

General Mathematics 2019 v1.2

Unit 1 Topic 1 mid-level annotated sample response

September 2018

Problem-solving and modelling task

This sample has been compiled by the QCAA to assist and support teachers to match evidence in student responses to the characteristics described in the assessment objectives.

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 Unit 1 Topic 1
2. comprehend mathematical concepts and techniques drawn from Unit 1 Topic 1
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 Unit 1 Topic 1.

Task

Context
In 2020, Tokyo will host the sixteenth Summer Paralympic Games. A significant number of people will travel to the games to support their country's athletes. These people need to understand the financial requirements of such a trip, including fixed and discretionary spending, in order to develop a personal budget based on their income.
Task
Investigate the financial requirements of a person aiming to travel from Australia to the Tokyo Paralympic Games in 2020 to support the Australian team. Produce a personal budget based on the results of your mathematical research, then refine the model to ensure they can afford to attend. You are to assume that the supporter: <ul style="list-style-type: none">• has a part-time job• is entitled to government disability support• will attend at least four different Olympic events. You must use: <ul style="list-style-type: none">• the approach to problem-solving and mathematical modelling provided• different data to other students in your class and school. You will have four weeks to complete the assessment, including three hours of class time.

Sample response

Criterion	Marks allocated	Result
Formulate Assessment objectives 1, 2, 5		
Solve Assessment objectives 1, 6		
Evaluate and verify Assessment objectives 4, 5		
Communicate Assessment objective 3		
Total		

Communicate

use of some mathematical conventions to develop the response
information not used in solution

Formulate

translation of simple aspects of the problem by identifying mathematical concepts and techniques

Formulate

statement of some assumptions

statement of some observations

Communicate

adequate organisation of the response
some headings used, however, sections missing or incomplete

Solve

superficial use of technology
use of online table but not all information considered, e.g. rent assistance

Introduction

For this assignment, I want to see if a person can afford to attend the Tokyo Paralympic Games in 2020. I estimate the total costs to be approximately \$8000 from people I have asked who have travelled to Japan.

I will need to produce a budget spreadsheet. I will calculate how much income the person has. Their savings will need to include the price of the flights, which will probably increase between now and 2020. Also, accommodation and food will cost more. Because of these costs, they will need a job to help save for the trip.

I will calculate the following things:

1. the cost of accommodation (in Australia and Japan)
2. their income (from government allowance and job)
3. the cost of airfares (return)
4. the rate to exchange spending money into Japanese yen.

Accommodation

Accommodation in Australia will go into the budget. The person would share a house with friends at a cost of \$140/week. This includes internet. They will share bills like water and electricity.

Accommodation in Japan during the Paralympics, I assume, will be about the same. So, accommodation will cost \$140 for a week, but they will need about two weeks of accommodation, so that's \$280 total.

Income

The person will get unemployment benefits or maybe a pension. On the Department of Human Services website is a rate estimator. I checked on there and found out there's a special rate for people with a disability. Here is the table from the website (Department of Human Services 2017):

Maximum payment rates of Disability Support Pension if you are 21 years of age or over, or under 21 years of age with children

Pension rates per fortnight	Single	Couple each	Couple combined	Couple each, separated due to ill health
Maximum basic rate	\$808.30	\$609.30	\$1,218.60	\$808.30
Maximum Pension Supplement	\$65.90	\$49.70	\$99.40	\$65.90
Energy Supplement	\$14.10	\$10.60	\$21.20	\$14.10
TOTAL	\$888.30	\$669.60	\$1,339.20	\$888.30

Communicate

adequate organisation of the response limited

Evaluate and verify
statement about decisions made relevant to the context of the task

Solve
use of simple procedures to make some progress towards a solution incorrect answer

Solve
use of simple procedures to make some progress towards a solution

Formulate
statement of some assumptions

Solve
superficial use of technology online calculator

Evaluate and verify
statements about the reasonableness of solutions
no evidence to support this statement; not reasonableness of the actual solution

I will make an assumption that the person is single, so they will get \$888.30 each fortnight.

Airfares

I looked up airfares on:

www.cheapflights.com.au/search/flights-to-Tokyo/from-Brisbane/departing-2017-08-25/returning-2017-09-06/.

I wanted a flight that left Brisbane on 25 August and returned on 6 September. You cannot book for 2020, so I looked up this year's flights. I found a flight for \$962 return with Qantas. This is a pretty reasonable flight price. I will increase this by 3% each year to allow for inflation.

So, $\$962 + (3\% \times 3 \text{ years}) = \971 .

Japanese money

\$280 for accommodation

\$100/day for spending money

$280 + (100 \times 12) = \1480 Australian dollars

I looked online for the conversion rate and found A\$1 = 84.46 Japanese yen. Using an online calculator, I found A\$1480 = 125003.55 Japanese yen.

I will assume that they spent most of the money and had 1000 Japanese yen when they were coming home. Using the online calculator again, this is A\$11.84, which they gave to charity on the plane trip home.

I will create a spreadsheet for the accommodation (in Australia and Japan), income (government allowance), airfares (return) and Japanese money so it will be easier to recalculate if there were any changes.

The budget

I will prepare a budget using a spreadsheet to see if the person can afford the trip. Based on the above calculations and leftover money, it would be reasonable for the person to afford to pay their own costs so they can travel to the Paralympics.

The only problem I can see would be if the inflation rate closer to 2020 was to change significantly. This would surely cause a lot of changes in my budget and, therefore, prevent the person from being able to afford the trip.

I have justified my decisions purely based on the calculations and hope that I have not made any mistakes in my thinking.

Budget — answers only (made in Excel)

Year	2017	2018	2019	2020
Accommodation (\$280/fortnight)	7280	7280	7280	7280
Income (\$888.30/fortnight)	23 095.8	23 095.8	23 095.8	23 095.8
– Airfares (\$971)	-	-	-	971
– Yen (\$100/day)	-	-	-	1400
TOTAL (\$)	30 375.8	30 375.8	30 375.8	28 004.80

Budget — formulas

Year	2017	2018	2019	2020
Accommodation \$280/fortnight	=280*26	=B3	=B3	=B3
Income \$888.30/fortnight	=888.3*26	=C3	=C3	=C3
– Airfares (\$971)				=971
– Yen (\$100/day)				=100*7*2
TOTAL	=B3+B4	=C3+C4	=D3+D4	=E3+E4-E5-E6

Solve

use of technology
formulas show very limited evidence of use of spreadsheet. No use of 2017–2019 for final calculation. Many budget factors not included, such as food, transport, bills

Communicate

adequate organisation of the response
no evidence of a conclusion or recommendations; does not satisfy objective

Reference list

Department of Human Services 2017, 'Disability Support Pension', www.humanservices.gov.au/customer/services/centrelink/disability-support-pension#tab-0.