

# 2025 ASSESSMENT REPORT

## MTG315123 GENERAL MATHEMATICS

### General Comments

The 2025 General Mathematics exam showed that students are able to demonstrate their knowledge and skills in a wide range of real-world applications. They are advised to carefully read each question and respond to every required item as marks are allocated to each one. As in previous years, thought must be given to efficient calculator usage, appropriate rounding and including units.

### Criterion 3 – Mathematical and Statistical Models

Students seemed to be quite well prepared and appeared to have enough time for the examination of this section. They are advised to read each question carefully then answer what is being asked, including units where appropriate.

#### Question 1

Identifying types of sequences might be easier if the first few terms are generated.

- This question was very well done.
- This question was not done well.
- This question was also not done well.
- This question was very well done.

#### Question 2

- This question was done very well with a common minor error of using  $t_n$  instead of  $U_n$ . Simplification was not requested so it was not required for full marks.
- This question was quite well done. A common error was not including the \$ in front of the final answer.

#### Question 3

- This question was very well done.
- This question was very well done.
- This question was quite well done.
- Second order difference equations such as this question are outside the scope of the course. It was not attempted or very poorly done. Students were rewarded with full marks for writing the first 4 or 5 terms and part marks were given for the correct beginning.

#### Question 4

- This question was very well done. Full marks were given for stating the correct values of  $a$  and  $b$  or writing the equation.
- This question was quite poorly done. Some students described a  $y$  intercept and many lost 0.5 mark for incorrect units.

- c. Finding the value of  $r$  was well done but two concepts were required when interpreting its value. Strong positive correlation, not association, needed to be mentioned as well as a lot of evidence suggesting that the gold price increases over time. Students are reminded to use variable names, not  $x$  and  $y$ .
- d. This question was done reasonably well. Students are reminded to include units and avoid writing double negatives, not  $-\$290.50$  less than predicted by the model.
- e. Most students received some marks for this question. Many students recognised that points on the residuals plot were unbalanced with 6 negative compared to 2 positive, but it was expected to also comment on the pattern in the residuals plot. For full marks,  $r^2$  needed to be mentioned as well as a statement that the linear model was not appropriate. Students who wrote about outliers were not penalised.

### Question 5

- a. This question was quite poorly done with most students unable to name perpetuity.
- b. This question was very well done in lots of different ways.
- c. This question was quite poorly done. Some students found future value instead of payment and incorrectly set their calculator to Begin instead of End.

### Question 6

- a. This question was generally well done.
- b. Most students received some marks for this question by correctly stating that Method 1 was better for tax purposes. Some explanations lacked depth of understanding that a higher tax deduction led to lower tax.
- c. This question was quite well done. Some students struggled to clearly state that a higher resale value was desired.

## Criterion 5 Bivariate Data Analysis

Question	Sample answer	Marks	Comments
7 a)	Missing “ $xy$ ” value = $27 \times 1081 = 29187$	1	No working needed.
	Missing “ $\Sigma$ ” value = sum of all $x$ values = $S_g = \frac{8}{2}(22 + 57) = 316$	1	Generally well done.
7b)	$a = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{8 \times 353356 - 316 \times 8808}{8 \times 13532 - (316)^2} = 5.181$ $b = \frac{\Sigma y - a\Sigma x}{n} = \frac{8808 - 5.181 \times 316}{8} = 896.4$ $T = 5.181A + 896.4.$	1 1 1	a and b – marks awarded for substitution only Candidates forgot to provide the linear equation, rounding (show that stipulates the number of decimal places required). Some candidates left ‘sigma’ symbol in their working after substituting in the numbers.
7c)	$T = 5.181 \times 32 + 896.4 = 1062.192$ seconds.	2	Candidates with the correct answer and no working were awarded full marks. Many candidates did not include units in their answers.
7d)	Substitute $T = 900$ , $900 = 5.181A + 896.4$ $\therefore 5.181A = 900 - 896.4$ $\therefore 5.181A = 3.6$ $\therefore A = 0.69$ The person would be 0.69 years old! (approx. 8 months.)	0.5 1 0.5	Some candidates literally made an educated guess – no maths involved or shown. Some candidates confused by the answer – either crossed it out or said 0.69 was approximately 7 years.
7e)	$r^2 = 0.6124$ is not very high, so only some association between the runner’s age and time in seconds is suggested. c) is interpolation and the $r^2$ value is moderate, so the value of 1062.92 can be considered reliable. d) is extrapolation, so cannot be considered reliable.	1 1 1	
8a)	$\frac{105}{165} \times 100\% = 63.6\%$ OR $\frac{165}{200} \times 100\% = 82.5\%$	1	This question seemed to be ambiguous, with a significant number of candidates giving the second answer, while markers were provided with the first. Both answers were accepted.
8b)	$\frac{110}{200} \times 100\% = 55\%$	1	

Question	Sample answer	Marks	Comments												
8c)	<table border="1"> <thead> <tr> <th></th> <th>In favour of LoudNoise</th> <th>Against LoudNoise</th> </tr> </thead> <tbody> <tr> <td>In favour of a Rock Arena</td> <td>64%</td> <td>14%</td> </tr> <tr> <td>Against a Rock Arena</td> <td>36%</td> <td>86%</td> </tr> <tr> <td><b>Total</b></td> <td><b>100%</b></td> <td><b>100%</b></td> </tr> </tbody> </table> <p style="text-align: center;">Table 5</p>		In favour of LoudNoise	Against LoudNoise	In favour of a Rock Arena	64%	14%	Against a Rock Arena	36%	86%	<b>Total</b>	<b>100%</b>	<b>100%</b>	2	<p>0.5 deduction for incorrect calculation (error carried forward).</p> <p>0.5 deduction if columns don't sum to 100%.</p> <p>0.5 deduction no % signs.</p>
	In favour of LoudNoise	Against LoudNoise													
In favour of a Rock Arena	64%	14%													
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<b>Total</b>	<b>100%</b>	<b>100%</b>													
8d)		3	<p>0.5 axis labels.</p> <p>1 key.</p> <p>0.5 each boundary.</p> <p>0.5 consistent bars (e.g. against always at the bottom).</p> <p>Candidates did not show axis label.</p>												
9a)	<p>There is some evidence of an association between being in favour of LoudNoise playing concerts and the Rock Arena being built.</p> <p>The percentage of those against a Rock Arena is much higher amongst those against LoudNoise (94%) compared with those in favour of LoudNoise (55%).</p> <p>[There is no association as both have a majority of people against.]</p>	<p>1</p> <p>2</p> <p>1</p>	<p>1 mark for acknowledging different %, 0.5 for each value stated. 2 if % stated.</p> <p>Candidates summarised but did not state whether an association exists. Overall comment for Q9 – some candidates did arithmetic across columns.</p>												
9b)	<p>The stadium should not be built.</p> <p>Both groups have a majority of people who do not want the arena</p> <p>Overall, only 30% of people are in favour despite the fact that more Loud Noise fans were surveyed</p>	<p>1</p> <p>1</p> <p>1</p>	<p>Any 2 statistical reasons accepted.</p> <p>As above (9a).</p>												
10a)	<p>There is a peak every October and a trough/valley every February.</p>	2	<p>Mostly well done, more precise wording is needed by candidates, some candidates misinterpreted the question, providing a rote-learned answer.</p>												
10b)	<p>Missing value = <math>(72 + 105 + 138) \div 3 = 105</math></p>	2	<p>Again, full marks were awarded for the correct answer with no working.</p>												

Question	Sample answer	Marks	Comments
10c)	<p>June 2023 = <math>95 \div 99 = 0.960</math> OR <math>3 - 0.616 - 1.424 = 0.960</math></p> <p>February Index Value = <math>(0.617 + 0.686 + 0.616 + 0.594) \div 4 = 0.628</math></p> <p>OR = <math>3 - 1.032 - 1.340 = 0.628</math></p>	3	<p>1 mark per number, 1 mark for working.</p> <p>Two answers were possible 0.96 and 0.961.</p> <p>Generally well done.</p>
10d)	<p>Deseasonalised value for October = <math>137 \div 1.340 = 102.2</math></p>	1	<p>Candidates missed showing their working out.</p> <p>Some candidates divided the raw October 2021 data (137) by the October 2021 index (1.301).</p>
10e)	<p>There is a slight downwards trend in the data as the deseasonalised number of cars is decreasing by 1.05 on average each quarter.</p>	1	<p>Interpretation of gradient not necessary.</p> <p>Well done.</p>
10f)	<p>February 2026 will be <math>t = 16</math>.</p> <p>We have <math>C = -1.05 \times 16 + 108.6 = 91.8</math> cars (deseasonalised).</p> <p>Predicted actual number is <math>91.8 \times 0.628 = 57.65</math> cars.</p> <p>Approximately 58 cars are predicted for February 2026.</p>	<p>1</p> <p>1</p> <p>1</p>	<p>Some candidates assumed quarters or months because of the yearly cycle.</p> <p>Many candidates did not find the ACTUAL value and did not round to a whole number of cars.</p>

# Criterion 6 Growth and Decay in Sequences

## General Comments

Most students found this section accessible, and it was generally well done. Students struggled to identify parameters in some questions. A significant number did not seem to understand the difference between a GP having  $S_{\infty}$  and a difference equation reaching equilibrium, using the formulae and explanations interchangeably.

Question	Sample answer	Marks	Comments
11 a)	$a_2 - a_1 = 50 - 20 = 30$ , $a_3 = a_2 = 80 - 50 = 30$ and $a_4 - a_3 = 80 = 30$ Since the sequence is increasing at a constant rate (30), it is an Arithmetic Sequence.	1  1	Some students didn't use table values to show the common difference.
11b)	3, 6, 12, 24	2	Some calculator issues with n-1. Some students started at 6 and called it the first term.
11c)	9, 17, 33	2	Most errors caused by students not reading the question.
12a)	$r = 0.9$ $t_5 = 72.90 \times 0.9 = \$65.61$ $t_6 = 65.61 \times 0.9 = \$59.05$	2	Many students did not recognise that this sequence involved money and were penalised for not having \$ signs or not rounding to 2dp.
12b)	$t_n = a \times r^{n-1} = 100 \times 0.9^{n-1}$	1	
12c)	$S_{40} = \frac{a(1-r^{40})}{1-r} = \frac{100(1-0.9^{40})}{1-0.9} = \$985.22$	2	
12d)	$S_{\infty} = \frac{a}{1-r} = \frac{100}{1-0.9} = \$1000$ Geometric sequence/series with $r < 1$ . Eventually Ron's earnings will drop below 1c so he won't get paid. Earnings will keep dropping until they reach zero?	2  1	Calculation of $S_{\infty}$ very well done. Some students did not complete the calculations. Many students explained what $S_{\infty}$ meant, not why it occurred for this sequence.
13a)	$2d = 144 - 100 = 44$ Thus $d = 22$ $A_7 = 100 + 22 = 122$ $a = A_1 = A_6 - 5 \times d = 100 - 5 \times 22 = -10$	1  1	This question was generally well done. Some students had difficulty with the algebra needed to find $a$ .
13b)	$G_8 = G_6 \times r^2$ $144 = 100 \times r^2$ $1.44 = r^2$ $r = 1.2$ $G_7 = G_6 \times r = 100 \times 1.2 = 120$ $a = G_1 = G_6 \div r^5 = 100 \div 1.2^5 = 40.19$	0.5  1 0.5 1	A significant number of students struggled to use the explicit GP equation here. Students who created equations for $G_8$ & $G_6$ and used the simultaneous eq'n solver were awarded full marks for both part a and b.

13c)		4	<p>Many students did not draw the geometric sequence. Those that did, often forgot to label each sequence. Term 7 of both sequences were very close. Students needed to show both A7 and G7.</p> <p>Students are reminded that terms of a sequence should not be joined on a graph. Markers recommend using 2 clearly contrasting pen colours rather than blue and black.</p>
13d)	<p><math>A_n</math> is linear growth.</p> <p><math>G_n</math> is exponential growth.</p>	1 1	<p>Students needed to be clear which sequence they were referring to. However, growth was awarded part marks.</p>
14a)	$C_{n+1} = 0.95 \times C_n + 3000, C_1 = 20000$	2	<p>Common errors included students using 0.05 or 1.05. Some students did not use a difference formula.</p>
14b)	<p>Asymptote at <math>\frac{d}{1-r} = \frac{3000}{1-0.95} = 60000</math></p> <p>60 000 is called an equilibrium value for the difference equation.</p>	2 1	<p>Students who used the CAS, needed to be very clear that multiple terms (more than 2) are at 60,000. Markers accepted many terms for the equilibrium, including steady state, plateau and asymptote ...</p>
14c)	$C_{n+1} = 0.95 \times C_n + 1000, C_1 = 20000$	1	<p>Markers were looking for the same formula as in part a) but with 1000 instead of 3000.</p>
14d)	<p>Membership will remain constant</p> $\frac{d}{1-r} = \frac{1000}{1-0.95} = 20000$ <p>OR</p> $C_2 = 0.95 \times 20000 + 1000 = 20000$	1 1	<p>Markers were looking for an indication that membership numbers would not change, with some justification of why. Mistakes in the rule were followed through for this explanation.</p>
14e)	<p>We need <math>\frac{d}{1-r} = 30000</math></p> $\therefore \frac{1000}{1-r} = 30000$ <p>Solving on the calculator gives <math>r = 0.967</math></p> <p>Thus only 3.33% of members can leave the club each year for the membership to reach an equilibrium value of 30 000.</p>	1 1 1	<p>Many students did not attempt this question.</p> <p>Those that did, were able to find the ratio, but did not link it back to the % of members lost marks.</p> <p>Students are reminded not to round during a question as rounding errors for the ratio made significant difference to the equilibrium value.</p>

# Criterion 7 Finance

## General Comments

Too many students wasted time using the formula instead of using the Finance app on their calculator.

Question	Sample answer	Marks	Comments
15a)	Bank A: $E=1+0.06151212-1=0.06323$ , so an effective interest rate of 6.23% p.a. Bank B: $E=1+0.062544-1=0.06398$ , so an effective interest rate of 6.40% p.a. Bank C: Already an effective interest rate of 6.50% p.a. So Bank C offers the best rate.	1 1 0.5 0.5	Common errors included leaving interest rate as a decimal, not using a formula as requested or not indicating the best option. Best rate was accepted as highest or lowest as the question doesn't state loan v investment.
15b)	$15000=12000(1+0.06254n)$ $n=14,392$ $\therefore$ 15 quarters or 3 years, 3 quarters.	1 1 1	Students were much more likely to make an error if they used the effective rate, especially when using the Finance app. Some students found n in years and treated the answer as quarters. Accepted 14 quarters for full marks.
16a)	Annuity in arrears  Because the payment is made at the end of each period	1 1	Most students got at least 1 mark as arrears was usually identified. A number of alternate answers were accepted such as payments coming after a lump sum or receiving the money then paying it back to a zero balance. Stating it was a loan was not sufficient for full marks.
16b)	$P=R[1-1+i-n]i$ $60000=R[1-1+0.04112-240]0.04112$  $60000 = R \times 163.60$  Rearrangement shown	0.5 0.5 0.5 0.5	Very few students showed a rearrangement of the formula or showed dividing by 163.60. No marks were awarded for use of the calculator in this question.

16c)	<p>Annuity in advance</p> <p>Because the payment is made at the beginning of each period</p>	<p>1</p> <p>1</p>	<p>Most students received at least 1 mark for the correct identification of advance. A number of alternate answers were accepted such as making payments before receiving a lump sum. Stating it was an investment or savings was not sufficient for full mark.</p>
16d)	<p><math>n=240</math>  <math>I\%=4.1</math>  <math>PV=0</math>  <math>PMT=-867.58</math>  <math>FV=?</math>  <math>P/Y=12</math>  <math>C/Y=12</math>  <math>\text{Mode}=\text{Begin}</math></p>	<p>2</p>	<p>A number of students that used their calculator did not state PMT At: Begin. Full marks were not awarded in this case.</p>
16e)	<p>Freda is investing approximately a quarter of the money each month that she would have paid in loan repayments. The value in d) is approximately half the \$600 000 for a home loan as the interest is working to improve the value of her savings, while it is working against the amount she owes on the loan.</p>	<p>2</p>	<p>Some students discussed the size of the payment being smaller, some discussed interest working in the savers' favour. Correct statements about both of these were needed for full marks. A lot of students talked about paying a lot of interest on a loan towards the start. While this is true it doesn't answer the question at all.</p>
17a)	<p><math>N=5 \times 4=20</math>  <math>I\%=8</math>  <math>PV=0</math>  <math>PMT=-1000</math>  <math>FV=?</math>  <math>P/Y=4</math>  <math>C/Y=4</math>  <math>\text{Mode}=\text{Begin}</math>  <math>FV=24783.32</math></p>	<p>3</p>	<p>This question was generally well done with both formula and calculator though PMT at:End was a common error. PMT at: Begin was needed to be shown for full marks.</p>
17b)	<p><i>EITHER</i>  <math>t_1=1.02t_0+1000=1.020+1000=\\$ 1020</math>  <math>t_2=1.02t_1+1000=1.021020+1000=\\$2 060.40</math></p> <p><i>OR</i>  <math>F=1000[1+0.02]^{20}-\frac{1000}{0.02}[\frac{1+0.02^{20}}{1+0.02}-1]=\\$2 060.40</math></p>	<p>2</p>	<p>Many students did not actually use the difference equation but merely copied it and wrote a list of terms generated by it. There was also some confusion over the n value being 2.</p>

17c)	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 10%;">Quarter</th> <th style="width: 15%;">Value at start (\$)</th> <th style="width: 15%;">Value after Deposit (\$)</th> <th style="width: 15%;">Interest Earned (\$)</th> <th style="width: 15%;">Value at end (\$)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>1000</td> <td>20</td> <td>1020</td> </tr> <tr> <td>2</td> <td>1020</td> <td>2020</td> <td>40.40</td> <td>2060.40</td> </tr> <tr> <td>3</td> <td>2060.40</td> <td>3060.40</td> <td>61.21</td> <td>3121.61</td> </tr> <tr> <td>4</td> <td>3121.61</td> <td>4121.61</td> <td>82.43</td> <td>4204.04</td> </tr> </tbody> </table> <p style="text-align: center; font-size: small;">Table 17</p>	Quarter	Value at start (\$)	Value after Deposit (\$)	Interest Earned (\$)	Value at end (\$)	1	0	1000	20	1020	2	1020	2020	40.40	2060.40	3	2060.40	3060.40	61.21	3121.61	4	3121.61	4121.61	82.43	4204.04	3 Many students lost marks on this question. A lot did not calculate the interest earned correctly. Students who used values to 3 decimal places were also minorly penalised.
Quarter	Value at start (\$)	Value after Deposit (\$)	Interest Earned (\$)	Value at end (\$)																							
1	0	1000	20	1020																							
2	1020	2020	40.40	2060.40																							
3	2060.40	3060.40	61.21	3121.61																							
4	3121.61	4121.61	82.43	4204.04																							
17d)	<p>Inflation is 1.5% p.a. annually for 10 years on \$60 000  <math>FV = PV(1+i)^n = 60000(1+0.015)^{10}</math>  <math>= 69632.45</math>  The car now costs \$69 632.45.</p> <p>Josh has to pay an extra <math>69632.45 - 60000 = \\$9632.45</math>.</p>	1 1 1 Some students calculated how much Josh had saved and worked out the difference between his savings and the new car cost. Full marks were awarded in this case. This question was generally well done. An error, not common but significant was some students' use of the simple interest formula for this question.																									
18a)	$n = 25 \times 12 = 300$ $I\% = 4.5$ $PV = 500000$ $PMT = ?$ $FV = 0$ $P/Y = 12$ $C/Y = 12$ Mode = End $PMT = -2779.16$ John's repayments are \$2779.16 per month.	2 This question was well done by students whether they used the calculator or formula.																									
18b)	After 5 years, 20 years is remaining. From a), alter n to be $n = 20 \times 12 = 240$ Solving for PV gives \$439, 289. 52 (14c if round PMT) remaining on the loan.	1 1 The number of payments remaining resulted in various errors in this question for students. Some missed the 5 years and used 300, others used the 240 but had PV at 500000 and found FV, others used 60 payments but found PV with an FV of 0.																									
18c)	From b), alter I% to be $I\% = 4$ . Solving for PMT gives new repayments of \$2662.01 per month. His repayments are \$117.15 less for the next 20 years	2 1 Most students did a good job of finding the new payment but did not complete the question by finding the difference between that and the original payment.																									

18d)	<p>From c), put <math>PMT = -2779.16</math> once more.  Solve for <math>n</math> gives <math>n = 224.9</math>, thus the loan can be paid off in 225 months.  This is a saving of <math>240 - 225 = 15</math> months.</p>	<p>1 1 1</p>	<p>Most students did a good job of finding the new number of payments remaining but many did not find how many payments were saved. A number of students using GDC did not make the payment negative resulting in an incorrect answer.</p>
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# Criterion 8 – Networks or Trigonometry

## Part 1 – Networks

Students were quite prepared and appeared to have enough time to complete this section. It was very pleasing to see almost all students attempting every question.

### Question 19

- This question was very well done. This question had no writing lines, and it was missed by a few students.
- This question was very well done.
- This question was also very well done. Some students tried to add a door between C and F or B and F which is physically not possible.

### Question 20

- This question was very well done. Some did not understand the requirements of this question and gave paths that connected every town.
- This question was quite well done. Some tried to find the shortest path rather than the minimum spanning tree. Students are reminded to clearly show their tree by using highlighter pens or wavy lines.

### Question 21

- Finding the values of the 3 cuts was quite well done. Several students lost 0.5 mark for incorrectly adding the backwards edge on Cut II.
- Many students were successful at adding 3 more cuts, but most did not find the minimum cut of 130 or the next lowest cut of 140. They were given some credit for using their smallest cut when stating the maximum flow, but they needed to find the minimum cut for full marks.
- This question was quite well done. There were many answers consistent with their responses to parts a) and b) which were awarded full marks.

### Question 22

- This question was quite well done. Unfortunately, it was missed by a few students.
- Most students were able to correctly mark in the dummy edge.
- This question was reasonably well done. Some students forgot to use the dummy edge when completing the timekeeper boxes. Many students received some credit for completing some of the forward and backward scans correctly and using their final number to state the minimum completion time.
- This question was quite well done. Credit was given for stating a critical path that was consistent with responses to part c).
- Finding the float time consistent with previous answers was reasonably well done.

## Question 23

- Almost all students were successful on this question.
- There were some minor errors, but generally this question was done well.
- This question was done quite well. Some students incorrectly used 4 lines instead of 3 to cover their zeros in part b).
- This question was very well done, even by students who made errors in the previous parts.

## Part 2 – Trigonometry

Approximately 5% of students studied Trigonometry and chose to complete this part. Students seemed to be reasonably well prepared for this exam section, and they appeared to have enough time to complete it.

## Question 24

- This question was generally well done.
- This question was quite well done. Some students unsuccessfully used  $A = \frac{1}{2}absinC$  or Heron's formula rather than the simpler  $A = \frac{1}{2}bh$ .
- This question was quite well done. Students are reminded to carefully read each question as some were penalised for not calculating the total area.

## Question 25

- This question was generally well done.
- This question was also generally well done.
- This question was quite well done.
- This question was quite well done. Most students recognised the need to use the cosine rule. Unsuccessful attempts tried to use right angle trigonometry.
- This question was quite poorly done. Some students attempted to find the angle at A using the Sine rule, not realising that it was an obtuse angle. Students are advised that the cosine rule is more reliable when finding an unknown angle in a triangle because the result may be an angle greater than  $90^\circ$ . The Sine rule in this situation gives an angle of around  $76^\circ$  and students need to consider the other possible answer of  $104^\circ$ . Some students correctly found the angle at B but then struggled to find the bearing from A to B.

## Question 26

- This question was reasonably well done.
- This question was quite well done. Some students struggled to find  $a$  by incorrectly using Pythagoras' theorem. Credit was given when  $b$  was found by taking  $a$  from 100.
- There were many good attempts at this question. Credit was given if  $\tan\theta$  was used with incorrect values from parts a) and b) to find  $\theta$ .

## Question 27

- This question was well done.
- Overall, this question was quite poorly done. Most students correctly state the Dubai time zone; however, many did not find the time difference between Melbourne and Dubai which impacted their ETA calculation. Students are reminded that they are required to state the arrival day as well as the time.

- c. This question was also quite poorly done. Several items were required in this answer, so the question needs to be read carefully and each item addressed. The travel time from Dubai to London was correctly found by many; however, several students were penalised for not stating the total travel time. Some did not correctly find and use the time difference between Dubai and London in their ETA calculation. The London arrival time needed the day stated as well. Most students received credit for stating whether Sally would make it to the game based on their calculations.

## Question 28

This question involves calculating large distances between places. It is reasonable to round off final answers to the nearest km. Many students gave their answers to 2 decimal places, but as the question did not specify accuracy, they were not penalised.

- a. This question was reasonably well done. Most students recognised that this is a Great Circle application, but some used a latitude rather than the difference in latitude for  $\theta$ .
- b. This question was quite poorly done. Some students who correctly identified this question as a small circle distance mixed up  $\theta$  and  $\alpha$ .
- c. This question was quite well done. A few students incorrectly used longitude values instead of latitudes when finding  $\theta$ .
- d. This question was quite well done. Credit was given if incorrect values from answers to parts a), b) and c) were used to calculate the difference in distances.