

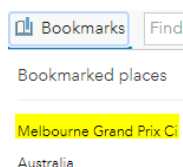
Calculating speed, distance and time

Lesson Map: <http://esriaustralia.com.au/education/SpatialActivity82>

Engage

Calculating the speed of Formula 1 cars on a race circuit

- Click on the map URL above to open the lesson map. Satellite imagery of Australia is displayed. Under the 'Bookmarks' tab, select *Melbourne Grand Prix Circuit*. The map extent will refocus on a Melbourne Grand Prix racing circuit. You can use the bookmarks to quickly jump to different locations specified in this worksheet.



- The Melbourne Grand Prix is the first race of the Formula One racing year. 24 drivers will race around the Grand Prix track. The circuit has 16 turns. Here is some additional information on the race:

Melbourne Grand Prix Circuit

First Grand Prix	1996
Circuit length	5.303 km
Number of laps	58
Race distance	307.574 km
Lap record	1:24.125 - M Schumacher (2004)

- Under the 'Details' tab, click 'Content'. You can toggle the *Melbourne Grand Prix circuit* layer on and off by checking/unchecking the checkbox. You may wish to have a closer look at the track without the red race route visible. Notice the main straight and pit lane. This is where the racers will begin and finish the race.
- ? Record the formula for calculating speed. Record your response below this question

Download student worksheet [here](#).

Time

30 minutes

Activity

Calculate speed, distance and time.

Learning Outcome

Students will be able to:

- Calculate speed using appropriate formulas
- Calculate distance using appropriate formulas
- Calculate time using appropriate formulas
- Solve word problems
- Engage with ICTs

ACARA Curriculum Link

[Essential Mathematics: Time and motion](#)

Teacher Feedback:

To share your feedback on this, or any Spatial Activity, please contact education@esriaustralia.com.au

or in your subject book. [*Speed = Distance ÷ Time or $S = D \div T$.*]

- ? Daniel Ricciardo is an Australian-born formula 1 driver. He is considered one of the best formula 1 drivers currently in the competition. Ricciardo's average lap time for the Melbourne Grand Prix is 1:28 minutes. One lap of the circuit is 5.303km long. Calculate the average speed (in km/h) Ricciardo is driving each lap. Record your working and round your final answer to two decimal places.

Working	$S = D \div T$ $S = 5.303\text{km} \div 1:28\text{min}$ (time converted to decimal form = 1.46666667) $S = 5.303\text{km} \div 1.46666667$ $S = 3.61568181\text{km/min}$ $S (\text{km/h}) = 3.61568181 \text{ km} \times 60 \text{ minutes}$ $S = 216.94\text{km/h}$
Final answer	Daniel Ricciardo's average speed per lap is 216.94km per hour.

- ? In 2004, Michael Schumacher – one of Formula 1's greatest racers – set a lap record at 1:24 minutes. What was Schumacher's average speed in km/h for this record lap. Record your working and round your final answer to two decimal places.

Working	$S = D \div T$ $S = 5.303\text{km} \div 1:24\text{min}$ (time converted to decimal form = 1.4) $S = 5.303\text{km} \div 1.4$ $S = 3.61568181\text{km/min}$ $S (\text{km/h}) = 3.78785714 \text{ km} \times 60 \text{ minutes}$ $S = 227.27\text{km/h}$
Final answer	Michael Schumacher's average speed for his 2004 record lap was 227.27km/h.

Explore

Calculating the distance from Brisbane to Sydney

- Click the 'Bookmarks' tab and select *Australia*. This will shift the map extent so all of Australia is visible.
- Under the 'Details' tab, click 'Content'. Turn off the *Melbourne Grand Prix circuit* layer. Turn on *Brisbane to Sydney route*. You may wish to zoom in on this route.
- In this section, you will be asked to find the distance from Brisbane to Sydney. In order to do this, you will need to rearrange the formula for finding speed so that distance is the focus of the equation i.e. $S = D \div T$ needs to be arranged to $D = S \times T$.
- The main travelling route from Brisbane to Sydney is via the M1 Pacific Motorway. It is a highway, where the speed limit is mostly 100km an hour. The journey typically takes 9 hours and 45 minutes to make.

- ? Calculate the distance of the travel route from Brisbane to Sydney. In your response, show evidence of working. Round your final answer to two decimal places.

Working	$D = S \times T$ $D = 100\text{km/h} \times 9:45 \text{ hours (time converted to decimal form = 9.75)}$ $D = 100\text{km/h} \times 9.75$ $D = 975\text{km}$
Final answer	<i>The distance of the Brisbane to Sydney route is 975km.</i>

Explain

Calculating travel time from Melbourne to Perth

- Click the 'Bookmarks' tab and select *Australia* again. This will ensure that the map extent includes all of Australia if you previously zoomed in on the Brisbane to Sydney route.
- Under the 'Details' tab, click 'Content'. Turn on the *Melbourne to Perth* route.
- In this section, you will be asked to find the travel time from Melbourne to Perth. In order to do this, you will need to once again rearrange the formula for finding speed so that time is the focus of the equation i.e. $S = D \div T$ needs to be arranged to $T = D \div S$.
- The main travelling route from Melbourne to Perth is also via highways, where the speed limit is mostly 100km an hour. The distance from Melbourne to Perth is 3412.2km.
- ? Calculate the travel time from Melbourne to Perth by car. In your response, show evidence of working. Round your final answer to the closest minute.

Working	$T = D \div S$ $T = 3412.2\text{km} \div 100\text{km/h}$ $T = 34.12 \text{ (conversion from decimal hours to minutes = } 0.12 \times 60 = 7.2 \text{ min)}$ $T = 34 \text{ hours and 7 minutes}$
Final answer	<i>It will take 34 hours and 7 minutes to travel from Melbourne to Perth.</i>

- ? Due to diminishing road surface conditions, major upgrades are scheduled to happen along a 346km stretch of the highway. In this upgrade stretch, the speed limit will be reduced to 60km/h in order to make it safer for road construction crews. How long will the journey from Melbourne to Perth take once major upgrades begin? In your response, show evidence of working. Round your final answer to the nearest minute.

Working	$T = (D_1 \div S) + (D_2 \div S)$ $D_1 = 3412.2\text{km} - 346\text{km}$ $D_1 = 3066.2\text{km}$ $T = (3066.2 \div 100) + (346 \div 60)$ $T = 30.662 + 5.767$ $T = 30 \text{ hr } 40 \text{ min} + 5 \text{ hr } 46 \text{ min}$ $T = 36 \text{ hours } 26 \text{ minutes}$
Final answer	As a result of the reduced speed limit across the highway upgrade stretch, it will now take 36 hours and 26 minutes to travel from Melbourne to Perth.

Extend

Calculating travel times for different transport options

- Ensure that your map extent still clearly shows the *Melbourne to Perth* route.
- A group of cyclists have been planning a charity ride from Melbourne to Perth to raise funds for rural and remote health services. They will be travelling along a bicycle path that runs parallel to the highway route. Therefore, the distance of 3412.2km is the same. The cyclists aim to ride at a pace of 21km/h but will only ride for 6 hours each day. At the conclusion of each day's ride, they will rest at a hotel before getting back on the bicycle the next day.
- ? Calculate (1) the total amount of time the cyclists will be riding for until they reach Perth and (2) the amount of nights they will need to book accommodation for. Show your working and round your answers to the closest minute where required.

Working	$T = D \div S$ $T = 3412.2\text{km} \div 21\text{km}$ $T = 162.49$ $T = 162 \text{ hours } 29 \text{ minutes}$ <i>The cyclists will reach Perth after 162 hours and 29 minutes of riding if they maintain their 21km/h pace.</i> $\text{Days riding} = 162.49 \text{ hours} \div 6 \text{ hours of cycling per day}$ $\text{Days riding} = 27.08$ $\text{Days riding} = 28 \text{ days (rounded up as they will not reach Perth until the 28}^{\text{th}} \text{ day)}$
Final answer	By cycling for 6 hours a day, the cyclists will take 28 days to reach Perth from Melbourne. This will mean they will need to book 28 nights of accommodation if they stay in Perth for one night at the conclusion of their journey.

Next Steps:

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