2003 HSC Notes from the Marking Centre General Mathematics

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2003 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 2003 General Mathematics HSC examination paper. It should be read in conjunction with the 2003 HSC General Mathematics examination paper, the marking guidelines and the General Mathematics Stage 6 syllabus.

General Comments

Over 29 500 candidates attempted the 2003 General Mathematics HSC examination paper. This number was down on the 2002 number of candidates by about 1500. 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 continue to have occurs in the marking of responses which involve an incorrect answer with little or no working shown. In these cases it was not possible to give part marks, since markers had no indication of the candidates' thinking towards their solution. The strong message must be given to candidates to write their working down so that part marks can be awarded for correct steps towards their answer. A simple example of this occurs when candidates have to round their answer to a certain degree of accuracy. Candidates should always write their calculator display before rounding their answer. Markers can then see that candidates have rounded correctly, even if the answer is not correct.

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 clearly and concisely to demonstrate their mathematical thinking, but responses were generally of a better standard than in 2002. Candidates still 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. Candidates need to pay particular attention to the situations where a question asks them to support their reasoning with calculations or examples, since the wording of the question was intended to be helpful.

If candidates are using graphics calculators they need to get into the habit of writing the list of substitutions for the Financial Mathematics questions, since marks may be awarded for some progress towards the answer, even if it is incorrect. Similarly, they should also write down the calculations as entered into their calculator.

Candidates need to bring a ruler to the General Mathematics examination for drawing graphs and diagrams accurately.

Section I

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

Question	Correct Response
12	A
13	C
14	B
15	B
16	D
17	C
18	D
19	B
20	A
21	A
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 was quite well done by most candidates. There were few candidates who did not attempt this question. Candidates who set work out clearly were able to gain marks for correct numerical expressions even when answers were incorrect. Many candidates demonstrated a poor knowledge of conversion of units in relation to volume and capacity. Candidates must be careful to choose the correct formula from the formulae sheet.

(a) (i) An incorrect response was extremely rare.

(ii) Many candidates were unable to deal with the concept of kilolitres successfully. Some candidates are unable to detect unrealistic (or sometimes even outrageous) answers. This question required a number of steps to successfully complete it and many candidates were unable to show a correct numerical expression. Candidates often converted from kilolitres to litres by dividing by 10.

(iii) Again, incorrect conversion of units was the most common error eg 1.2 L = 120 mL. Another common error was to provide the amount of drops for all 13 shrubs – candidates need to read questions carefully.

(iv) Many candidates realised that to divide their answer from the previous part by 600 was all that was required. Of those making errors, the most common was to divide by 10 and then multiply by 60.

(b) Many candidates did this part well. Not obtaining the radius from the given diameter was a common error. Many did not square the radius. Some candidates seemed to halve the diameter and then not halve the surface area of the sphere (they may have felt that they had already

halved the formula). Some candidates also added the area of the circle, closing the hemisphere.

(c) Most candidates were able to use Simpson's rule, but many made minor errors with the formula. The 'zero' length also seemed to cause problems for many. Most realised that two applications were required. Some candidates had problems with the value of h.

(d) (i) The majority of candidates correctly calculated the volume of one cylinder. Many multiplied this answer by 8, interpreting the question as requiring the total of all of the cylinders. Some candidates used the surface area formula instead of the volume formula. Units were often incorrect or ignored. Although not penalised here, this made it difficult to gain the mark for conversion of units in d(ii).

(ii) Most candidates correctly calculated the volume of 8 cylinders. Many candidates had difficulty linking volume and capacity successfully. Candidates were required to clearly demonstrate a link between cubic units of volume and litres or millilitres. Some candidates used inappropriate arguments eg '4904 L is under 5 L'. They need to consider what they have written and determine if it conveys the desired message.

Question 24

This question was devoted entirely to aspects of personal finance. Calculations were required in the areas of simple and compound interest, the future value of a regular investment, income and tax.

The question proved to be quite challenging, with the marks obtained being skewed towards the lower end of the range. Many candidates displayed evidence of confusion, with an abnormal amount of crossing out and restarting. Most candidates showed a considerable amount of 'working'. The use of graphics calculators was minimal, although it was to a greater extent than in previous years. Those who did use graphics calculators typically stated the entries they were using, and so were able to obtain 'working' marks if their final answers were incorrect.

(a) The compound interest formula was readily identified, but correctly passing from 4.75% pa to $0.0475 \div 12$ (= 0.003958….) per month caused considerable difficulty. Many responses showed some correct working, but calculator errors were very common. Many responses indicated rounding within the calculation, and hence the final numerical answer was often incorrect.

(b) (i) The common error was to add only one amount of \$900 to \$58 624 to obtain the annual taxable income. The need to do 'something' with the tax of \$14 410.80 was also a source of error in this part.

(ii) What was a routine calculation from the table based on an answer to b(i) was completed fairly well, although often using an incorrect amount. A number of candidates who were unable to calculate the taxable income in b(i) were able to calculate it correctly as the first part of their answer to b(ii). Thus it was obvious that a lot of candidates did not understand what was required of them in b(i). A significant group of candidates calculated the tax on the first and second jobs separately and then added them to find the total tax.

(iii) This 'show' question revealed a dichotomy in the candidature. There were many satisfactory responses. The question required candidates to find the difference in the tax given (paid) and the tax calculated in (ii), and to find the monthly difference before subtracting this

from $900 to obtain the stated amount. Many candidates took the less certain path of obtaining the difference in net income resulting from having a second job before working to the monthly net income from the second job. A third group successfully calculated the proportion of the $10 800 income in the separate tax brackets and proceeded to calculate the tax on the second income. It appeared that only some candidates were able to formulate a solution via this method and those attempting this approach were usually successful. The above methods were frustrated by errors carried through from parts (i) and (ii). Of course there were some responses that used the answer to work backwards to obtain some of the legitimate numbers, but this strategy was not acceptable. Common incorrect responses included obtaining the tax on $10 800 (the second job income), subtracting from $10 800, and then adjusting the amount to one that was 'monthly'. Finding the difference between $486.44 and $900, then subtracting it from $900 to obtain $486.44 was not acceptable.

(iv) As alternatives for the correct future value formula, candidates used compound interest and present value formulae. Similar errors to those in part (a) occurred with regard to changing an annual percentage rate to a monthly rate and rounding within the calculation. Some candidates incorrectly used a value they obtained in b(iii) for M rather than using the given $486.44. Candidates should be encouraged to trust values stated on the examination paper and not assume the examination question is wrong when it doesn't match their answer.

A few candidates attempted to solve for M, using A = $12 000, but were unsure of their answer in a comparison with $486.44. At least one candidate attempted to solve for n, using logarithms (unsuccessfully).

(c) Overall, this question was not done very well. Many candidates could not work with fortnights. The 'number of fortnights in 2 years' ranged from 24 through to 104 with 56 being a common misconception. Better responses calculated the interest per year after selecting the correct fortnightly repayment, multiplying by 52, subtracting the total borrowed, dividing by 2, and then dividing by 15 500. Common errors included: dividing by the total to be repaid; not subtracting the principal from the total to be repaid; and not changing the result for 2 years back to an annual rate. Many candidates terminated their calculation after obtaining the total interest or the interest per year.

Candidates who started with the simple interest formula very often used 52 (months) in place of 2 (years).

Question 25

Candidates managed to score the full range of marks in this question and there were very few non-attempts for the whole question. The numbering in (a) seemed to cause some candidates some difficulty. This needs to be highlighted to all General Mathematics candidates in the future.

(a) (i) (1) Many candidates scored this mark. A significant number wrote both the mode and its frequency without clearly indicating which of the numbers actually answers the question. Common errors included the calculation of the median and of the average.

(i) (2) It is clear that many candidates equate the word 'mode' with 'most', but struggle to put it correctly in context. Interpreting the sense of the word 'most' used by many candidates in their explanation of 'the mode number of cars in a household' was extremely difficult. Many candidates, who probably knew what the mode was, lost a mark here through their incorrect use

of 'most', for example 'most households have 2 cars'.

Candidates should be encouraged to use the words 'common', 'popular', 'frequent' and 'often' when describing the mode. Many candidates also failed to realise that the question required an explanation of mode in the given context. Candidates definitely require more practice at answering this type of question.

Common errors included: incorrect placement of the word 'most' in candidates' explanation; correct definitions of mode without any reference to the context of the question; and descriptions of median and mean.

(ii) This was a very good example of a question that should encourage candidates to show all working. Bald incorrect answers for this question gained no marks as it could not be seen where the error occurred. 33 171 – 2735 = 30 436 was a very common answer for the number of 'free parking' stickers used. Better understanding of frequency tables is necessary.

(iii) Many candidates calculated the correct percentage for households with no cars and gave that as their answer, rather than finding that percentage of 360° ie $\frac{2735}{33\ 171} \approx 8.2\%$.

(iv) Many candidates read the information on the horizontal axis as 'noon, 1 pm, 3 pm, 6 pm, 12 midnight', so that 6 pm to 8.30 pm was interpreted as lying between 6 pm and 12 midnight, giving a result of $20.

(b) (i) Many candidates answered these parts together, easily identifying two differences and possible reasons for both. Some candidates interpreted the word 'difference' mathematically, reading percentages from matching columns in both graphs and then subtracting. As there were so many differences in the graphs, some candidates gave many differences, writing at least a page. The majority of candidates wrote simple statements such as 'More primary students walk to school than secondary students'. Others looked for more holistic descriptions such as 'Secondary students are spread more evenly across the modes of transport rather than the primary students who are concentrated in walk and car' or 'More secondary students travel on public transport'.

A number of candidates thought 'differences' also implied 'similarities'. Many candidates wrote more than was required in this question, not only wasting a considerable amount of time, but contradicting themselves in the process of writing more and more.

Candidates need to be reminded that in written responses the key word used and the mark allocated to a question indicate the length and depth of response. It is important that candidates are familiar with the relevant terms in the glossary. In this case, the term 'describe' and '2 marks' should indicate that a one-page response is too long.

Common errors included the identification of differences without a description.

(ii) Almost all candidates could give a plausible reason for the differences in the graph. The most common answers mentioned that secondary candidates were older, more independent, more mature or more responsible, or the need for additional safety for younger children. Candidates need to remember that being concise in explanations is important in a mathematics test.

(iii) A number of candidates thought that 10% was an appropriate response to 'How many of these students travelled to school by bus?'

(c) (i) Many candidates simply did not attempt this part. Others just wrote the formula and then stopped. Many candidates ignored 'with reference to the mean and standard deviation' in the question. They discussed percentages, z-scores and many other aspects of the topic, often correctly, but did not answer the question. Candidates still need to be encouraged to highlight the key words in the question. It is clear that the terminology in this topic is confusing to many candidates. They often confused Hardev's score with his z-score and the standard deviation. Candidates need further practice in using this terminology in explanations. Some candidates used a numerical example very effectively as part of their answer to the question eg 'If the mean was 50 and the standard deviation was 10, then Hardev would have scored 60'.

Many candidates thought a z-score of 1 implied a result somewhere amongst the 68% of candidates lying in that region bounded by 1 standard deviation either side of the mean.

(ii) Many candidates who correctly answered (c) (i) gave the answer 15.85% here, overlooking the 0.15% of people sitting the aptitude test with scores more than 3 standard deviations above the mean.

Question 26

On the whole, candidates did not exhibit a high level of success with this question. Many candidates scored low marks for the algebraic modelling, but more for the trigonometry section.

There was a large number of non-attempts for part or the whole question.

Candidates' setting out seems to have improved, but they need to be reminded not to cross out any work so thoroughly that it cannot be read by the marker, and to present their work down the page for ease of reading and marking.

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 becoming familiar with the meaning of words such as 'explain' and 'describe'.

(a) (i) and (ii) Many candidates matched $N = a – bt$ with $y = mx + b$ incorrectly, and so treated a as the gradient and b as the y-intercept. The understanding that one pronumeral represented the initial value and the other a rate of change was commonly expressed, but not necessarily accurately.

These two parts required explanations of the meaning of pronumerals in the context of the question. While many succinct answers were provided, a common error was to answer the questions in terms of the graph, and not the context. Students need to be given regular practice in writing clear and concise explanations.

(iii) A high number of candidates scored 0 marks, a reasonable number scored 2 marks, while a smaller number scored 1 mark. This seemed to be a question in which candidates showed they could either rearrange the equation adeptly or were totally unable to do it. The skills of basic algebraic manipulation were shown to be rather rare, particularly when negative values and

quotients were involved.

(iv) Candidates used a range of good strategies to solve this question, which was generally well done. A common mistake was to substitute the value 10 000 into the equation for N, instead of subtracting to get 50 000.

(v) Displaying a correct graphical solution was quite common, but a very large number of candidates scored 0 marks. Common mistakes included starting the new line on the graph from the N axis, instead of from the existing line where $t = 15$; and drawing a line of steeper slope.

(b) (i) Candidates were asked to explain why an angle must be 110°. The ability to clearly explain was not commonly shown. Some good diagram work was evident. A very common error was to use the fact that the angle was 110° in the argument.

(ii) Many candidates showed that they were adept at using the sine rule and scored 3 marks. Some could calculate the third angle in the triangle, but could go no further. Errors were made in placing the features onto the diagram. It was common for candidates to confuse angle values, as well as sides and angles.

Question 27

This question was generally well answered and provided opportunities for candidates to show their strengths in probability and trigonometry. The full range of marks was awarded with a significant number of candidates indicating a firm understanding of probability or trigonometry, or both.

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 showed all necessary working, 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 formulae 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 their calculations.

(a) (i) This part was generally well answered with the answers 25% or $\frac{1}{4}$ being most common. Incorrect answers such as $\frac{1}{3}$ were common. Some candidates gave two answers, one being incorrect, typically 25% = $\frac{1}{3}$. They either did not understand the bias towards Hotel X, thinking one hotel out of three, or they had a very poor understanding of fractions and equivalent percentages.

(ii) (1) This part was well done by most candidates. There were many interpretations of a 'list' that were accepted. The majority of successful candidates chose to use a tree diagram or to list the combinations either in a vertical or horizontal fashion. Some candidates chose to show the bias towards Hotel X by duplicating the Hotel X combinations, and thus giving eight elements in their list. Some candidates did not convert 'head' and 'tail' to 'cold' and 'hot' respectively, while others included both in their lists. Many candidates chose to abbreviate their lists, which sometimes made it harder for the markers to interpret, although in some cases a key was provided. In some responses separate tree diagrams were drawn for the toss of the coin and the choice of hotel, with no connection between them. It was interesting to note that several candidates totally misinterpreted the question and wrote out a list of menu items for a hot or cold breakfast.

(ii) (2) Although this part asked for a brief reason, many candidates wrote lengthy statements, some of which included irrelevant information, typically about choices of hot or cold breakfasts. Candidates were awarded the mark if they could show, in their own words, that the probabilities associated with the three hotels were not equal. Extractions from the question itself such as 'Hotel X is his favourite' were not accepted unless supported with the required response.

(ii) (3) Many candidates who saw the connection with (a) (i) successfully multiplied by $\frac{1}{2}$ to obtain the answer. A common error was to either add the two probabilities (sometimes incorrectly) or simply quote them. A significant number of candidates, in redrawing a tree diagram or restating a list for this part, did so correctly when they had not done so in part (a) (ii) (1).

(b) (i) In general, this part was poorly answered, with candidates having difficulty in understanding the sample space for the rolling of two dice. Those who chose to draw a table showing 36 possible outcomes were generally successful, but the majority of candidates who attempted the question worked on the false assumption that since rolling one die has 6 possible outcomes then rolling two dice would have 12 possible outcomes. As a result, the most common incorrect answers were $\frac{10}{12}, \frac{5}{6}$ or $\frac{5}{6}+\frac{5}{6}=\frac{10}{12}$. Drawing suitable diagrams when solving multi-stage probability questions needs to be reinforced when teaching this topic.

(ii) This part was not very well answered. Candidates need to realise that a 3-mark question must include working. Those candidates who responded to this part were usually successful in obtaining 1 or 2 marks, but few obtained the full 3 marks. Candidates needed to show that the probabilities must be multiplied by the associated loss or gain and the results added. A common error was to state probabilities (correct or incorrect) and fail to link them in an expression. It was also noted that some candidates failed to see a connection between the answer to part (i) and this part. Many candidates tried to give a worded response with the most common being 'will lose $2'.

(c) (i) This question was very well answered by the majority of candidates who used either the tangent ratio or the sine rule. Common errors were: using incorrect trigonometric ratios; using the sine rule with 90^{o} rather than 25^{o}; and calculating in radian or gradian mode.

(ii) This question was not answered as well as part (i), however, a significant number of candidates obtained full marks. Although the use of Pythagoras' theorem was the simplest and

quickest way to find the length CE, many candidates chose to use the cosine rule or other more time-consuming trigonometric methods. When using Pythagoras' theorem the most common errors included forgetting to double length AB, or subtracting AE^2 from AC^2. Some candidates used the cosine rule with ΔACE and the included right angle. Those who found the length of BE and angle CBE correctly were generally successful in completing the subsequent calculation using the cosine rule, although many candidates were rounding answers too early in the calculation, resulting in inaccurate final answers. Some candidates assumed ΔBCE to be isosceles and thus incorrectly used $\angle BCE = \angle BEC = 12.5^\circ$ and the sine rule. A small number of candidates attempted to use the sine ratio with ΔACE, incorrectly stating that $\angle AEC = 65^\circ$.

Question 28

(a) The vast majority treated this as simple direct variation, rather than direct squared variation, leading to an oversimplified 173 pesos, rather than the required 231 pesos. Methods involving inverse, square root, inverse squared and inverse square root were also common. Those who attempted to find a constant of proportionality had more success than those who simply used ratios, as they were less likely to miss the word 'squared'.

Poor rounding skills (eg. 1.4444444 = 1.4 or 4.333333 = 4) caused large errors in final answers. A number of candidates inappropriately rounded their answer (eg 173 = 170).

(b) (i) Many candidates were unable to produce a 'formula' including the population (103 400 000), the rate of increase (1.0157) and the number of years (x). The most common errors included the use of 1.57 or 0.0157 as the rate of increase, and failure to include the 'x', using a 1 or 2. Many candidates simply restated the formula from the question, $y = b(a^x)$, without substituting the appropriate values for a and b.

Some candidates had difficulty handling large numbers (103 400 000) or working with decimal percentages (incorrectly writing 1.57% = 1.57 or 0.157), and transcription errors were common.

Many of those who realised the need to add 1 to the 0.0157, included the x inside the brackets ($1 + 0.0157^x$), rather than writing $(1 + 0.0157)^x$ or (1.0157^x). Some candidates used the incorrect substitution $y = 1.57(103\ 400\ 000)^x$, and were unable to interpret the scientific notation of their answer in part (ii), and were also unable to round their answer as required.

(ii) Many candidates reverted to first principles, rather than using their formula from part (i), and successfully compounded the population increase, to give them the correct new population of 106 672 247. Those who had a reasonable formula in part (i) used it well to come up with an answer that was worth marks if it followed from their formula.

A common error for those who had used 0.0157 as their growth rate, giving a population of 25 487, was to then add the original population, hoping to get a more reasonable, but incorrect answer of 103 425 487. This was not awarded a mark, as it did not follow from their formula.

The rounding of the answer to the nearest thousand was done quite well by those who attempted to do it. A number of candidates showed only their rounded answer, denying themselves a possible mark if they had made an error in their calculation. Candidates need to show their unrounded answer before they attempt to round it.

(c) (i) This was the best answered section of this question. Most candidates just showed a bald answer, some used the common differences in the table, many guessed 25 then showed that it works when put in the rule. Some attempted quite complex algebra, and became confused. A common error was $77 \div 1.8 - 32 = 10.8$.

(ii) Many candidates did not grasp the concept of doubling the result *after* the 12 had been added, thereby leaving out the brackets, $F = (C + 12) \times 2$ becoming $F = C + 12 \times 2$. A common error was to square rather than double the answer, obtaining $F = (C + 12)^2$. Some did not read carefully that the formula needed to contain F and C, so used A or T instead.

A number of candidates did not write an 'equation' but left their answer as $(C + 12) \times 2$. Some candidates used the formula from part (i), giving $F = 1.8C + 32$.

(d) The use of two graphs and the mention of both straight-line and declining balance methods of depreciation in the same question caused confusion. Once candidates realised they needed to find the point common to both graphs (value = \$400 after 2 years) a good start was often made.

A number of candidates had difficulty writing down the formula from the Formulae Sheet. Those who tried substitution, without actually writing the formula first, had most difficulty. Those who substituted the 2 and 400 correctly into the correct formula also had a good starting point with $400 = 800(1 - r)^2$, but often went no further. The most common misuse of the declining balance formula gave $0 = 800(1 - r)^2$. This often led to $R = \sqrt{800} + 1$, which unfortunately gives very close to the correct answer.

Candidates generally had trouble with the algebra in solving their equation, such as finding the square root of both sides of the equation before dividing by 800, or for the expansion of $(1 - r)^2$. Quite a few candidates demonstrated ability to manipulate the formula after making substitutions. Even with incorrect substitutions, marks were awarded for correct working. Most candidates who attempted to change the subject of the declining balance formula did it poorly.

Those who used 'guess and check' generally did a good job. Some obviously used graphics calculators and gave a bald 29.289%. A common problem was with the conversion of r as a decimal (0.29) to R as a percentage.

General Mathematics

2003 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I			
1	1	DA5: Interpreting Sets of Data	H14
2	1	AM1: Basic Algebraic Skills	P2
3	1	FM1: Earning Money	P2
4	1	AM3: Algebraic Skills/Techniques	H2
5	1	FM6: Depreciation	H8
6	1	PB3: Multi Stage Events	H4
7	1	AM2: Modelling Linear Relationships	P5
8	1	DA7: Correlation	H4
9	1	M5: Further Application Area and Volume	H6
10	1	M7: Spherical Geometry	H6
11	1	M5: Further Applications Area/Volume	H6
12	1	DA4: Summary Statistics	P2
13	1	PB2: Relative Frequency and Probability	P10
14	1	M6: Applications of Trigonometry	H6
15	1	AM3: Algebraic Skills/Techniques	H7
16	1	FM5: Annuities and Loan Repayments	H8
17	1	AM4: Modelling Linear/Non-linear Relationships	H5
18	1	M5: Further Applications Area and Volume M1: Units of measurement	P7, H7
19	1	M1: Units of Measurement	P2
20	1	FM3: Taxation	P2
21	1	DA5: Interpreting Sets and Data	H4
22	1	PB2: Relative Frequency and Probability PB4: Applications of Probability	P10
Section II			
23 (a) (i)	1	M1: Units of Measurement	P2
23 (a) (ii)	1	M1: Units of Measurement	P2
23 (a) (iii)	1	M1: Units of Measurement	P2
23 (a) (iv)	1	M1: Units of Measurement	P2

Question	Marks	Content	Syllabus outcomes
23 (b)	2	M5: Further Applications Area/Volumes	H6
23 (c)	2	M5: Further Applications Area/Volumes	H6
23 (d) (i)	2	M2: Applications Area/Volume	P6
23 (d) (ii)	3	M2: Applications Area/Volume	P6, H11
24 (a)	2	FM2: Investing Money	P8
24 (b) (i)	1	FM1: Earning Money	P2
24 (b) (ii)	2	FM3: Taxation	P2, P8
24 (b) (iii)	3	FM3: Taxation	P2, P11
24 (b) (iv)	2	FM5: Annuities and Loan Repayments	H5, H8
24 (c)	3	FM4: Credit and Borrowing	H8
25 (a) (i) 1	1	DA4: Summary Statistics	P2
25 (a) (i) 2	1	DA4: Summary Statistics	P2, P11
25 (a) (ii)	2	DA4: Summary Statistics	P2
25 (a) (iii)	1	DA3: Displaying Single Data Sets	P4
25 (a) (iv)	1	AM2: Modelling Linear Relationships	P4
25 (b) (i)	2	DA5: Interpreting Sets of Data	H4
25 (b) (ii)	1	DA5: Interpreting Sets of Data	H11
25 (b) (iii)	1	DA5: Interpreting Sets of Data	H4, H5
25 (c) (i)	2	DA6: The Normal Distribution	H4, H11
25 (c) (ii)	1	DA6: The Normal Distribution	H5
26 (a) (i)	2	AM2: Modelling Linear Relationships	P4, P5
26 (a) (ii) 1	1	AM2: Modelling Linear Relationships	P5
26 (a) (ii) 2	1	AM2: Modelling Linear Relationships	P5
26 (a) (iii)	2	AM3: Algebraic Skills and Techniques	H2
26 (a) (iv)	1	AM3: Algebraic Skills and Techniques	H2, H7
26 (a) (v)	2	AM2: Modelling Linear Relationships	P5
26 (b) (i)	1	M6: Applications of Trigonometry	H6
26 (b) (ii)	3	M6: Applications of Trigonometry	H6

Question	Marks	Content	Syllabus outcomes
27 (a) (i)	1	PB2: Relative Frequency and Probability	P10
27 (a) (ii) 1	2	PB1: Language of Chance	P10
27 (a) (ii) 2	1	PB2: Relative Frequency and Probability	P10
27 (a) (ii) 3	1	PB1: Language of Chance PB3: Multi Stage Events	P4, H10
27 (b) (i)	1	PB3: Multi Stage Events	H10
27 (b) (ii)	3	PB4: Applications of Probability	H10, H11
27 (c) (i)	2	M4: Right-angled Triangles	P2, P6
27 (c) (ii)	2	M4: Right-angles Triangles	P2, P6
28 (a)	2	AM4: Modelling Linear and Non-linear Relationships	H3, H5
28 (b) (i)	2	AM4: Modelling Linear and Non-linear Relationships	H3
28 (b) (ii)	2	AM3: Algebraic Skills and Techniques AM4: Modelling Linear and Non-linear Relationships	H5, H7
28 (c) (i)	1	AM1: Basic Algebraic Skills	P2
28 (c) (ii)	2	AM2: Modelling Linear Relationships	P4
28 (d)	4	FM6: Depreciation AM3: Algebraic Skills and Techniques	H5, H8

BOARD OF STUDIES
NEW SOUTH WALES

2003 HSC General Mathematics
Marking Guidelines

Question 23 (a) (i)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 23 (a) (ii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct numerical expression for cost of watering shrubs for a week	1

Question 23 (a) (iii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct numerical expression for the number of drops required	1

Question 23 (a) (iv)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct numerical expression for number of drops per minute	1

Question 23 (b)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of surface area or CNE	2
• Progress towards correct answer using formula for surface area of hemi-sphere	1

Question 23 (c)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Correct numerical expression OR • One application of Simpson's rule correctly applied and evaluated OR • Two applications of Simpson's rule using $h = 6$, correctly applied and evaluated	1

Question 23 (d) (i)

Outcomes assessed: P6

MARKING GUIDELINES

Criteria	Marks
• Correct numerical expression for volume of one cylinder	2
• Progress towards correct volume of one cylinder	1

Question 23 (d) (ii)

Outcomes assessed: P6, H11

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of total capacity and correct conclusion	3
• Correct calculation of total capacity and incorrect or missing conclusion OR • Numerical expression with only one error and consistent conclusion OR • Incorrect calculation from CNE with consistent conclusion	2
• Correct numerical expression for total capacity with incorrect calculation and missing or incorrect conclusion	1

Question 24 (a)

Outcomes assessed: P8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of value of investment	2
• Progress towards correct answer	1

Question 24 (b) (i)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of total taxable income or CNE	1

Question 24 (b) (ii)

Outcomes assessed: P2, P8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of tax payable or CNE Do not accept bald incorrect answers from (b) (i) using CFPA	2
• Progress towards correct answer	1

Question 24 (b) (iii)

Outcomes assessed: P2, P11

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of monthly net income or CNE or CFPA	3
• Significant progress towards answer	2
• Incorrect answer but showing awareness of meaning of net income as difference between gross income and tax paid, either based on monthly or annual income	1

Question 24 (b) (iv)

Outcomes assessed: H5, H8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of amount in account after 2 years	2
• Progress towards correct answer, showing use of future value formula or equivalent evidence of use of graphics calculator	1

Question 24 (c)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Calculation of flat rate of interest or CNE	3
• Substantial progress towards answer eg calculating the interest	2
• Some progress towards answer eg calculating amount repaid	1

Question 25 (a) (i) 1

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correctly determines mode	1

Question 25 (a) (i) 2

Outcomes assessed: P2, P11

MARKING GUIDELINES

Criteria	Marks
• Correctly explains meaning of mode in this context	1

Question 25 (a) (ii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of number of cars or CNE	2
• Progress towards correct answer eg 55 748	1

Question 25 (a) (iii)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct number of degrees or CNE	1

Question 25 (a) (iv)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 25 (b) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Describes any two correct (and distinct) differences	2
• Describes any one difference or identifies two differences	1

Question 25 (b) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Any logical reason consistent with their answer to (i)	1

Question 25 (b) (iii)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct number of students	1

Question 25 (c) (i)

Outcomes assessed: H4, H11

MARKING GUIDELINES

Criteria	Marks
• Correct interpretation of Hardev's score	2
• Partially correct interpretation of Hardev's score, with reference to – Being above the mean or – Being one standard deviation away from the mean	1

Question 25 (c) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct percentage of people or CNE	1

Question 26 (a) (i)

Outcomes assessed: P4, P5

MARKING GUIDELINES

Criteria	Marks
• Correct value of 'a' and correct meaning with reference to the context (ie not the y intercept)	2
• Either correct value of 'a' and unacceptable meaning or v.v	1

Question 26 (a) (ii) 1

Outcomes assessed: P5

MARKING GUIDELINES

Criteria	Marks
• Correct value of b, or CNE	1

Question 26 (a) (ii) (2)

Outcomes assessed: P5

MARKING GUIDELINES

Criteria	Marks
• Correct answer for the meaning of b in the context – Do not accept statements like 'the gradient', 'b is the gradient', 'b is the negative gradient'	1

Question 26 (a) (iii)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct rearrangement of equation	2
• Attempt with one incorrect step	1

Question 26 (a) (iv)

Outcomes assessed: H2, H7

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CFPE using (a) (iii) or (a) (ii) and N = 50 000	1

Question 26 (a) (v)

Outcomes assessed: P5

MARKING GUIDELINES

Criteria	Marks
• Old and new graphs correctly drawn, new graph less steep for t from $t = 15$ to the point of intersection with the t axis. (Graph may be curved)	2
• Some correct elements shown	1

Question 26 (b) (i)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Explanation of size of $\angle ABT$	1

Question 26 (b) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of $\angle ATB$ and BT	3
• Some progress towards calculating BT using the sine rule	2
• Some progress towards correct answer (may include diagram)	1

Question 27 (a) (i)

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct probability	1

Question 27 (a) (ii) (1)

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct list	2
• Progress towards correct list	1

Question 27 (a) (ii) 2

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct answer or equivalent	1

Question 27 (a) (ii) (3)

Outcomes assessed: P4, H10

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE or (a) (i) $\times \frac{1}{2}$	1

Question 27 (b) (i)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE	1

Question 27 (b) (ii)

Outcomes assessed: H10, H11

MARKING GUIDELINES

Criteria	Marks
• Correct answer for financial expectation or CNE	3
• One or two minor error(s) eg $20\times\frac{1}{36}+2\times\frac{10}{36}+2\times\frac{25}{36}$ OR • Substantial progress towards answer eg all three probabilities	2
• Progress towards correct answer eg \$20 $\times \frac{1}{36}$	1

Question 27 (c) (i)

Outcomes assessed: P2, P6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of AB	2
• CNE or substantial progress towards answer	1

Question 27 (c) (ii)

Outcomes assessed: P2, P6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of length CE or CNE	2
• Substantial progress towards answer	1

Question 28 (a)

Outcomes assessed: H3, H5

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of cost or CNE	2
• Some progress towards answer eg correct calculation of constant of proportionality (k)	1

Question 28 (b) (i)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Correct formula	2
• Either a or b correct in formula	1

Question 28 (b) (ii)

Outcomes assessed: H5, H7

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of size of population to the nearest thousand OR • CFPA	2
• Progress towards answer eg correct calculation without rounding	1

Question 28 (c) (i)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 28 (c) (ii)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct equation	2
• 2 (C + 12) (expression only) $F = 12 + C \times 2$ or $F = C + 12 \times 2$ OR • Significant progress towards correct equation	1

Question 28 (d)

Outcomes assessed: H5, H8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of R. The steps may include: – Finding $S = 400$ when $n = 2$ – Using $S = V_0(1 - r)^n$ formula to find $r = 0.29$ – Interpreting $r = 0.29$ as $R\% = 29\%$	4
• Substantial progress towards correct answer eg First two steps from above list	3
• Progress towards correct answer eg correct substitution into declining balance formula using $S = 400$ or their S when $n = 2$	2
• Minor progress towards correct answer eg calculation of S when $n = 2$	1