

Measure and Calculate Duration.

Table of Contents

Teaching Plan Overview and Summary.....	page2
Measure duration of events using a stop watch.....	page3
Calculate duration using start and finish time	page6

Differentiate and Assess

Not every student will be ready to investigate this concept at this Level and so we will need to differentiate to ensure every student is learning at their leading edge. Select the Differentiate button on this screen.

Integrate

Every mathematical concept is integrally related to other mathematical concepts. Teaching and learning related concepts simultaneously develops deep relational understanding. Select the Integrate button on this screen.

Intervene

Some students may not yet be ready to investigate this concept at any Level, and so we will need to provide some intervention. Select the Intervention button on this screen.

MEASURE AND CALCULATE DURATION.

EXPLICIT TEACHING PLAN OVERVIEW PAGE

THIS PAGE IS A SUMMARY OF THE EXPLICIT TEACHING PLAN, INCLUDING STRATEGIC QUESTIONS, AND DESCRIBING THE SEQUENCE WHICH WILL OCCUR OVER MULTIPLE LESSONS.

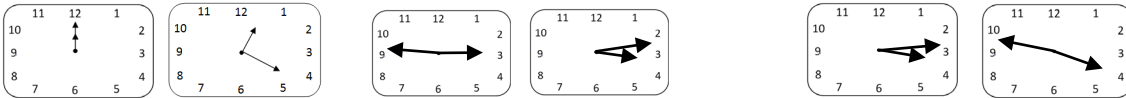
RESOURCES: ANALOG CLOCKS WITH HANDS THAT MOVE IN SYNC, MAP / GLOBE SHOWING MERIDIANS OF LONGITUDE, PENCIL, PAPER

WHAT COULD WE DO?

Children:

- use a stop watch to measure time duration

- calculate time duration using start and finish time on an analog clock, for example,



12:00 till 12:24 = 24 minutes, 14 minutes to 3 till 12 minutes past 3, 12 minutes past 3 till 12 minutes to 4

14 minutes + 12 minutes = 26 minutes 18 minutes + 18 minutes = 36 minutes

- calculate time duration using start and finish time on a digital clock, for example,

2:46 **3:12**

14 minutes to 3 till 12 minutes past 3
14 minutes + 12 minutes = 26 minutes
minutes

2:46 **5:12**

14 minutes to 3 till 12 minutes past 5
14 minutes + 2 hours + 12 minutes = 2 hours and 26 minutes

WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

Children:

- ask one another questions about calculating time duration using start and finish time, for example:
 - ▶ What is the start time?
 - ▶ What is the finish time?
 - ▶ How could we calculate the duration between these times?
 - ▶ How many minutes to the hour?
 - ▶ How many minutes past the hour?
 - ▶ How many minutes altogether?
 - ▶ How many hours?
 - ▶ How many minutes and hours between the start and finish times?

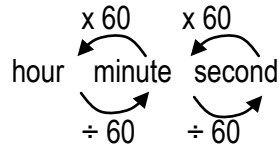
MEASURE AND CALCULATE DURATION.

EXPLICIT TEACHING PLAN

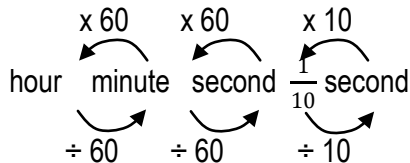
FULL EXPLICIT TEACHING PLAN, EMBEDDING DEEP RELATIONAL UNDERSTANDING, METALANGUAGE, AND QUESTIONS THAT MAY BE USED OVER MULTIPLE LESSONS.

WHAT COULD WE DO?	WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?
<p>Children think about, talk and listen to a friend about, then have the opportunity to share what they already know.</p> <p>Display a stopwatch, for example, on an interactive whiteboard or smart phone. Record, for example, duration.</p> <p>Record, for example, elapsed Distribute a stopwatch to children in pairs.</p> <p>Allow children to investigate starting and stopping the stopwatch.</p> <p>Children press a button to start their stopwatch timing.</p>	<ul style="list-style-type: none">▶ Today brings an investigation about duration of time.▶ What do you know about duration of time?▶ Talk about duration of time with a friend.▶ Is anyone ready to share what they are thinking about duration of time? ▶ Let's investigate time duration using a stopwatch.▶ What does duration mean?▶ Does duration just mean how long something takes?▶ Does duration mean how much time has passed?▶ Does duration mean how much time has elapsed? ▶ Have you seen a stopwatch before?▶ When we press a button, it counts up or down seconds.▶ When we press a button, it stops so that we can see how much time has elapsed.▶ Do you think we could use a stopwatch to measure how much time elapses?▶ Everyone start your stopwatch.▶ What units of measurement are on our stopwatch?▶ Can you see seconds?

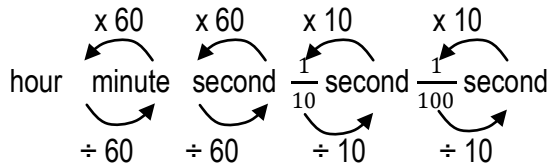
Display, for example,



Display, for example,



Display, for example,



- ▶ Can you see the place for minutes?
- ▶ Can you see another time unit to the right of the seconds, that changes very quickly?
- ▶ Those are decimal fractions of seconds.

- ▶ We've investigated how units of time were invented.
- ▶ We found that hours were divided into 60 parts to make minutes.
- ▶ We found that minutes were divided into 60 parts to make seconds.
- ▶ We found that when time units were invented, the smallest unit was a second.
- ▶ Then by the time we needed to measure time duration even more accurately, decimals had been invented.

- ▶ So instead of dividing the second by 60 to make a new time unit, people just divided the second by 10 to get a tenth of a second.
- ▶ Then they divided the tenth of second by 10 to get a hundredth of a second.
- ▶ So fractions of a second are measured using decimals!

- ▶ To get even smaller units of time, we can keep divided by 10 and we'll get milliseconds, microseconds, even nanoseconds!

Take children outside to measure a 100 metre track using a long tape measure or a trundle wheel.

In pairs, children measure the duration of one another's runs of 100 metres.

Display the world record for the 100 metre run, for example,
9.58 seconds set by Usain Bolt, and
10.49 seconds set by Florence Griffith-Joyner

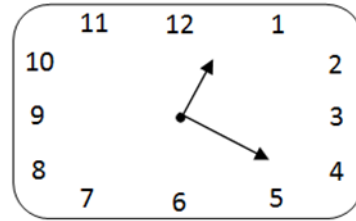
- ▶ Do you think we could use a stopwatch to measure time duration? Let's investigate!
- ▶ What event could we time with our stopwatch?
- ▶ Could we measure the duration of a race?
- ▶ Could we measure how much time it takes you to run 100 metres?

- ▶ Let's go outside and measure a 100 metre track.

- ▶ In your pairs, one child run while the other measures the duration of your run.
- ▶ Then swap.
- ▶ Let's go inside and check our results.

- ▶ Let's record the time duration of our own and our friend's 100 metre run.
- ▶ Here we have the world records for running 100 metres.
- ▶ How does your time compare?
- ▶ Did you record your time in just seconds?
- ▶ Or did you include tenths and hundredths of seconds?
- ▶ Why do you think records like these are measure in hundredths of seconds?
- ▶ The record for the men's 100 metres run was 9.69 seconds, before Usain Bolt ran it in 9.58 seconds.
- ▶ If the duration was just measured in seconds, would we know that he had beaten the previous record?
- ▶ Interestingly, he set both records!

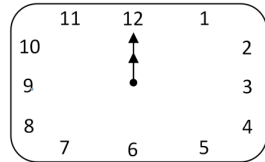
As children draw an analog clock, check for accuracy in number placement, for example,



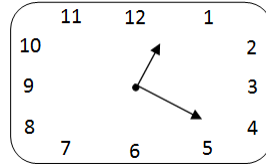
- ▶ Let's investigate time duration on an analog clock.
- ▶ Let's start by investigating analog clocks
- ▶ What do you understand about this clock?
- ▶ What does each hand tell us?
- ▶ Which hand is counting the hours?
- ▶ Is the shorter hand counting the hours?
- ▶ Which hand is counting the minutes?
- ▶ Is the longer hand counting the minutes?
- ▶ How does each hand move?
- ▶ Does the hour hand travel from one number to the next in one hour?
- ▶ Does the minute hand travel clockwise all the way around the clock in 1 hour?
- ▶ How many minutes between each number on an analog clock?
- ▶ Are there 5 minutes between each number on an analog clock?

- ▶ We've investigated measuring time duration using stopwatches.
- ▶ And we found that we can measure time duration very accurately with a stopwatch.
- ▶ We found that there are times when we need to measure time duration very accurately.
- ▶ But there are also times when measuring just to the nearest minute or second is fine too.
- ▶ **Today we're going to investigate time duration using analog clocks.**

Display an analog clock showing 12 o'clock, for example,



Display an analog clock showing 12:23, for example,



Point to the first time recorded on the analog clock.

Record, for example, 12:00

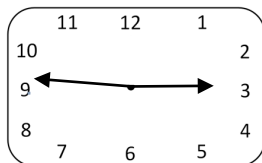
Point to the second time recorded on the analog clock.

Record, for example, 12:23

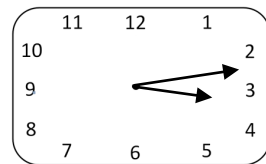
Record, for example, elapsed time: 23 minutes

Record, for example, time duration: 23 minutes

Display an analog clock showing 14 minutes to 3, for example,



Display an analog clock showing 12 minutes past 3, for example,



- ▶ Has any time elapsed between the times on these clocks?
- ▶ What time is the first clock showing?
- ▶ Is the first clock showing 12 o'clock?
- ▶ What time is the second clock showing?
- ▶ Is the second clock showing 23 minutes past 12? Is the second clock showing 12:23?
- ▶ How much time has elapsed?
- ▶ The first time is 12 hours and zero minutes.
- ▶ The second time is 12 hours and 23 minutes.
- ▶ Does that mean that 23 minutes has elapsed?
- ▶ Does that mean the time duration is 23 minutes?
- ▶ That was quite easy to work out the time duration between those times!
- ▶ Let's investigate another time duration.
- ▶ Please show the time 14 minutes to 3 on your clock
- ▶ Please show the time 12 minutes past 3 on a different clock.
- ▶ Has any time elapsed between the times on these clocks?

Point to the first time recorded on the analog clock

Record, for example, 2:46

Point to the second time recorded on the analog clock.

Record, for example, 3:12

Record, for example, 14 minutes

Record, for example, 14 minutes 12 minutes

Record, for example, 14 minutes + 12 minutes = 26 minutes

Record, for example, time duration: 26 minutes

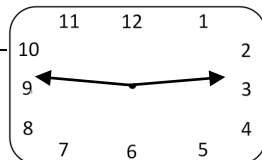
Record, for example, elapsed time: 26 minutes

- ▶ What is the first time?
- ▶ Is the first time 14 minutes to 3?
- ▶ Is the first time 2:46?

- ▶ What is the second time?
- ▶ Is the second time 12 minutes past 3?
- ▶ Is the second time 3:12?

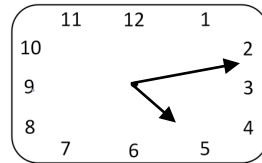
- ▶ How much time has elapsed?
- ▶ How many minutes until 3 o'clock on the first time? Are there 14 minutes till 3 o'clock?
- ▶ How many minutes after 3 o'clock on the second time? Are there 12 minutes after 3 o'clock?
- ▶ Could we add the 14 minutes and the 12 minutes to see how much time has elapsed?
- ▶ What does 14 minutes plus 12 minutes equal?
- ▶ Does 14 minutes plus 12 minutes equal 26 minutes?
- ▶ What was the duration of the time?
- ▶ Was the time duration, 26 minutes?
- ▶ Was the elapsed time, 26 minutes?

Display an analog clock showing 14 minutes



to 3, for example,

Display an analog clock showing 12 minutes past 5, for example,



Point to the first time recorded on the analog clock.

Record, for example, 14 minutes

Record, for example, 14 minutes + 2 hours

Record, for example, 14 minutes + 2 hours + 12 minutes

Record, for example, 14 minutes + 2 hours + 12 minutes =
2 hours and 26 minutes

Record, for example, time duration: 2 hours and 26 minutes

Record, for example, elapsed time: 2 hours and 26 minutes

Display a digital clock, for example,

- ▶ Let's investigate longer time duration using analog clocks.
- ▶ Please show the time 14 minutes to 3 on your clock
- ▶ Please show the time 12 minutes past 5 on a different clock.

- ▶ If we started timing at 14 minutes to 3, and stopped timing at 12 minutes past 5, how much time has elapsed?
- ▶ How could we use the analog clock to work it out? Let's investigate!
- ▶ How many minutes until 3 o'clock?
- ▶ Are there 14 minutes till 3 o'clock?
- ▶ How many hours between 3 o'clock and 5 o'clock?
- ▶ Are there 2 hours between 3 o'clock and 5 o'clock?
- ▶ How many minutes after 5 o'clock?
- ▶ Are there 12 minutes after 5 o'clock?

- ▶ Could we add the 14 minutes and the 2 hours and the 12 minutes to see how much time has elapsed?
- ▶ What does 2 hours plus 14 minutes plus 12 minutes equal?
- ▶ Does 2 hours plus 14 minutes plus 12 minutes equal 2 hours and 26 minutes

- ▶ What was the duration of the time?
- ▶ Was the time duration, 2 hours and 26 minutes?
- ▶ Was the elapsed time, 2 hours and 26 minutes

6:23



- ▶ Let's investigate time duration on digital clocks.
- ▶ What do you understand about this clock?
- ▶ What does the colon (dot) represent?
- ▶ Does the colon separate the units of time?
- ▶ What does each digit tell us?
- ▶ Do the digits before the colon count the hours?
- ▶ Do the digits after the colon count the minutes?
- ▶ So what units of time are on this digital clock?
- ▶ Are there hours and minutes on this digital clock?
- ▶ Does the colon separate the hours and the minutes?
- ▶ Sometimes people record a dot instead of a colon between the digits in digital time.
- ▶ Does that mean the colon is a decimal point?
- ▶ Does a decimal point separate digits created by multiplying and dividing by 10?
- ▶ Does the colon between the digits in digital time separate digits created by multiplying and dividing by 10?
- ▶ No, the digits have been created by multiplying and dividing by 60.
- ▶ The colon is not a decimal point!
- ▶ The colon is a sexagesimal point!
- ▶ Sexagesimal means 60!

Record the times 2:46 and 3:12 on digital clocks, for example,

2:46

3:12

Point to the first time recorded on the digital clock.

Record, for example, 14 minutes

Point to the second time recorded on the digital clock

Record, for example, 14 minutes 12 minutes

Record, for example, 14 minutes + 12 minutes = 26 minutes

Record, for example, time duration: 26 minutes

Record, for example, elapsed time: 26 minutes

- ▶ Please show the time 2:46 on your clock
- ▶ Please show the time 3:12 in another clock
- ▶ If we started timing at 2:46, and stopped timing at 3:12, how much time has elapsed?
- ▶ How could we use the digital clock to work it out? Let's investigate!
- ▶ If it is 2:46, how many minutes until 3 o'clock?
- ▶ How many minutes in an hour?
- ▶ Are there 60 minutes in an hour?
- ▶ If there are 60 minutes in an hour, how many minutes from 46 minutes to 60 minutes?
- ▶ Would 10 minutes get us to 2:56?
- ▶ And another 4 minutes get us to 60 minutes?
- ▶ When we get to 60 minutes, do we start another hour?
- ▶ Are there 14 minutes till 3 o'clock?
- ▶ How many minutes after 3 o'clock?
- ▶ Are there 12 minutes after 3 o'clock?
- ▶ Could we add the 14 minutes and the 12 minutes to see how much time has elapsed?
- ▶ What is 14 minutes plus 12 minutes?
- ▶ What was the duration of the time?
- ▶ What was the elapsed time?

Record the times 2:46 and 5:12 on digital clocks, for example,

2:46 5:12

Point to the first time recorded on the digital clock

Record, for example, 14 minutes

Point to the second time recorded on the digital clock

Record, for example, 14 minutes 2 hours

Record, for example, 14 minutes 2 hours 12 minutes

Record, for example, 14 minutes + 2 hours + 12 minutes = 2 hours, 26 minutes

Record, for example, Time duration = 2 hours, 26 minutes

- ▶ Let's investigate longer time duration using digital clocks
- ▶ Please show the time 2:46 on your clock
- ▶ Please show the time 5:12 in another clock

- ▶ If we started timing at 2:46, and stopped timing at 5:12, how much time has elapsed?
- ▶ If it is 2:46, how many minutes until 3 o'clock?
- ▶ How many minutes in an hour?
- ▶ If there are 60 minutes on an hour, how many minutes from 46 minutes to 60 minutes?
- ▶ Would 10 minutes get us to 2:56?
- ▶ And another 4 minutes get us to 60 minutes?
- ▶ When we get to 60 minutes, do we have another hour?
- ▶ Are there 14 minutes till 3 o'clock?
- ▶ How many hours between 3 o'clock and 5 o'clock?
- ▶ Are there 2 hours between 3 and 5 o'clock?
- ▶ How many minutes after 5 o'clock?
- ▶ Are there 12 minutes after 3 o'clock?
- ▶ Could we add the 14 minutes and the 2 hours and the 12 minutes to see how much time has elapsed?
- ▶ What is 2 hours plus 14 minutes plus 12 minutes?
What was the duration of the time?