
	+ What time is it in Shanghai and which timezone is it located in?
	+ Students then get to choose five cities of their own to work out which timezone they are located
* Students can label a world map that is divided up into the time zones but they have to label the time difference with reference to the IDL.

Evidence of Learning:Students should be able to locate the UTC and IDL on a map and use time zones to calculate the time in another part of the world. They should be able to find the time differences between places in the world. | [Time Zones Printable](https://www.cia.gov/library/publications/the-world-factbook/graphics/ref_maps/physical/pdf/standard_time_zones_of_the_world.pdf) https://www.cia.gov/library/publications/the-world-factbook/graphics/ref\_maps/physical/pdf/standard\_time\_zones\_of\_the\_world.pdf[Time Zones](https://www.timeanddate.com/time/map/) https://www.timeanddate.com/time/map/[Time in Australia (Wikipedia)](https://en.wikipedia.org/wiki/Time_in_Australia) example of a website students can use for their research https://en.wikipedia.org/wiki/Time\_in\_Australia[World Clock](https://www.timeanddate.com/worldclock/) https://www.timeanddate.com/worldclock/ |
| * + review how to interpret timetables, for example, bus, train and ferry timetables, and use them to solve problems Personal and social capability icon Civics and citizenship icon
 | Teaching Strategies:Show students a variety of timetables from different sources. Include hard copies as well as interactive websites.Review how to interpret timetables using an existing timetable of any mode of transport. Examples of questions to ask:* What is the purpose of this timetable?
* What features does this timetable have?
* What would happen if this timetable did not exist?
* How long is the journey between Stop A & Stop B?
* What time would you arrive at Stop B if you took the 2:15PM from Stop A?
* What is the latest time I can leave Stop A to arrive at Stop B before 12:00PM?

Activities:* Planning a day out - students plan a trip to their favourite (or choose one from a few the teacher selects) recreational destination in Sydney (or another Australian city) by public transport.
	+ Students must search for the timetables they will need for the trip and save this as evidence for their work
	+ Give students a time they must get to the destination and a time they must reach home.
	+ Have students plan three possible routes that they could take that uses different modes of transport or show different lengths to the journey
	+ Make sure they include what time they will need to leave home and how long the journey will take

Evidence of Learning:Students are able to answer any of the above questions and other related questions for any type of timetable that is presented to them. | [Sydney Trains Timetables](http://www.sydneytrains.info/timetables/#landingPoint) http://www.sydneytrains.info/timetables/#landingPoint[Sydney Bus and Ferry Route Timetables](Sydney%20Bus%20and%20Ferry%20Route%20Timetables) https://transportnsw.info/routes#/ |
| * + solve practical problems, for example, travelling east and west, incorporating time zones, or internet and phone usage across time zones, or the timing of events broadcast live from states of countries between different time zones Critical and creative thinking icon  Information and communication technology capability icon Intercultural understanding icon Personal and social capability icon
 | Language:Review how time zones are referred to in the media, particularly for Australian states: Australian Western Standard Time (AWST; UTC+08:00), Australian Central Standard Time (ACST; UTC+09:30), and Australian Eastern Standard Time (AEST; UTC+10:00)Compare these to other countries’ references to their time zones.Teaching Strategies:Use concrete materials such as an orange, a beach ball or basketball to show east and west of the UTC. A globe of the world would be ideal. Google Earth can be used to give perspective. [Download Google Earth](https://www.google.com/earth/download/ge/) onto your desktop to access more settings and features. https://www.google.com/earth/download/ge/Select View Grid to show North, South, East, West hemispheresActivities:* Use Google Earth to answer questions such as:
	+ In which hemisphere does Australia, the USA, Africa, or China lie?
	+ In which direction would you travel to get from Sydney to New Zealand/Lebanon/Canada
	+ Which direction would give the shortest distance if you were travelling from New York to London? From New York to Sydney?
* Compare TV guides for live broadcasts of events in different states of Australia.
* Have students calculate the time they would get to watch popular/favourite TV shows in their state. E.g. what is the earliest time and date I can watch the premiere of Season 7 of Game of Thrones if it is airing on HBO at 9pm, 17 July 2017 in the USA?
* Have students calculate what time they would be watching live events happening in other parts of the world e.g. the Olympic Games, FIFA World Cup, NBA Finals etc.
	+ Teachers provide the event, dates and times and students must calculate when they will watch it in Sydney (or their hometown). Daylight saving must be taken into account to keep it realistic. This can be made more difficult if students also have to calculate the viewing time in a country or city that is in a different time zone.
	+ Alternatively, students can also research the dates and times themselves for some given events (or chosen by students in the class) and then work out the time they will watch it in their hometown
* Help students apply their knowledge of calculating time differences to work out when it would be appropriate to call/Skype/Facetime friends or family overseas. They can continue to use the Times Zones website to assist in their calculations.
	+ Example scenario: One of your school friends has moved to Berlin, Germany for an exchange program for six months. You plan to Skype them weekly. If you cannot call during your school hours and their school hours and they will be sleeping after 12AM their time, between what hours can you Skype them? Some further questions to consider: Are the times realistic for you or for them? What may be some difficulties? Would one of you have to compromise your sleep or meal times?
	+ Example scenario: Your family in India love to hear from you every Saturday when they get together for dinner from 7:00PM. What time would you have to call them in Sydney to talk to them?

Evidence of Learning:Student should be able to explain whether they would be able to call/video chat a family member or friend in another city in the world at a given time by using appropriate calculations. They should also be able to work out what time and day they would be able to view particular live broadcasts. | [Time Zone Abbreviations](https://www.timeanddate.com/time/zones/) https://www.timeanddate.com/time/zones/[Countries In Both The Eastern And Western Hemispheres](http://www.worldatlas.com/aatlas/infopage/eastwestco.htm) http://www.worldatlas.com/aatlas/infopage/eastwestco.htmImages are a good illustration of how the east and west hemisphere are divided[Map with East and West Longitude](http://www.bdcc.co.uk/Gmaps/ll_grat_v3_demo.htm) http://www.bdcc.co.uk/Gmaps/ll\_grat\_v3\_demo.htm[Three-Dimensional Animation of the Earth](https://earth.google.com/web) https://earth.google.com/webTeachers can use Google Earth to demonstrate the longitudeTV GuideExample of a [TV guide students can use](https://au.tv.yahoo.com/tv-guide/73/0/0/11/) https://au.tv.yahoo.com/tv-guide/73/0/0/11/Select TV guides for different States and non-free-to-air channels along the top of the page[Biggest Events in Sport](http://bleacherreport.com/articles/1247928-ranking-the-biggest-events-in-sports) http://bleacherreport.com/articles/1247928-ranking-the-biggest-events-in-sportsResource for teachers to find real life examples of popular sporting events to create questions and scenarios from[Time Zones](Time%20Zones) https://www.timeanddate.com/time/zones/ |

Reflection and evaluation: