2002 HSC Notes from the Marking Centre General Mathematics

Contents

2002 HSC NOTES FROM THE MARKING CENTRE
GENERAL MATHEMATICS

Introduction

This document provides candidates and teachers with feedback in relation to the quality of responses provided by candidates to the 2002 General Mathematics HSC examination paper. It should be read in conjunction with the 2002 HSC General Mathematics examination paper, the marking guidelines and the General Mathematics Stage 6 syllabus.

General Comments

Over 31,100 candidates attempted the 2002 General Mathematics HSC examination paper. Responses again indicated the wide range of ability of candidates presenting for this paper, from those with poor literacy and/or numeracy skills to others who are able to present their work well, write articulate responses and think about the reasonableness of their answers.

One of the main difficulties markers had was marking responses from candidates who, when they did not gain the correct answer, showed little or no working towards obtaining their answer. In these cases it was not possible to give part marks, since markers had no indication of the candidates' thinking toward their solution. Candidates must write their working down so that part marks can be awarded for correct steps towards their answer.

Some questions required candidates to explain their answer and/or justify their result in words and/or by using calculations. Candidates still have difficulty writing about their mathematical thinking clearly and concisely, but responses were, generally, of a better standard than for 2001. Candidates do need to become familiar with appropriate terminology and read their answers after they have been written to ensure that they make sense.

Candidates still need to pay attention to the number of marks given to each part of a question, so that they know the expected extent of their answers. A simple yes/no is not enough for a three-mark question, whereas a three-page explanation for a small number of marks is not necessary. They need to pay particular attention to the situations where a question asks candidates to support their reasoning with calculations or examples, since the wording of the question was intended to be helpful to the candidates.

Graphics calculators were used more often than was the case for 2001. Candidates need to get into the habit of writing the list of substitutions for the Financial Mathematics questions for which they are using their graphics calculators, since marks may be awarded for some progress towards the answer, even if it is incorrect. They should also write down the calculations as entered into their calculator, for the same reason.

Candidates need to bring a ruler along to the General Mathematics examination for drawing graphs accurately. They have enough trouble with scale using a ruler – without a ruler they usually make considerable errors in accuracy.

Section I

Question	Correct Response
1	D
2	B
3	C
4	B
5	A
6	A
7	C
8	D
9	D
10	B
11	C

Question	Correct Response
12	D
13	D
14	A
15	B
16	C
17	B
18	C
19	A
20	B
21	D
22	C

Section II

In the pages following there are specific comments about each of the free-response questions, from Question 23 to Question 28. Each of these questions was worth 13 marks.

Question 23

This question involved calculations in the area of financial mathematics – the use of percentages for simple interest, compound interest for investments, hire purchase, holiday loading and sales tax. It also included currency conversion and interpretation of a non-linear graph of loan repayments.

The majority of candidates scored within the mid-range of the available marks. 'Full marks' were rare, as were scores of 0, 1, or 2. There were virtually no 'Non attempts'. There was evidence of good presentation of working and answers in many scripts. Poorer responses showed answers only, depriving candidates of being awarded part marks for correct working. The use of graphics calculators was evident in only a very small number of responses. Such calculator usage (as for ordinary calculators) does not always guarantee a correct solution.

(a) (i) The concept of adding the deductions and subtracting the total from fortnightly pay was understood by the candidates, most of whom gained the mark. A significant number of candidates imitated the question's setting out of deductions in a vertical column, leading to some problems in addition/subtraction. The number 269.17 was often written as 296.17 – and often, when written correctly, was transferred to the calculator as 296.17.

(ii) Calculating 17.5% of an amount caused a problem for some candidates. Many also appeared to have read 'fortnights' as 'weeks' and proceeded to calculate 4 fortnights' worth of loading.

(iii) (1) The mark offered here for a correct answer was perhaps the most difficult to obtain on this question. The concept of an amount being 120% of the amount required was beyond many candidates. The popular incorrect response was

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finding 20% of $180 and subtracting this amount from $180, indicating that this type of problem-solving needs a higher profile in classrooms.

    (iii) (2)   Candidates were fairly successful in gaining the mark in this part for converting from euros into Australian dollars. The most common error came from multiplying 0.58 by 180.

(b) In general, the responses in this part of the question were disappointing, indicating a limited understanding of the Financial Mathematics section of the course.

    (i)   A surprising number of candidates attempted this question using a step-by-step method by calculating the annual interest and adding it to the principal (5 times). Many candidates attempted this question with an incorrect formula and produced answers that were quite unrealistic. Candidates who used the correct formula often had errors in writing $1 + 3.1\%$, the expressions 1.0031 and 1.31 being the most common. Many candidates who used graphics calculators indicated that they did not know how to use them appropriately. A significant number of candidates missed an opportunity to gain a relatively easy mark for correct rounding by either ignoring the rounding or not showing appropriate working to enable markers to check that a correct rounding had occurred.

    (ii)   Most of the candidates who calculated the compound interest 'the long way' in part (i) used the formula correctly in (ii)! Most candidates who repeated the use of the compound interest formula with modification to the interest rate and the related time period were successful.

The question required candidates to indicate which of two sisters had made the better investment. Many candidates were unable to express themselves adequately with a surprising number indicating that the sister who had the smaller amount at the end had made the better investment 'because she didn't have as much interest'. The confusion between investments and loans was quite obvious. The magnitude of some answers showed a lack of appreciation of the appropriateness of numerical answers. There was considerable support for the notion that interest compounding monthly automatically gives a better result than interest compounding yearly.

(c) (i)   This question tested the ability of candidates to take financial information and set up appropriate hire purchase calculations to determine the value of monthly repayments.

Many candidates were unable to complete this question without being provided with question sub-parts to guide them to the solution. Commonly, the only mark awarded was for the correct calculation of the deposit or the balance to be borrowed. The simple interest calculation was very disappointing. A significant number of candidates, who calculated the interest correctly, then divided the interest, rather than the balance plus interest, by 36, to calculate the monthly repayments. Some candidates attempted to convert to monthly repayment from the outset but they were almost always unable to calculate the required interest per month.

    (ii)   Most candidates obtained full marks in this graph-reading question.

(1)   The most common incorrect answer was $3500 through poor reading of the vertical axis. The second most common incorrect answer was $1600 (the amount paid).

(2)   The common incorrect answer was 30 months, half of the 60-month term. An answer of $2900, the amount owing half-way through the repayment period, occurred regularly.

Question 24

(a)   (i)   This question was generally very well done. The most common mistake was '3 out of 9'.

(ii)   Candidates were awarded one mark for drawing a box-and-whisker plot using the 5 numbers given, and one mark for constructing it to scale. Candidates displayed a full range of diagrams, from the accurate scaled plot to a hasty sketch not drawn to scale, a column graph or stem-and-leaf plot. Many did not use a ruler. Some candidates did not know the significance of the five number summary and proceeded to use the raw scores given initially to recalculate the quartiles. Some candidates used the five number summary as five raw scores and calculated the upper and lower quartiles and the mean from these scores and then drew a box-and-whisker plot using these figures. The interquartile range was often confused with the range.

(iii) Many candidates missed this question all together. Candidates who were successful in part (ii) were generally successful in this part.

(b)   (i)   This part was very well done, showing that candidates had a good understanding of the basic structure of two-way tables. Most candidates gained two marks for this part.

(ii)   This part was also very well done. Many candidates even showed that the figure could be calculated two ways from the table, providing a cross-check. Unfortunately quite a number of candidates omitted this question.

(iii) Most candidates found this question easy but some made errors if they converted the fraction to a percentage. Some candidates lost marks trying to reduce fractions further than was possible.

(iv)   The comments to part (b) (iii) also apply to this part ie errors in converting to a percentage (unnecessarily) or errors in reducing fractions further than was possible. Quite a number of candidates omitted this question.

(c)   (i)   This question was reasonably well done although some candidates found the nature of the question difficult.

(ii)   This question was problematic in that most candidates recognised that there was no replacement and proceeded to calculate the probability of being chosen at the instant of the second draw, instead of the overall probability of being chosen second. So the most common answer was '1 out 11'. This part was commonly the only part incorrect.

(iii) Most successful candidates used a tree diagram strategy to achieve the correct answer. Not as many as expected adopted the complementary method approach. Many just said '9 not chosen out of 12', and displayed an appropriate fraction.

Question 25

Question 25 seemed to provide candidates with the most difficulty of any question on the paper. The overall standard of responses across the question was poor.

(a) (i) (1) Many candidates showed little understanding of the concept of 'similar figures' or the notion of similarity. Most tried naming corresponding angles or intervals. The most common incorrect response was '*EC*'. Congruency and similarity were frequently confused. This was very poorly answered overall.

(2) Most candidates answered incorrectly, giving 3 as the enlargement factor instead of 4. Some used the small triangle only to give a 'factor' of 50/20. Many gave the enlargement factor as a ratio instead of a number.

(3) Most candidates knew to use their enlargement factor from part (2), which for many gave an answer of 60 cm instead of 80 cm. Several candidates used Pythagoras' theorem and trigonometry to calculate the length of *CB*, rather than using the obvious similarity.

(ii) This was quite poorly answered, and frequently not attempted. The concept of an equation seemed to confuse many candidates. Some used the variation symbol or a third unknown variable, but did not convert into a single equation.

(b) (i) Many candidates found an angular difference of 160° or 80° rather than the correct 200°. This then led to an incorrect time difference, showing poor understanding of the difference between longitude values and the International Dateline. The mention of time zones confused many. A common error was the attempt to work with latitudes. Conversion of angular distance into time difference was also poorly done. Changing from minutes into hours also confused many candidates. Many could not convert from decimal time format to minutes in order to distinguish between 13.33 hours and 13 hours and 20 minutes.

(ii) Many candidates rounded their time from part (i) to the nearest hour, incorrectly simplifying the question. Many could not work out which town was ahead of the other, and subtracted the time instead of adding. Many ignored the instruction to provide both time and day, as asked for in the question. There was confusion with common notions of 'night' and when Friday ends and when Saturday begins. The use of am and pm was frequently confused.

(c) (i) The manipulation and understanding of scientific notation were very poor. A number of candidates converted the numbers to expanded form. Many candidates could not square the large numbers in scientific notation or substitute large numbers correctly into the annulus formula. Many could not even copy the numbers correctly from the examination paper into the formula.

Calculator use was generally poor, both for calculating the correct answer, and for reading the scientific mode from the calculator. Many candidates could not correctly

transcribe their calculator readout into correct scientific notation. Rounding was poorly done, with many candidates confusing 2 decimal places with 2 significant figures.

(ii) This part was not well answered, with many candidates making elementary algebraic errors. Those who worked one step at a time to manipulate the formula generally earned at least one mark. Many candidates attempted to expand, re-organise, cancel and take the square root all in one step, making multiple errors. Many candidates did not take sufficient care when writing square root signs over fractions: the square root sign often did not extend to include the denominator, and did not extend far enough to the right to cover the entire fraction. Common errors were to leave the formula with R^2 as the subject, or to take the square root incorrectly ie $\sqrt{R^2 - r^2} = R - r$.

(iii) This part was poorly answered, and left out by many. Some candidates incorrectly used the circumference or area of a circle formula in an attempt to find r. Those who used their own formula from part (ii) could generally substitute correctly, but many then had trouble calculating their answer. Many candidates could not rewrite their formula correctly between parts of the same question. Those who chose to substitute into the original annulus formula had common difficulties, with many candidates squaring the number 6.79 when substituting for A, or swapping R for A. Confusion also seemed to occur when candidates included units of measure in their substitution steps.

Question 26

Generally, the answers to this question reflected the very wide range of mathematical ability of the candidates. The full range of marks was awarded. Some answers reflected very poor literacy levels. Candidates showed that they need to work on interpreting what the question is asking and become familiar with the meaning of words such as 'explain' and 'describe' (Board of Studies glossary of key words).

(a) This part was generally well answered with most successful responses the result of an algebraic or trial-and-error method. It was difficult to award any marks for incorrect answers when candidates responded without any working whatsoever. Candidates who had an incorrect answer but did show working were usually awarded a mark for correctly 'working towards' the answer. Many candidates had shown within their working that 9 was the answer, but failed to conclude this at the end of their working. Although candidates were not penalised for this on this occasion, it is clear that candidates need to realise the importance of a conclusion. The most common incorrect answer was 6.

(b) (i) Many candidates were able to find the correct mean by a variety of methods. It was evident by the number of candidates who painstakingly added up each of the 30 scores and then divided by 30 that there was a lack of confidence in using the statistical mode on the calculator. The most common incorrect responses were $97 \div 30$ (from incorrect $0 \times 3 = 3$), $94 \div 6$ (from 6 possible scores 0, 1, 2, 3, 4, 5), $97 \div 6$, $30 \div 6$, $30 \div 5$.

(ii) The majority of candidates who gave an answer to this question gave the population standard deviation as their answer. Many did not understand what was meant by sample standard deviation and some who did not know the difference between the two stated both as their answer. Many candidates did not round their answers correctly.

(iii) The median was determined by calculating the average of the 15th and 16th scores (both scores of 4). Generally, most candidates who answered correctly arranged the scores in order and proceeded to work their way from either end to find the two middle scores. Some incorrect approaches were: leaving off the three zero scores deeming them insignificant; finding the middle of the frequency column; the 'range' of the frequency column ie 7 – 3; finding the middle of the *fx* column, $94 \div 2 = 47^{th}$ score $\Rightarrow 4$.

(iv) This part was very poorly answered with very few candidates stating the very simple answers 'negatively skewed' or 'skewed to the left'. Many incorrect responses were the opposite (positively skewed or skewed right) or a description of the shape of a resulting graph or stem-and-leaf plot, failing to use language that focused on the skewness of the data. Some candidates correctly stated that mean minus median (or mode) was a negative answer, therefore the skew was also negative.

(v) Although the question stated '... estimate how many of these Year 12 students ...', it was very easy to calculate the correct answer by using simple knowledge of fractions and/or percentages. Many candidates did attempt to do this but made the following errors: they did not read the question carefully and included the four scores of 3 (messages); they rounded off through the stages of working, resulting in a significant error at the end; they did not round to the nearest whole person.

(c) (i) This part was very well answered by most candidates.

(ii) and (iii) These parts were, in general, poorly answered, with a significant number of candidates failing to use the two obvious points on the line to determine rise/run and then continuing to use this in the next part. The intercept was also easily found by producing the line through the *G* axis, but many candidates chose to use algebraic methods to find this value. In part (iii), although many candidates could state the formula $y = mx + b$, they had difficulty in understanding the connection with *G* and *A*.

(iv) This part was poorly answered, with a significant number of candidates being confused between correlation and skewness. Many candidates wrote about a correlation for Algebra and another for Geometry, rather than using words indicating a positive correlation between both.

(v) This part relied on candidates identifying an outlier that contradicts the statement. They needed to show that the scores for that candidate were high for one subject and low for the other and not just simply state that there was an outlier. Many candidates tried to reword the (incorrect) statement in the question but without any clear reference to a specific counter-example. Some candidates did not interpret the graph in two dimensions, and failed to see that one '×' represented the results of one candidate in two different tests. Some candidates felt that since the graph was not labelled with the candidates' names, then assumptions could not be made about their results.

Question 27

This question emphasised mathematics of the triangle and the progression from Stage 5 to Stage 6 in measurement. It is a reasonable expectation that candidates studying General Mathematics should be familiar with this style of question and that the average candidate can achieve the standard suggested.

Candidates who optimised their marks:
- showed a clear, concise and appropriate method to solve each problem. That is, those who worked in a logical manner, stated what they were doing with clear well-labelled diagrams and with all necessary working shown, were clearly at an advantage compared to those who showed poor or no working or who did not indicate where they were heading. In all parts of this question, it was difficult to award marks where working was non-existent or poorly presented
- referred correctly to the formula sheet, probably keeping it in clear view on their desks, were familiar with it and used it carefully where necessary
- drew diagrams and included given information as well as information calculated while doing the question
- did not round off too early in a question and therefore avoided discrepancies (especially relevant to part (b)(i)).

(a) (i) Few candidates appeared to have sufficient knowledge and understanding of bearings. The language of bearings needs to be better understood. 'Find the size of $\angle XYZ$' was interpreted by a number of candidates as 'find the size of triangle *XYZ*'.

(ii) Many candidates assumed the presence of a right angle and then used Pythagoras' theorem, an obviously incorrect method. The cosine rule was applied well by those who decided that it was the correct rule to use in this question.

(iii) Once again a fundamental knowledge of bearings was necessary and many candidates could not do this part.

Note: All candidates in General Mathematics must ensure that their calculators are set to DEGREE mode. RAD or GRAD modes are NOT appropriate.

(b) (i) This part was done best with a clear diagram and a sound knowledge of Pythagoras' theorem. The presence of the right angle suggested either the use of Pythagoras' theorem or trigonometric ratios – the former approach being the easier and yielding successful outcomes far more often.

(ii) Candidates quite often had the trigonometry correct but too often could not use their calculators to calculate the required angle.

(c) (i) Simpson's rule was well understood by a great many of the candidates, with many showing a good understanding of the procedure required. Candidates who showed their substitution line seemed to more often use their calculators correctly. The value of *h* was often incorrect, suggesting that some candidates do not understand how to apply the formula.

(ii) Many candidates used a 'derived' form of Simpson's rule and gave their working as $\frac{150}{3}[0+4\times86+0]$. Many candidates gave incorrect applications of this derived formula.

Question 28

(a) (i) A correct response was extremely rare. Most candidates showed that the formula was correct for a particular value of x. A diagram of the cross-section with appropriate lengths marked was sufficient to gain a mark.

(ii) Most candidates were aware of obvious physical restrictions involved with this question. Candidates who substituted values greater than or equal to 14 or below 0, which resulted in a negative value, were aware that a negative value for area was a physical impossibility. Many candidates related their answers to the physical idea of folding up sides to show that x was unable to exceed 14. Most did not mention values of x less than 0.

(iii) A common answer was that the maximum value was 14, possibly as a result of the previous part. Many candidates gave an answer of 7 rather than completing the question using $x = 7$ to gain a maximum value of 98.

(b) (i) This part was quite well done by most candidates. The question explicitly gave the variables to use and candidates who deviated from these were penalised. Of the incorrect responses, $Q = 50^n$ was common.

(ii) Candidates did not see the connection with what they had written in part (b)(i) and the graph they were drawing. Most candidates were attempting to graph $Q = 50n$ even when they had not been successful in the previous part, indicating that they were able to interpret the situation graphically but not necessarily algebraically.

Carelessness with the scale on the axes led to a situation where a correct graph was very difficult for candidates to obtain. Despite the question stating that the graph was a straight line, candidates still drew curves or segmented lines.

(iii) Many candidates simply drew a horizontal line on their graph and gave no interpretation of the point of intersection. Candidates tended to state the point of intersection and felt that this had answered the question. Candidates who knew the 'break-even' point concept were very successful with this part.

(iv) This question was reasonably well attempted by many candidates, with a significant number scoring 2 marks or greater. Most candidates were well acquainted with the concept of compound interest, although some used simple interest. Commonly, candidates failed to total their High School years and simply proceeded with the Year 12 amount as their investment for University. Candidates confused the addition of $2500 during University, often adding it to the investment at the wrong time.

Few candidates used graphics calculators – of those who did, many were successful as they listed the values that they were using. Most candidates did conclude correctly from their mathematical findings. Candidates who showed little or no calculations to justify their conclusions were penalised, as the question explicitly required calculations to justify the conclusion made. Many candidates gained marks for demonstrating the correct method, even where some arithmetical errors were present.

General Mathematics

2002 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I			
1	1	DA5: Interpreting sets of data	H9
2	1	AM1: Basic algebraic skills AM3: Algebraic skills and techniques	P2, H2
3	1	M2: Applications of area and volume	P2, P6
4	1	FM1: Earning money	P2
5	1	PB3: Multi-stage events	H10
6	1	AM2: Modelling linear relationships	P4
7	1	FM2: Investing money	P8
8	1	DA6: The normal distribution	H4
9	1	FM4: Credit and borrowing	H5, H8
10	1	M5: Further applications of area and volume	H2, H6
11	1	FM6: Depreciation	H8
12	1	DA6: The normal distribution	H5
13	1	AM3: Algebraic skills and techniques M5: Further applications of area and volume	H2, H6
14	1	AM3: Algebraic skills and techniques	H2, H11
15	1	FM5: Annuities and loan repayments	H8
16	1	AM3: Algebraic skills and techniques	H2
17	1	DA3: Displaying single data sets	P4
18	1	PB4: Applications of probability	H10
19	1	M1: Units of measurement	P2
20	1	PB2: Relative frequency and probability	P10
21	1	M1: Units of measurement	P2
22	1	AM2: Modelling linear relationships	P4
Section II			
23(a)(i)	1	FM1: Earning money	P2, P8
23(a) (ii)	1	FM1: Earning money	P2, P8
23(a)(iii)(1)	1	FM3: Taxation	P2, P8
23(a)(iii)(2)	1	M1: Units of measurement	P2
23(b)(i)	2	FM2: Investing money	P2, P7, P8
23(b)(ii)	2	FM2: Investing money	P2, P8, P11
23(c)(i)	3	FM4: Credit and borrowing	H8
23(c)(ii)(1)	1	FM4: Credit and borrowing	H2, H8
23(c)(ii)(2)	1	FM4: Credit and borrowing	H2, H8

Question	Marks	Content	Syllabus outcomes
24(a)(i)	1	PB2: Relative frequency and probability	P10
24(a)(ii)	2	DA3: Displaying single data sets	P4
24(a)(iii)	1	DA3: Displaying single data sets	P4
24(b)(i)	2	DA5: Interpreting sets of data	H4
24(b)(ii)	1	DA5: Interpreting sets of data	H4
24(b)(iii)	1	PB4: Applications of probability	H4, H10
24(b)(iv)	1	PB4: Applications of probability	H4, H10
24(c)(i)	1	PB2: Relative frequency and probability	P10
24(c)(ii)	1	PB3: Multi-stage events	H10
24(c)(iii)	2	PB3: Multi-stage events	H10
25(a)(i)(1)	1	M3: Similarity of two-dimensional figures	P2
25(a)(i)(2)	1	M3: Similarity of two-dimensional figures	P2, P6
25(a)(i)(3)	1	M3: Similarity of two-dimensional figures	P2, P6
25(a)(ii)	1	M3: Similarity of two-dimensional figures AM4: Modelling linear and non-linear relationships	P2, P6, H2, H3
25(b)(i)	1	M7: Spherical geometry	H6, H11
25(b)(ii)	2	M7: Spherical geometry	H6, H11
25(c)(i)	2	M5: Further applications of area and volume	H2, H6
25(c)(ii)	2	AM3: Algebraic skills and techniques	H2
25(c)(iii)	2	M5: Further applications of area and volume AM3: Algebraic skills and techniques	H2, H6
26(a)	2	DA4: Summary statistics	P2
26(b)(i)	1	DA4: Summary statistics	P2
26(b)(ii)	1	DA4: Summary statistics	P2
26(b)(iii)	1	DA4: Summary statistics	P2
26(b)(iv)	1	DA5: Interpreting sets of data	H4
26(b)(v)	1	PB4: Applications of probability	H10
26(c)(i)	1	DA7: Correlation	H4
26(c)(ii)	1	DA7: Correlation AM2: Modelling linear relationships	P4, H4
26(c)(iii)	2	DA7: Correlation AM2: Modelling linear relationships	P4, H4
26(c)(iv)	1	DA7: Correlation	H4
26(c)(v)	1	DA7: Correlation	H4, H11
27(a)(i)	1	M6: Applications of trigonometry	H2, H6
27(a)(ii)	2	M6: Applications of trigonometry	H6
27(a)(iii)	1	M6: Applications of trigonometry	H6

Question	Marks	Content		Syllabus outcomes
27(b)(i)	3	M4:	Right-angled triangles	P6
27(b)(ii)	1	M6:	Applications of trigonometry	H6
27(c)(i)	2	M5:	Further applications of area and volume	H6
27(c)(ii)	3	M5:	Further applications of area and volume	H2, H6
28(a)(i)	1	AM4:	Modelling linear and non-linear relationships	H11
28(a)(ii)	1	AM4:	Modelling linear and non-linear relationships	H11
28(a)(iii)	2	AM4:	Modelling linear and non-linear relationships	H5
28(b)(i)	1	AM4:	Modelling linear and non-linear relationships	H2
28(b)(ii)	3	AM4:	Modelling linear and non-linear relationships	H2
28(b)(iii)	1	AM4:	Modelling linear and non-linear relationships	H5
28(b)(iv)	4	FM2: FM5:	Investing money Annuities and loan repayments	P2, P8, H5, H8

2002 HSC General Mathematics
Marking Guidelines

General principles

This introduction highlights some general principles of mathematics marking that are intended to facilitate rewarding students' mathematical knowledge and skills. They are not prescriptive rules, but need the professional judgement of marking teams in particular situations.

Correct from previous answer: If an error is made in some part of a question (and generally penalised there), then working and answers that are consistent with this initial error are rewarded in subsequent parts. This principle would not, normally, apply in the case where the initial error trivialises subsequent parts.

Ignoring subsequent errors: When a student has reached a point in a question where their working and answer is worth a mark(s), then they normally would not lose such marks through subsequent errors.

Correct numerical expression: Often a correct numerical (or algebraic) expression is sufficient for the award of (full) marks, rather than the answer calculated out completely. These correct numerical expressions, where applicable, are indicated in the sample answers by boxes around the expressions.

Transcription errors: Where students clearly transcribe incorrectly from the examination paper to their writing booklet, and this does not make the question easier, then such transcription errors *are not normally penalised.*

Correct rounding or correct units: There are usually specific questions where correct rounding or the correct unit is essential for (full) marks. *Thus it would be in these questions that marks are deducted for incorrect rounding or wrong units. In this way, these errors are not usually penalised several times throughout the paper.*

Multiple solutions and crossing out
- any correct attempt crossed and replaced correctly is read and marks awarded without penalty
- any attempt crossed out without replacement is marked as though it were not crossed out
- multiple attempts, not crossed out, will all be read and normally marks will be awarded for the best attempt, provided the methods are not in conflict. If so, a 1 mark penalty would usually be imposed. The marker needs to use their best judgement at all times. In general, students should not gain from two or more different attempts at the same question.
- correct attempts crossed out and replaced with incorrect attempts again require the use of judgement. In general, award some marks as though the work were not crossed out – but probably not full marks. The response depends on the circumstances.

Section II

Question 23 (a) (i)

Outcomes assessed: P2, P8

MARKING GUIDELINES

Criteria	Marks
• Correct expression for fortnightly net pay	1

Question 23 (a) (ii)

Outcomes assessed: P2, P8

MARKING GUIDELINES

Criteria	Marks
• Correct expression for annual leave loading	1

Question 23 (a) (iii) (1)

Outcomes assessed: P2, P8

MARKING GUIDELINES

Criteria	Marks
• Correct expression for price of boots	1

Question 23 (a) (iii) (2)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct numerical expression	1

Question 23 (b) (i)

Outcomes assessed: P2, P7, P8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation rounded correctly	2
• Correct numerical expression OR • Correct rounding shown	1

Question 23 (b) (ii)

Outcomes assessed: P2, P8, P11

MARKING GUIDELINES

Criteria	Marks
• Correct calculation for Liz's investment. Correct justification	2
• Correct expression for Liz's investment OR • Error in expression or calculation and appropriate conclusion	1

Question 23 (c) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation for monthly repayment	3
• Correct method with one minor error such as not considering deposit	2
• Some progress toward solution, such as $15\% \times \$5000 \times 3$	1

Question 23 (c) (ii) (1)

Outcomes assessed: H2, H8

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 23 (c) (ii) (2)

Outcomes assessed: H2, H8

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 24 (a) (i)

Outcomes assessed: P10
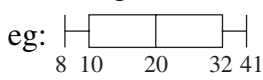
MARKING GUIDELINES

Criteria	Marks
• Correct probability	1

Question 24 (a) (ii)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct diagram drawn to scale	2
• Correct diagram but on an inappropriate scale eg: (box plot) 8 10 20 32 41 OR • Correct diagram to scale without numbers	1

Question 24 (a) (iii)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 24 (b) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct values for *A* and *B*	2
• Correct value for *A* OR for *B*	1

Question 24 (b) (ii)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct number of cars	1

Question 24 (b) (iii)

Outcomes assessed: H4, H10

MARKING GUIDELINES

Criteria	Marks
• Correct fraction	1

Question 24 (b) (iv)

Outcomes assessed: H4, H10

MARKING GUIDELINES

Criteria	Marks
• Correct fraction	1

Question 24 (c) (i)

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct probability	1

Question 24 (c) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct expression for probability	1

Question 24 (c) (iii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Calculates complement of answer or similar error OR • Shows progress towards a solution	1

Question 25 (a) (i) (1)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct naming of similar figures	1

Question 25 (a) (i) (2)

Outcomes assessed: P2, P6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 25 (a) (i) (3)

Outcomes assessed: P2, P6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 25 (a) (ii)

Outcomes assessed: P2, P6, H2, H3

MARKING GUIDELINES

Criteria	Marks
• A correct equation relating *d* and *x*	1

Question 25 (b) (i)

Outcomes assessed: H6, H11

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 25 (b) (ii)

Outcomes assessed: H6, H11

MARKING GUIDELINES

Criteria	Marks
• Correctly calculates time and day	2
• Makes progress towards correct answer. (Bald correct day only gets 0)	1

Question 25 (c) (i)

Outcomes assessed: H2, H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer, in scientific notation, correct to 2 significant figures	2
• Makes some progress towards correct answer OR • Correct rounding to 2 significant figures of non-trivial calculation	1

Question 25 (c) (ii)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Rearranges the formula for the area of an annulus to make *R* the subject	2
• Makes some progress towards correct answer	1

Question 25 (c) (iii)

Outcomes assessed: H2, H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer, or consistent with non-trivial answer from (c) (ii)	2
• Substitutes correctly into area of annulus formula, or their non-trivial answer from (c) (ii)	1

Question 26 (a)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Makes some progress towards correct answer	1

Question 26 (b) (i)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 26 (b) (ii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer. (Do not accept population standard deviation)	1

Question 26 (b) (iii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 26 (b) (iv)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Description showing understanding of skewness	1

Question 26 (b) (v)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct expression for number of students	1

Question 26 (c) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 26 (c) (ii)

Outcomes assessed: P4, H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer, or suitable expression	1

Question 26 (c) (iii)

Outcomes assessed: P4, H4

MARKING GUIDELINES

Criteria	Marks
• Linear equation with gradient consistent with 26 (c) (ii) and G-intercept $\doteq 10$	2
• Linear equation with gradient consistent with 26 (c) (ii) OR • Linear equation with G-intercept $\doteq 10$	1

Question 26 (c) (iv)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Appropriate description	1

Question 26 (c) (v)

Outcomes assessed: H4, H11

MARKING GUIDELINES

Criteria	Marks
• Appropriate explanation	1

Question 27 (a) (i)

Outcomes assessed: H2, H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 27 (a) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation for *XZ*	2
• Substitutes appropriately into the cosine rule formula	1

Question 27 (a) (iii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct bearing	1

Question 27 (b) (i)

Outcomes assessed: P6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of perimeter	3
• Makes significant progress towards solution	2
• Length of $QS = 3$	1

Question 27 (b) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of size of $\angle QPS$	1

Question 27 (c) (i)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation for area	2
• Attempts to use Simpson's rule	1

Question 27 (c) (ii)

Outcomes assessed: H2, H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculations to find area of lake. (Do not accept bald answer)	3
• Makes significant progress towards solution	2
• Makes some progress towards solution	1

Question 28 (a) (i)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Diagram or working showing evidence of $x \times (28 - 2x)$, or equivalent	1

Question 28 (a) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Appropriate explanation	1

Question 28 (a) (iii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correctly determines maximum value	2
• Recognises that maximum value occurs when $x = 7$ OR • Progress towards correct maximum value	1

Question 28 (b) (i)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct formula using correct variables	1

Question 28 (b) (ii)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct straight line graph (or consistent with (i)) • Axes drawn with appropriate scales marked	3
• Straight line graph drawn (incorrect slope or y-intercept) on axes marked with appropriate scale OR • Axes drawn with appropriate scales chosen for data	2
• Correct straight line graph (or consistent with (i)) drawn without appropriate scales OR • Progress towards producing a correct graph	1

Question 28 (b) (iii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Interprets point at which horizontal line crosses straight line graph appropriately	1

Question 28 (b) (iv)

Outcomes assessed: P2, P8, H5, H8

MARKING GUIDELINES

Criteria	Marks
• Comprehensive justification of answer with calculations showing savings years 9–12, compound interest (2005–2007) and future value of additional $2500 added (2005–2007). Working must be shown OR • Correct and clear calculations to give the correct amount saved, with correct conclusion	4
• Calculations that are correct for 2 of the 3 components, with valid conclusion OR • Complete and correct calculations with missing or invalid conclusion OR • Correct amount saved after 4 years and correct method for calculating compound interest at uni, without adding on $2500 each time, with valid and correct conclusion OR • Some progress from correct amount saved after 4 years that uses compound interest and regular addition of $2500 correctly	3
• Makes reasonable progress OR • Correctly calculates the amount saved after 4 years using compound interest formula or step-by-step method and adding amounts for each year OR • Correct procedure for amount saved at uni from incorrect previous procedure	2
• Makes some progress OR • Bald answer of $14 067 with valid conclusion OR • Correct calculation of 1 compound interest amount	1