RICH MATHEMATICAL TASK BOOKLET

# MEASUREMENT TIME

YEAR 7 - 8
ODD YEARS

## Teacher Booklet

## Task 1

What can you do in a minute? Ten seconds? Thirty seconds? Five minutes?

Work with a buddy and make a table. Record five things you think you can do for the duration of each of the times.

After you have recorded a set use a stopwatch to test out how accurate you were with your prediction. Re-record and repeat each activity until you are almost accurate with your prediction.

## Teacher Notes

During the launch, have the students brainstorm everything they know about time. Begin a graffiti Time board which students add to in their independent time.

This is a whole class activity and students should list such things as hopping (left foot, right foot), skipping, writing name, lifting heavy book up and down, blinking, clicking.

Have stop watches of similar tools available. Develop a board where students record what they can do in specified lengths of time.

Facilitate the students to notice that accuracy of duration of different times can be measured using informal tools.

For the independent task, you will need the task below.

## Shareback

Select students to share who have systematically developed tables which accurately illustrate informal measures of the duration of different lengths of time. Discuss predictions and how accurate they were. What were the big differences?

## Big Ideas

*A clock is a circular number line - the hands move gradually around this number line.*

*On an analogue clock the hour hand shows the approximate time in the day and the minute hand shows a more exact time.*

*There are multiple ways to measure time and some units of time measurement are more appropriate than others within different contexts.*

*Time is displayed in different ways depending on the context.*

*Numbers that are used to measure time repeat themselves in a cycle.*

*Time measurements can be compared when they are converted into the same unit.*
*The magnitude of the attribute to be measured and the accuracy needed determines the appropriate measurement unit for time.*

*Conversion between units of time are more difficult than conversions between metric units because of the number systems used.*

## Connect

Why is it important to be able to measure accurately different durations of time without using a time measuring tool like a stopwatch?

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

How many minutes are there between each hour on an analogue clock? Make a number line of an analogue clock which shows from 6 A.M. to 11 A.M. Make sure you put all the markings in between. Record what the markings mean and then record the number they represent. What do you notice?

Use your timeline to show the activities you do between 8 and 9 o'clock on a school morning.

## Curriculum Links

***During Year 7***

*Read, interpret, and use timetables and charts that present information about duration*

*Convert between units of time and solve duration problems that involve fractions of time*

***During Year 8***

*Read, interpret, and use timetables, charts, and results that present information about duration*

*Convert times to a common unit, such as seconds or minutes, and use decimal units of time (milliseconds)*

## Mathematical Language

*Morning, afternoon, evening, night, day, tomorrow, yesterday, after, before, longer, shorter, equal, seconds, minutes, hours, week, month, year, decade, time, measurement, timeline, midday, midnight, noon, analogue clock, digital clock, clockwise, anticlockwise, circular numberline, circumference, intervals, quarter hour, half an hour, three quarters of an hour, duration*

# Anticipations

Solutions, Misconceptions

## Task 2

With your group record 6 things you all do over 24 hours.

Record what time you start and finish each of these things in hours and minutes on a 24-hour clock. Record the duration of each of these things.

Now make a timeline which shows the start and finish and duration of each of these activities.

Match the start and finish time with what they would look like on an analogue clock.

## Teacher Notes

Have digital, 24-hour clocks and analogue clocks for students to use.

Facilitate the students to notice that when measuring time we use different bases (for example, 60 seconds, minutes, 12 hours, 24 hours, 12 months, 7 days)

Expect students to represent using both 24-hour clocks and analogue clocks with accurate markings. Facilitate students to discuss how 24 hour time works. What explanations do they develop for how to convert to 24 hour time?

When discussing duration of time, how does subtraction of time work? Notice who is able to subtract time correctly. Can students make conjectures about what happens when we are adding and subtracting time vs when we are adding and subtracting using base 10? How does it differ?

For the independent task, use the task below.

## Big Ideas

*A clock is a circular number line - the hands move gradually around this number line.*

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## Shareback

Select students to share who are able to represent in multiple ways time and duration of time.

## Connect

How does an analogue clock match the duration of a year? What about a 24-hour clock? What do you notice about the different durations of time we measure?

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

Create a timeline for these birthdays

- 18 December 2011
- 29 October 2010
- 13 March 2011
- 17 February 2010
- 30 June 2010
- 27 June 2011
- 18 March 2010

What is the difference in time between your first date on the timeline and the mid-point date?
What is the difference in time between your first and last dates in months and days?

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# Anticipations

Solutions, Misconceptions

# Task 3

Represent your answers on both an analogue clock and a 24-hour clock.

1. Our umukai was put down seven and a quarter hours ago. If it is 12.15 P.M now, what time was it put down? It needs another four and a half hours to finish cooking. What time will it be lifted?

2. If the umukai was put down at 4:45, what time would it be lifted if it needs 11 and a half hours to cook?
If the women started preparing all the other food for the umukai at 9:55 the previous day and finished preparing it at 18.17, how long had the preparation taken?

## Teacher Notes

Have available both analogue and 24-hour clocks for students to use.

Facilitate the students to notice the need to use timelines as a way to represent time duration.

Have them recognise that when talking about time measurement and duration they use the base of 60, 24, and 12. Support them to notice how fractions of time are related, such as quarter and half an hour, and how this can me measured from any starting point, not just o'clock.

For the independent task, you will need the task below.

## Shareback

Select students to share who are able to explain and justify their reasoning using appropriate representations.

## Big Ideas

*A clock is a circular number line - the hands move gradually around this number line.*

*On an analogue clock the hour hand shows the approximate time in the day and the minute hand shows a more exact time.*

*There are multiple ways to measure time and some units of time measurement are more appropriate than others within different contexts.*

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*Conversion between units of time are more difficult than conversions between metric units because of the number systems used.*

## Connect

How is the base different from our number system when we are using minutes and hours on an analogue clock and a 24-hour clock?

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

Every year our school has a fiafia night.

If it starts at 5.45 P.M. and goes for 2 hours and 22 minutes. What time does it end?

At the school down the road their fiafia night starts at 18.55 and goes until 20.17.

Which school has a longer fiafia night?

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# Anticipations

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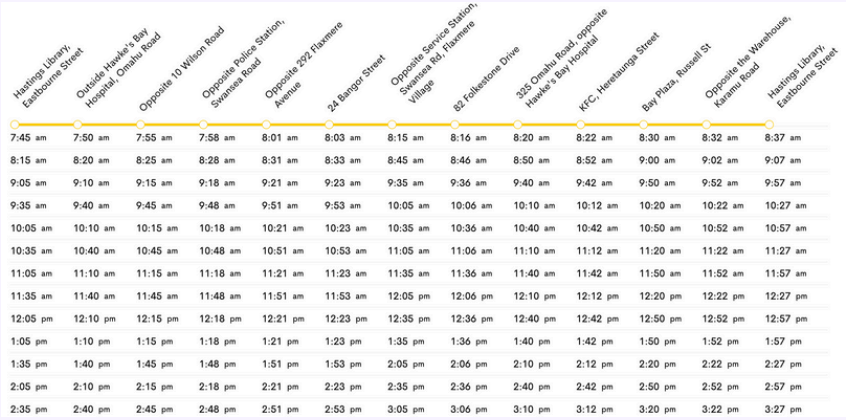
# Task 4

Losi needs to accompany her Nan to the Hastings hospital for an appointment. They are going to take the bus from Flaxmere. The closest stop is opposite 292 Flaxmere Avenue. The Hospital appointment is at 10.30 and should take about an hour. Nan has said that they can then go to Kmart at Bay Plaza as a thank you for helping out today. They will also have some lunch at Bay Plaza and then go home to Flaxmere.

Create a plan for Losi and her Nan showing where and what time they need to catch the bus at each stop and what time they will get home. Show how long they will spend at the hospital and at Bay Plaza.



| Hastings Library, Eastbourne Street | Outside Hawke's Bay Hospital, Omahu Road | Opposite 10 Wilson Road | Opposite Police Station, Swansea Road | Opposite 292 Flaxmere Avenue | 24 Bangor Street | Opposite Service Station, Swansea Rd, Flaxmere Village | 82 Folkestone Drive | 335 Omahu Road, opposite Hawke's Bay Hospital | KFC, Heretaunga Street | Bay Plaza, Russell St | Opposite the Warehouse, Karamu Road | Hastings Library, Eastbourne Street |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7:45 am | 7:50 am | 7:55 am | 7:58 am | 8:01 am | 8:03 am | 8:15 am | 8:16 am | 8:20 am | 8:22 am | 8:30 am | 8:32 am | 8:37 am |
| 8:15 am | 8:20 am | 8:25 am | 8:28 am | 8:31 am | 8:33 am | 8:45 am | 8:46 am | 8:50 am | 8:52 am | 9:00 am | 9:02 am | 9:07 am |
| 9:05 am | 9:10 am | 9:15 am | 9:18 am | 9:21 am | 9:23 am | 9:35 am | 9:36 am | 9:40 am | 9:42 am | 9:50 am | 9:52 am | 9:57 am |
| 9:35 am | 9:40 am | 9:45 am | 9:48 am | 9:51 am | 9:53 am | 10:05 am | 10:06 am | 10:10 am | 10:12 am | 10:20 am | 10:22 am | 10:27 am |
| 10:05 am | 10:10 am | 10:15 am | 10:18 am | 10:21 am | 10:23 am | 10:35 am | 10:36 am | 10:40 am | 10:42 am | 10:50 am | 10:52 am | 10:57 am |
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| 11:35 am | 11:40 am | 11:45 am | 11:48 am | 11:51 am | 11:53 am | 12:05 pm | 12:06 pm | 12:10 pm | 12:12 pm | 12:20 pm | 12:22 pm | 12:27 pm |
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| 2:05 pm | 2:10 pm | 2:15 pm | 2:18 pm | 2:21 pm | 2:23 pm | 2:35 pm | 2:36 pm | 2:40 pm | 2:42 pm | 2:50 pm | 2:52 pm | 2:57 pm |
| 2:35 pm | 2:40 pm | 2:45 pm | 2:48 pm | 2:51 pm | 2:53 pm | 3:05 pm | 3:06 pm | 3:10 pm | 3:12 pm | 3:20 pm | 3:22 pm | 3:27 pm |

## Teacher Notes

For the task, have timetables printed for students to access (see copy masters). Facilitate students to notice and record how long the bus ride take so that the appointment can be reached on time. The bus operates on a circular route so support students to notice this.

For the connect, ask students to calculate time taken for bus rides between various stops.

For the independent task, use the task below.

## Shareback

Select students to share who are able to explain and justify their solutions using appropriate representations of their timeline of the days activities.

## Big Ideas

*A clock is a circular number line - the hands move gradually around this number line.*

*On an analogue clock the hour hand shows the approximate time in the day and the minute hand shows a more exact time.*

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## Connect

Work out how long the bus ride is between:

- Hastings Library and KFC
- Wilson Road to The Warehouse
- The Warehouse to Swansea Road

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

Using the Flaxmere / Hastings bus timetable, plan your own adventure day. Remember to include what time you get on the bus and how long you will be at each stop.

## Curriculum Links

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# Anticipations

Solutions, Misconceptions

# Task 5

Parveen and her family are going to Fiji to have a holiday with their family.

They have two choices of flights.
Air New Zealand departs 12.55 and takes 3.1 hours.
Fiji Airways departs 11.35 and takes 3.2 hours.

Fiji is one hour behind NZ and the distance between Fiji and NZ is 2151 kms. The flying speed on average is 804.67 km per hour.

1. What time would they land in Fiji if they take either flight?
2. If they travelled at a constant flying speed of 804.67 km per hour, what time would they land on either flight?
3. What is the time difference between your answer to the first and second question?

Can you explain why the flight takes longer than their average flying speed?

## Teacher Notes

Facilitate the students to notice that time can be written as a decimal and that it is often used by airlines but most often in everyday use it is recorded as hours and minutes to suit the different contexts. Support students to explore the relationship between 0.1 and 6 minutes, rather than 10 minutes. Encourage students to make conjectures about how to convert decimals of hours into minutes.

For the connect, the relationship between decimals and fractions of hours and minutes can be represented on a number line.

For the independent task, use the task below.

## Shareback

Select students to share who are able to explain and justify their solutions using appropriate representations.

## Big Ideas

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## Connect

Rename in hours and minutes:
3.1 hours
3.2 hours
3.5 hours
3.9 hours

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

After school Jessica watched three television shows.

The first started at 3:12 and went for three quarters of an hour. The next went from 4:03 and finished at 4:40 and the last one started at 5:07 and ran for seven minutes short of an hour.

How much television did she watch?

What time did she finish watching television?

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# Anticipations

Solutions, Misconceptions

## Task 6

In the Year 8 Girls 100m sprint finals, Mikayla had a winning time of 14.58 seconds. Third place was Cara who had a time of 14.68 seconds. Annah came second but wasn't sure of her time. What are 12 different times Annah could have run the 100m to win second place?

## Teacher Notes

During the launch facilitate a discussion about when students have seen small units of time being used such as swimming and running races.

Facilitate the students to notice the need to use timelines as a way to represent measurement of time.

Notice students who use accurate intervals for measuring duration of milliseconds and how this links to the base 10 number system rather than base 60.

Expect students to represent using timelines as a way to explain and support their reasoning.

For the independent task, use the task below.

## Shareback

Select students to share who are able to explain and justify their reasoning using comparative representations.

## Connect

What did you notice about how representations supported you to explain and justify your reasoning?
How are milliseconds and decimal numbers linked?

## Big Ideas

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## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time, fractions and decimals

## Independent Tasks

These are the race results from a Formula 1 race. How long did Lando Norris and Charles Leclerc take to complete the race?

| POS. | NO. | DRIVER | TEAM | LAPS | TIME / RETIRED |
|---|---|---|---|---|---|
| 1 | 1 | Max Verstappen | Red Bull Racing | 56 | 1:34:00.161 |
| 2 | 4 | Lando Norris | McLaren | 56 | +7.959s |
| 3 | 16 | Charles Leclerc | Ferrari | 56 | +15.373s |

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# Anticipations

Solutions, Misconceptions

# Task 7

What is the time difference?

1. You get up at 6.16 A.M. and you go to bed at 9.05 P.M?
2. You go to the library at 12:47 and you leave it at 13: 25?
3. You have dinner at 6.39 P.M., and you clear the table at 19:21?
4. You go to bed at a quarter to 10 and wake up at 8:01?
5. This month is November 2025. Covid began in January 2020?
6. You were born in 2012, your mother was born in 1986, and your nana was born in 1961 and great grandmother was born in 1933?
7. This is 2025. The first Olympic games were believed to have begun 2800 years?
8. The next Winter Olympics are in 2026. The first Winter Olympics were held in 1924. How many decades ago was that?
9. My family all live in New Zealand, but my grandparents left Niue to live in New Zealand 5 and a quarter decades ago?
10. Abel Tasman was the first of the European explorers to visit New Zealand. He arrived almost 3 and a half centuries ago. If we are in 2022, when did he first come to New Zealand?

## Teacher Notes

Facilitate the students to notice the need to convert across different measurements to calculate different durations of time.

For the independent task, use the task below.
Have access to the link and as needed print the different ones needed in
http://newzealandwars.co.nz/land-wars-timeline/full-timeline/

## Shareback

Select students to share who are able to explain and justify their reasoning.

## Big Ideas

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## Connect

What time measurement conversions do you use to calculate durations of time?

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Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

Aotearoa has a sad history shown in the Land Wars which took place in the 18th Century.

Make a timeline beginning with the first events in the Land Wars in Wairau and include in your timeline the events in the Northern War, Wellington, and Whanganui.

What was the duration of time from the first event to the last event across the timeline?

What other lengths of time can you notice across your timeline. Record at least five of these.

http://newzealandwars.co.nz/land-wars-timeline/full-timeline/

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# Anticipations

Solutions, Misconceptions

# Task 8

Use the Air New Zealand flight chart to plan a return trip to Tonga and back for you and your family. The distance to fly from New Zealand to Tonga is 2383 km. The flight to Tonga takes approximately 2 hours and 55 minutes. The back from Tonga takes approximately 3 hours and 15 minutes.

Choose a day to travel on and a day to return.

Make a timeline which shows in both analogue and on a 24-hour clock the flight to Tonga and the flight back to New Zealand. Include on the timeline the distance you have travelled:

The time you need to be at the Airport to check in.
The time you need to be in the departure lounge ready for boarding.
The time you would board before take-off.
The time the meal is served a quarter of the way through the flight.
The time you have to get ready for landing after you have completed 5/6 of the flight.
The landing time.
The time it takes to get through immigration and collect your luggage.

Write some statements you can make from your timeline.

## Teacher Notes

Facilitate the students to notice the way most timetables use a 24-hour clock for accuracy. However, many people convert this to an analogue time and so how time is recorded depends on the context.

For the independent task, you will need the task below.

## Shareback

Select students to share who are able to use a timeline representation to explain and justify their statements.

## Big Ideas

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## Connect

The flight time between Auckland and Tonga is approximately 2 hours 55 minutes but when I googled it, it said 2.61 hours. Are both correct? Why or why not?

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

When measuring time in years we talk about decades and centuries. What decade are we in now? What century are we in? Use your timeline to identify the decade and century an event occurred.

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# Anticipations

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## Task 9

Is Strickland, right?

He says that if the time has a 4 in it, it must be 4 o'clock in the afternoon.

Don agrees with him, and he says he has a way of proving it. What might he say?

Generosa disagrees with him, and she says she can give lots of times it might also be. What times might she use to justify her disagreement?

## Teacher Notes

Facilitate the students to notice the pattern of numbers used to describe seconds, minutes and hours.

Monitor for students using vocabulary which supports their explanations and justification including the use of because.

For the independent task, you need the task below.

## Shareback

Select students to share who are able to explain and justify their reasoning.

## Connect

What are all the possible numbers we might see on an analogue clock?

## Big Ideas

*A clock is a circular number line - the hands move gradually around this number line.*

*On an analogue clock the hour hand shows the approximate time in the day and the minute hand shows a more exact time.*

*There are multiple ways to measure time and some units of time measurement are more appropriate than others within different contexts.*

*Time is displayed in different ways depending on the context.*

*Numbers that are used to measure time repeat themselves in a cycle.*

*Time measurements can be compared when they are converted into the same unit.*
*The magnitude of the attribute to be measured and the accuracy needed determines the appropriate measurement unit for time.*

*Conversion between units of time are more difficult than conversions between metric units because of the number systems used.*

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

Maria has dance class at 4.15pm every Wednesday. She takes 17 minutes to walk to class from home. What time must she leave home to get to dance class?

George runs around the block 3 times every evening. The first lap takes him 9 minutes. The second lap takes him 11 minutes. The final lap takes him 15 minutes. How much time does it take for George to complete his 3 laps?

## Curriculum Links

***During Year 7***
*Read, interpret, and use timetables and charts that present information about duration*

*Convert between units of time and solve duration problems that involve fractions of time*

***During Year 8***
*Read, interpret, and use timetables, charts, and results that present information about duration*

*Convert times to a common unit, such as seconds or minutes, and use decimal units of time (milliseconds)*

## Mathematical Language

*Morning, afternoon, evening, night, day, tomorrow, yesterday, after, before, longer, shorter, equal, seconds, minutes, hours, week, month, year, decade, time, measurement, timeline, midday, midnight, noon, analogue clock, digital clock, clockwise, anticlockwise, circular numberline, circumference, intervals, quarter hour, half an hour, three quarters of an hour, duration*

# Anticipations

Solutions, Misconceptions

# Task 10

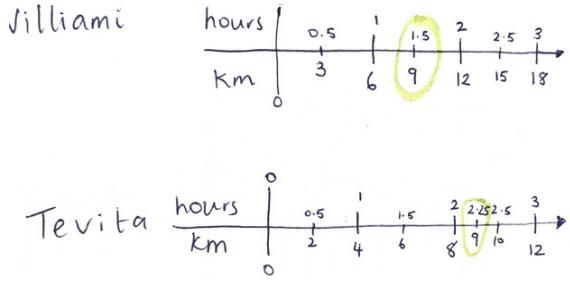
Villiami and Tevita live in different villages.

Both villages are 9 kilometres away from the nearest market.

Villiami rides his bike at 6 kilometres per hour and Tevita rides his at 4 kilometres an hour.
They both want to arrive at the market at exactly noon.
What time should each of them start riding?

## Teacher Notes

Facilitate the students to notice how time distance and speed are connected. Ratios can be represented on a double number line such as the one below and this can be modelled during the connect to support conceptual understanding. Begin by marking the whole hours and corresponding km. Then find half hours and for Tevita's travel time find




Notice students who need support to convert 1.5 hours in 1 hour 30 minutes rather than 1 hour 50 minutes and 2.25 hours into 2 hours 15 minutes rather than 2 hours 25 minutes, and who is able to subtract this from 12.00 to find each persons starting time.

## Shareback

Select students to share who have developed explanations and are able to justify their mathematical reasoning using a representation.

## Connect

Change the speeds and / or distances to practice calculating time taken to travel.

## Big Ideas

*A clock is a circular number line - the hands move gradually around this number line.*

*On an analogue clock the hour hand shows the approximate time in the day and the minute hand shows a more exact time.*

*There are multiple ways to measure time and some units of time measurement are more appropriate than others within different contexts.*

*Time is displayed in different ways depending on the context.*

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*Conversion between units of time are more difficult than conversions between metric units because of the number systems used.*

## Suggested Learning Outcomes

Represent time using digital and analogue clocks

Represent time using digital and analogue language (such as quarter to)

Investigate duration of events and time between events

Explain relationships between units of time

## Independent Tasks

Complete the following assessment task (attached at the end of the document) as the independent activity:

Assessment Task 1: My Timetable

## Curriculum Links

***During Year 7***
*Read, interpret, and use timetables and charts that present information about duration*

*Convert between units of time and solve duration problems that involve fractions of time*

***During Year 8***
*Read, interpret, and use timetables, charts, and results that present information about duration*

*Convert times to a common unit, such as seconds or minutes, and use decimal units of time (milliseconds)*

## Mathematical Language

*Morning, afternoon, evening, night, day, tomorrow, yesterday, after, before, longer, shorter, equal, seconds, minutes, hours, week, month, year, decade, time, measurement, timeline, midday, midnight, noon, analogue clock, digital clock, clockwise, anticlockwise, circular numberline, circumference, intervals, quarter hour, half an hour, three quarters of an hour, duration*

# Anticipations

Solutions, Misconceptions

# Assessment Task 1 - Measurement - Time - Year 7 / 8

Calculate these time differences.
Can you give the answer in at least two different time measurements e.g. days and hours ?

1. You get up at 7.16 A.M. and you go to bed at 9.05 P.M?

2. You start playing tag a 12:47 and you stop at 13: 25?

3. You have dinner at 6.39 P.M., and you do the dishes at 19:21?

4. You go to bed at a quarter to 9 and wake up at 7:01?

5. This month is December 2025. Covid began in February 2020?

6. I was born in 2013 my nana was born in 1967 and my great grandmother was born in 1945?

7. Queen Elizabeth the 2$^{nd}$ died in 2022. Her predecessor Queen Elizabeth the 1$^{st}$ died in 1663?

8. It is February. We had our Kapa Haka competition in April last year?

9. My family all live in New Zealand but my grandparents left Samoa to live in New Zealand 3 and a quarter decades ago?

10. Abel Tasman was the first of the European explorers to visit New Zealand. He arrived almost 6 and a half centuries ago. If we are in 2025, when did he first come to New Zealand?