

Essential Mathematics 2019 v1.1

Unit 2 sample assessment instrument

October 2021

Examination

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Schools develop internal assessments for each senior subject, based on the learning described in Units 1 and 2 of the subject syllabus. Each unit objective must be assessed at least once.

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. select, recall and use facts, rules, definitions and procedures drawn from all Unit 2 topics
2. comprehend mathematical concepts and techniques drawn from all Unit 2 topics
3. communicate using mathematical, statistical and everyday language and conventions
4. evaluate the reasonableness of solutions
5. justify procedures and decisions by explaining mathematical reasoning
6. solve problems by applying mathematical concepts and techniques drawn from all Unit 2 topics.

Subject	Essential Mathematics
Technique	Examination
Unit	2: Money, travel and data
Topic	Fundamental topic: Calculations 1: Managing money 2: Time and motion 3: Data collection

Conditions						
Response type	Short response					
Time	60 minutes	Perusal	5 minutes			
Other	<ul style="list-style-type: none"> • Part A: simple (40 marks) • Part B: complex (10 marks) • QCAA formula sheet • Scientific calculator only 					
Instructions						
<ul style="list-style-type: none"> • Show all working in the space provided. • Use a black or blue pen. 						
Criterion	Grade			Examination result		
Foundational knowledge and problem-solving	A	B	C	D	E	/ 50

Part A: Simple (40 marks)
Question 1 (2 marks)
Alex earns \$12.66 per hour as a second-year apprentice electrician. Calculate how much she will earn for working a 38-hour week.
Question 2 (2 marks)
Harry has a job delivering pamphlets to letterboxes. He is paid \$8 for delivering 300 pamphlets. If he delivers 2400 pamphlets, calculate his total earnings.
Question 3 (1 mark)
Express 14:45 hours in 12-hour time.

Part A: Simple (40 marks)

Question 4 (1 mark)

A flight departs Cairns at 10:30 am and arrives in Melbourne at 1:55 pm on the same day. Assuming there is no daylight saving, determine the length of the flight.

Question 5 (2 marks)

Brisbane is three hours ahead of Perth. Determine what time it is in Perth, if it is 6:15 pm in Brisbane.

Question 6 (2 marks)

Calculate the average speed of a bus if it travelled 714 kilometres in $8\frac{1}{2}$ hours.

Question 7 (2 marks)

Pehlaj received 4.5% commission on his total sales of \$14 790. Calculate the commission he earned.

Question 8 (2 marks)

Consider this survey statement: 'Ask every tenth shopper in a grocery store what their favourite meal is'.

a. Identify the target population.

b. Is the above an example of a 'census' or a 'sampling' method?

Part A: Simple (40 marks)

Question 9 (1 mark)

The scheduled time for my job interview was 8:00 am. I arrived at reception and noticed my watch displaying the following time:



Determine how early I was to my interview.

Question 10 (4 marks)

On average, one fruit bun provides a person with 832 kJ of potential energy.

- a. Assume a person uses 104 kJ of energy in five minutes of jogging. Determine how many minutes that person can jog using the energy gained from eating one fruit bun.

- b. Determine the number of calories provided by one fruit bun. Round your answer to the nearest whole calorie.

Question 11 (3 marks)

On a road map, the distance in a straight line between Brisbane and Stanthorpe is 6.5 cm. The scale is 1 : 2 500 000. Use leading-digit approximation to estimate the actual distance between the two towns. Answer in kilometres.

Part A: Simple (40 marks)

Question 12 (4 marks)

A survey was designed to investigate the TV viewing habits of school students.

a. Describe two possible sources of error for the responses to the following survey question:

Approximately how many hours do you spend watching TV?

- up to 1 hour
- up to 2 hours
- up to 3 hours
- more than 4 hours

b. Which one of the following groups might be considered a random sample for this survey? Explain your choice.

- Your class
- The athletics team
- A selection from the school roll
- The teachers

Question 13 (4 marks)

Jess budgets one quarter of her net income for food. Her annual net income is \$47 944.

a. How much money should she budget for food each year?

b. Determine the amount of money she should budget for food each week.

Part A: Simple (40 marks)

Question 14 (2 marks)

Refer to the weekend train timetable below.

Saturday and Sunday (On public holidays please use Sunday timetable) (continued)																						
Station	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	WE pm	SAT pm	SAT pm	SAT am	SAT am
Varsity Lakes	2:40	3:10	3:40	4:10	4:40	5:10	5:40	6:10	6:40	7:10	7:40	8:10	8:40	9:10	9:40	10:10	10:40	11:10	11:40	12:10	12:40	
Robina	2:43	3:13	3:43	4:13	4:43	5:13	5:43	6:13	6:43	7:13	7:43	8:13	8:43	9:13	9:43	10:13	10:43	11:13	11:43	12:13	12:43	
Nerang	2:49	3:19	3:49	4:19	4:49	5:19	5:49	6:19	6:49	7:19	7:49	8:19	8:49	9:19	9:49	10:19	10:49	11:19	11:49	12:19	12:49	
Helensvale	2:54	3:24	3:54	4:24	4:54	5:24	5:54	6:24	6:54	7:24	7:54	8:24	8:54	9:24	9:54	10:24	10:54	11:24	11:54	12:24	12:54	
Coomera	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	1:00	
Ormeau	3:04	3:34	4:04	4:34	5:04	5:34	6:04	6:34	7:04	7:34	8:04	8:34	9:04	9:34	10:04	10:34	11:04	11:34	12:04	12:34	1:04	
Beenleigh	3:11	3:41	4:11	4:41	5:11	5:41	6:11	6:41	7:11	7:41	8:11	8:41	9:11	9:41	10:11	10:41	11:11	11:41	12:11	12:41	1:11	
Loganlea	3:19	3:49	4:19	4:49	5:19	5:49	6:19	6:49	7:19	7:49	8:19	8:49	9:19	9:49	10:19	10:49	11:19	11:49	12:19	12:49	1:19	
Altandi	3:33	4:03	4:33	5:03	5:33	6:03	6:33	7:03	7:33	8:03	8:33	9:03	9:33	10:03	10:33	11:03	11:33	12:03	12:33	1:03	1:33	
Park Road	3:47	4:17	4:47	5:17	5:47	6:17	6:47	7:17	7:47	8:17	8:47	9:17	9:47	10:17	10:47	11:17	11:47	12:17	12:47	1:17	1:47	
South Bank	3:50	4:20	4:50	5:20	5:50	6:20	6:50	7:20	7:50	8:20	8:50	9:20	9:50	10:20	10:50	11:20	11:50	12:20	12:50	1:20	1:50	
South Brisbane	3:52	4:22	4:52	5:22	5:52	6:22	6:52	7:22	7:52	8:22	8:52	9:22	9:52	10:22	10:52	11:22	11:52	12:22	12:52	1:22	1:52	
Roma Street	3:57	4:27	4:57	5:27	5:57	6:27	6:57	7:27	7:57	8:27	8:57	9:27	9:57	10:27	10:57	11:27	11:57	12:27	12:57	1:27	1:57	
Central arrive	3:59	4:29	4:59	5:29	5:59	6:29	6:59	7:29	7:59	8:29	8:59	9:29	9:59	10:29	10:59	11:29	11:59	12:29	12:59	1:29	1:59	
Central depart	4:01	4:31	5:01	5:31	6:01	6:31	7:01	7:31	8:01	8:31	9:01	9:31	10:01	10:31	11:01	11:31	12:01	12:31	1:01	1:31	2:01	
Fortitude Valley	4:03	4:33	5:03	5:33	6:03	6:33	7:03	7:33	8:03	8:33	9:03	9:33	10:03	10:33	11:03	11:33	12:03	12:33	1:03	1:33	2:03	
Bowen Hills	4:06	4:36	5:06	5:36	6:06	6:36	7:06	7:36	8:06	8:36	9:06	9:36	10:06	10:36	11:06	11:36	12:06	12:36	1:06	1:36	2:06	
Albion	4:10	4:40	5:10	5:40	6:10	6:40	7:10	7:40	8:10	8:40	9:10	9:40	---	---	---	---	---	---	---	---	---	
Wooloowin	4:12	4:42	5:12	5:42	6:12	6:42	7:12	7:42	8:12	8:42	9:12	9:42	---	---	---	---	---	---	---	---	---	
Eagle Junction	4:14	4:44	5:14	5:44	6:14	6:44	7:14	7:44	8:14	8:44	9:14	9:44	---	---	---	---	---	---	---	---	---	
International	4:22	4:52	5:22	5:52	6:22	6:52	7:22	7:52	8:22	8:52	9:22	9:52	---	---	---	---	---	---	---	---	---	
Domestic	4:25	4:55	5:25	5:55	6:25	6:55	7:25	7:55	8:25	8:55	9:25	9:55	---	---	---	---	---	---	---	---	---	
Continues to																						

Explanations

- SAT** Operates Saturday only.
- WE** Operates Saturday and Sunday.
- am** Morning services.
- pm** Afternoon and evening services.
- Refer to the time listed before/after this symbol for start/finish of journey.

Data adapted from: Translink, 'Gold Coast and airport line', <https://translink.com.au/sites/default/files/assets/timetables/170123-gold-coast-airport.pdf>.

- a. Determine the time interval between trains departing Central Station.

- b. State the latest departure time for a train from Helensvale Station on Sunday night.

Question 15 (6 marks)

A carpenter with a building company is paid \$1406 for a 38-hour week.

- a. Calculate the hourly rate the carpenter is paid.

- b. Time-and-a-half is paid for the first two hours of overtime over 38 hours in the week. If the carpenter works 40 hours this week, calculate their total pay.

Part A: Simple (40 marks)

Question 16 (2 marks)

Below is an employee's timesheet.

DATE	TYPE	WORK FROM	BREAK FROM	BREAK TO	WORK TO
Mon 4th Sep	Work Hours	09:15	13:00	13:30	17:00
Tue 5th Sep	Work Hours	08:45	13:00	13:30	17:00
Wed 6th Sep	Work Hours	08:45	13:00	13:30	17:00
Thu 7th Sep	Work Hours	08:00	13:00	13:30	17:00
Fri 8th Sep	Work Hours	09:00	13:00	13:30	15:30
Mon 11th Sep	Work Hours	09:15	13:00	13:30	16:45
Tue 12th Sep	Work Hours	09:00	13:00	13:30	18:00
Wed 13th Sep	Work Hours	08:30	13:00	13:30	16:15
Thu 14th Sep	Work Hours	09:00	13:00	13:30	16:45

Calculate the total number of hours worked on Tuesday 12 September.

Part B: Complex (10 marks)

Question 17 (5 marks)

In 2016–17 Khuong has income of \$63 720 from his job in customer service. He also earns \$4560 in share dividends and bank interest, and has allowable deductions of \$620. Khuong has already paid \$13 530.40 in PAYG tax.

- c. Use the following income tax rates to calculate the total income tax, including Medicare levy, that Khuong should pay.
- d. Calculate any refund or tax bill Khuong will receive.

These rates apply to individuals who are Australian residents for tax purposes.

Tax rates 2016–17

The following rates for 2016–17 apply from 1 July 2016.

Taxable income	Tax on this income
0 – \$18,200	Nil
\$18,201 – \$37,000	19c for each \$1 over \$18,200
\$37,001 – \$87,000	\$3,572 plus 32.5c for each \$1 over \$37,000
\$87,001 – \$180,000	\$19,822 plus 37c for each \$1 over \$87,000
\$180,001 and over	\$54,232 plus 45c for each \$1 over \$180,000

The above rates do not include the:

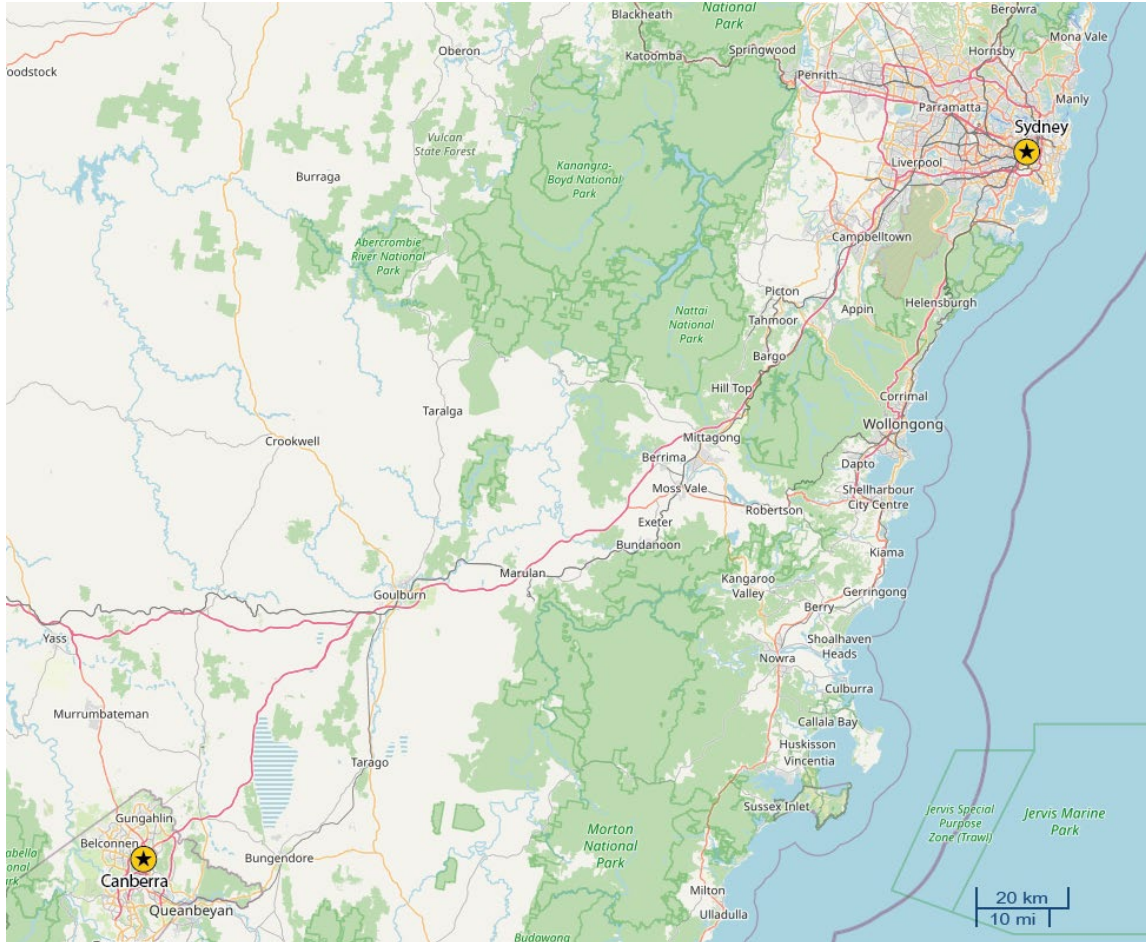
- > Medicare levy of 2%
- > Temporary Budget Repair Levy; this levy is payable at a rate of 2% for taxable incomes over \$180,000.

Source: Australian Taxation Office, 'Individual income tax rates', www.ato.gov.au/Rates/Individual-income-tax-rates.

Part B: Complex (10 marks)

Question 18 (5 marks)

The annual remote-controlled jet plane challenge is a straight-line distance course from Sydney to Canberra.



Data source: © OpenStreetMap contributors, licensed under the Creative Commons Attribution-ShareAlike 2.0 license (CC BY-SA 2.0).

The remote-controlled jet planes must not take longer than four hours of continuous flying to reach their destination. The specifications for two models of remote-controlled jet planes are listed in the table below.

Model type	Maximum speed (km/hr)	Maximum flying time (hours)
A	75	3
B	150	1.25

Use mathematical reasoning to determine if either or both of these planes could qualify for this challenge.

Examination marks summary

Question number	Simple familiar (SF)	Complex familiar (CF)	Complex unfamiliar (CU)
1	2		
2	2		
3	1		
4	1		
5	2		
6	2		
7	2		
8	2		
9	1		
10	4		
11	3		
12	4		
13	4		
14	2		
15	6		
16	2		
17		5	
18			5
Total	40	5	5



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