2006 HSC Notes from the Marking Centre General Mathematics

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2006 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 2006 General Mathematics HSC examination paper. It should be read in conjunction with the 2006 HSC General Mathematics examination paper, the marking guidelines and the *General Mathematics Stage 6 Syllabus.*

General Comments

Just over 29 300 candidates attempted the 2006 General Mathematics HSC examination, slightly more than the number of candidates in 2005. 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 that involve an incorrect answer with little or no working shown. In these cases it is not possible to give part marks, since markers have no indication of the candidates' thinking towards their solution. Candidates are advised to write their working down so that part marks can be awarded for some 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, and only round their answer in the last step of working, not in an earlier step. 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. Responses were generally of a better standard than in 2005 and it is clear that candidates are improving the clarity of their expression. However, this does still present a problem for a significant number of candidates. They still need to become familiar with appropriate terminology and read their answers after writing them to ensure that the answers make sense.

Candidates need to pay attention to the number of marks allocated to each part of a question, so that they know the expected extent of their answers. A three-page explanation for a small number of marks is not necessary. Candidates should pay particular attention to the situation where a question asks them to justify with calculations or examples, and ensure that they provide an appropriate response.

It seemed that more candidates than in the past used graphics calculators and most of these are writing the list of substitutions for the Financial Mathematics questions, so that part marks may be awarded for some progress towards the answer, even if it is incorrect.

Candidates should bring a ruler to the General Mathematics examination in order to draw graphs and diagrams accurately. Candidates should also take note of diagrams where 'Not to scale' is indicated since in these cases measuring lines or angles to obtain a result is not going to be awarded any marks.

In the better responses, candidates:

- 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 clearly and showed all necessary working, were at an advantage compared to those who showed poor or no working, or who did not indicate where they were heading.
- referred correctly to the formulae sheet, were familiar with it and used it carefully where necessary
- drew large, clear, well-labelled diagrams and included given information as well as information calculated while doing the question
- did not round off too early in their calculations
- were able to articulate their explanations, either with the support of calculations or in clear, written form
- considered the reasonableness of their answers within the context of the question.

Section I

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

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

Section II

Question 23

Question 23 examined candidates' ability to interpret data displayed in graphical form, analyse data by calculating the mean from grouped data, and describe a process of data collection by random sampling. Aspects of algebraic simplification and modelling linear relationships were also tested.

(a) Candidates were asked to simplify the product of a pair of algebraic fractions: $\frac{ab^2}{w} \times \frac{4w}{3b}$.

In the best responses, candidates cancelled terms and then multiplied, or multiplied and then cancelled terms to obtain the correct response $\frac{4ab}{3}$. However, few could be rewarded for making progress towards the answer by correctly cancelling one pair of terms or by multiplying the numerators and denominators to obtain a single, unsimplified fraction.

Attempts to cancel in the weaker responses showed a distinct lack of understanding, giving results such as $\frac{4w}{w} = 3w$, $\frac{ab^2}{3b} = \frac{a^2}{3}$ or $3ab$. Often the factors 4 and 3 were not displaced to the front, ie the answer was left as $\frac{ab^2 4w}{w3b}$. Some candidates tried 'division by the reciprocal of the second fraction'. There was also confusion with equation solving demonstrated by attempts at 'cross multiplying'. Having obtained the correct fraction $\frac{4ab}{3}$, some candidates went further to give $1\frac{1}{3}ab$, or incorrectly, $1\frac{ab}{3}$.

(b) (i) Most candidates successfully obtained the correct average daily temperature of Town *B* for April. However, the word 'average' prompted some candidates to do a calculation, which generally took them outside the range.

(ii) This was probably the best answered part of the entire question. February was the month for which the distance between the lines on the radar chart was greatest. The answer did not require any calculation and could be obtained visually.

(iii) Most candidates answered this part correctly. They identified the months where the solid line was further out from the centre than the dotted line.

(c) (i) Better responses demonstrated knowledge of ideas involved in sampling, for example, referring to stratified samples and taking proportional numbers from each of the strata.

(ii) Finding the mean from a small set of grouped data in a frequency table, a routine aspect of the syllabus, was not completed correctly by the majority of candidates. After giving the correct answer, reference to the interval '5 to 9' was often made. This interval was the modal class and it also contained the median.

The best responses included copying the frequency table, inserting a class-centre column and/or appending an *fx* column. Weaker responses used the lower or upper ends of the classes as the score.

Candidates who supplied 'graphics calculator' as their working evidence usually had an incorrect answer. Copying down a calculator entry display "2;69 7;72 12;38 17;21" did not always lead to a correct answer either. More working needs to be shown so that progress marks can be awarded.

Many simple calculations using numbers from the table resulted in answers that should have been recognised as unreasonable.

(d) (i) Almost all candidates were able to read from the 'Weight' axis up to the horizontal line (part of the step graph) and across to the 'Amount charged' axis, giving the correct answer $6. The most common incorrect answer was $4.50, the charge by Company *B* for a 3 kg parcel.

(ii) Most candidates nominated 4 kg, with fewer correctly choosing the other correct example, 7 kg, as a point of intersection of the line and step graph.

(iii) A minority of candidates were able to give the two correct ranges. Many candidates supplied discrete values within the correct ranges, when the ranges themselves are required with continuous data.

Very few candidates were able to supply a sophisticated response such as:

$$4\,kg < weights \leq 6kg \quad \text{and} \quad weights > 7\,kg\,.$$

Those who attempted to use symbols usually did so incorrectly. The best responses were of the form '4 kg to 6 kg and more than 7 kg'. Many attempts to supply a range for the second part closed it at 9 kg or 10 kg, not taking into account that the arrow heads on both graphs indicate 'and onwards'.

(iv) The mark here was not for just doing a calculation. Candidates had to answer the question 'What is the rate per kg?' successfully. Candidates need to express currency correctly ie writing '$1.50' after a calculator gives 1.5 as an answer.

In summary, candidates generally had an understanding of the concept of a random sample, how to calculate a rate and interpret line graphs. They had difficulty with an algebraic simplification and obtaining a correct or meaningful answer to a calculation to find the mean.

Question 24

The majority of scripts were neat and well-organised with candidates obviously mindful of the benefits of appropriate presentation. Many candidates failed to read the question carefully.

There were a number of candidates who did not have their calculator correctly set to 'degrees' mode.

(a) Many candidates approached this question from a consumer rather than a mathematical/graphical perspective. Answers suggesting 'Brand *Y* may not contain more powder even though it comes in a bigger box' were common, with a significant number of candidates claiming the absence of a printed weight/volume for the contents of the boxes was misleading. The absence of a price for each brand was also a concern for many. A large number of candidates considered the fact that the horizontal and vertical axes were not labelled as the *x* and *y* axes, and that the boxes were not evenly spaced along the horizontal axis, to be misleading. Some candidates were also concerned that no time period was given and many thought that the horizontal axis should have been a time axis.

(b) (i) Even though a number of candidates seemed to be put off by the three-dimensional diagram, the question was reasonably well done by the majority of candidates, though the methods used by many of them were surprising. The expected solution was $\cos\theta = \frac{44}{130}, \theta = 70°$, but many candidates used Pythagoras' theorem to find the length of the third side in the triangle and then used either sin θ, tan θ, the sine rule or the cosine rule to find the value of θ.

Candidates who wrote $\cos\theta = \frac{44}{130}$ correctly, often proceeded to $130\cos\theta = 44$ or something similar and were obviously unable to progress from there. A common solution to this question was $\cos\theta = \frac{44}{130}$, $\theta = 0^\circ\ 20'\ 18.46''$, with candidates using the 'degree-minute-second' key in lieu of the 'shift' key – 'cos' key combination. A number of candidates used $\sin(90^\circ - \theta) = \frac{44}{130}$ to determine $\angle(90° - \theta)$ and, believing they had found θ, gave the answer 20°. A proportion of these candidates proceeded to find the complement of 20° correctly.

A small number of candidates used a scale drawing to answer the question correctly.

(ii) Most candidates chose to use the cosine rule, and substituted and evaluated correctly. Candidates who insisted on performing each calculation in the cosine rule separately, rather than allowing their calculators to determine the correct order of operations, often presented the following:

$$\begin{aligned} x^2 &= 130^2 + 44^2 - 2 \times 130 \times 44 \cos 53° \\ &= 16\,900 + 1936 - 11\,440 \cos 53° \\ &= 18\,836 - 11\,440 \cos 53° \\ &= 7396 \cos 53° \\ &= 4451.023\,911 \ldots \\ x &\approx 67 \end{aligned}$$

Continuing to view the triangle as right-angled after the fence developed a lean was a common error in this question.

Again, a small number of candidates used a scale drawing to answer the question correctly.

(c) There were many excellent responses to this question. However, a significant proportion of the candidates had difficulty interpreting the ogive and, even though it was clear that they knew what a box-and-whisker plot was, could not access the data required to draw the box-and-whisker plot accurately. A number of candidates did not use a ruler, resulting in an inaccurate diagram.

Many candidates read 70 from the top of the 'Number of people' (cumulative frequency) axis and mistakenly determined quartiles on the basis of 70 rather than 60 choir members. The mean was a popular inclusion in five-number summaries. Distinct, labelled graduation marks on a reference axis with a consistent scale was a characteristic of the better responses to this question.

Choosing an appropriate scale presented a problem for some candidates, with reference axes often graduated from 0 to 200, resulting in a small box-and-whisker plot that was difficult to interpret.

Using the corresponding cumulative frequencies (giving $Q_1 = 15$, $Q_2 = 30$ and $Q_3 = 45$) instead of the three correct quartiles was a reasonably common error in this question.

$Q_1 = 152.5$, $Q_2 = 165$ and $Q_3 = 177.5$ were also commonly used, with candidates finding the midpoint of 140 and 190 to determine Q_2 and repeating the process for 140 and 165 and 165 and 190 to obtain Q_1 and Q_3 respectively.

A significant number of candidates appeared to choose 145, 165 and 185 as their quartiles directly from the horizontal axis, without any consideration of the cumulative frequencies.

(d) (i) A surprising number of candidates either ignored or failed to notice the given area of cross-section and proceeded to calculate it by a variety of incorrect methods, often involving circular or semi-circular regions.

A considerable number of weaker responses included all numerical values on the diagram multiplied together to obtain the volume.

$1890 \times 300 \times 80 = 45\ 360\ 000\ \text{cm}^3$ was a common response.

Many candidates who obtained $567\ 000\ \text{cm}^3$ successfully were unable to convert to 567 L. Dividing by 100 or 10 000 to convert millilitres to litres was common and those candidates who attempted to obtain the volume in cubic metres first were usually unsuccessful.

(ii) A large number of candidates, who appeared to realise 80 cm had to be divided by 2 to obtain the length of the semi-major axis, performed the calculation and then halved (when they should have doubled) their result. Similarly, a number of candidates who correctly calculated 30 cm for the length of the semi-minor axis failed to realise this was the value required for d and doubled their result.

Trial and error was a popular method in this question with candidates obviously making good use of the replay and edit functions on their calculators.

Question 25

Most candidates attempted all parts of this question. In general, candidates were more successful in answering the probability questions in part (a) and part (c) than the other two parts of the question. However, a small number of candidates attempted to give their answers to all probability questions as ratios.

It was unfortunate to note that a large number of candidates simply wrote bald answers, without the support of working, for two-mark and four-mark questions. Candidates who showed full working and calculations had a greater chance of being awarded full or part marks. In some parts, candidates who did set work out clearly were able to gain marks for correct numerical expressions. It was very clear, particularly in part (d), that students who did not try to cram all of their answers into the first page of their writing booklet were generally more successful.

(a) (i) Many candidates were successful in this part. Those candidates who attempted to use a tree diagram were often not successful, while those who used a list to determine the number of possible arrangements of the cards generally had more success.

(ii) This part was correctly answered by the majority of candidates, even those who had not correctly answered part (i).

(iii) This part was successfully answered by many candidates.

(b) (i) The majority of candidates were not successful in correctly counting the number of days from 23 May to 20 June (inclusive). The most common response was for candidates to incorrectly answer 28, which results from counting only one end of the period, as well as assuming only 30 days in May. The candidates who answered correctly often wrote out every date between 23 May and 20 June, and then counted them. A significant number of incorrect responses included a statement such as 'there are no interest free days, so you are charged interest every day'.

(ii) This part was answered well by many candidates, based on their value from part (i). Some candidates did not divide the interest rate by 100, which resulted in a large interest value. This was often followed by the subtraction of the principal to gain a more reasonable value. A number of candidates were uncertain about the additional information supplied in the question, such as the credit limit of $2000 and the payments totalling $263.83, and felt compelled to use these in their calculations.

(c) (i) Many candidates were successful in this part.

(ii) The majority of candidates had difficulty gaining full marks in this part. Many candidates knew to reduce the numerator and denominator of their answer in part (i) but were unsure how to combine this with the information from part (i). Tree diagrams were frequently drawn but were often incorrect. Some candidates were not careful enough in differentiating addition and multiplication signs. Those candidates who did not draw tree diagrams often gave incorrect answers such as $\frac{2}{179}$, $\frac{3}{180}\times\frac{3}{180}$, or $\frac{3}{180}+\frac{2}{179}$.

(d) Successful methods included comparing the effective interest per year for both Paul and Martha as well as comparing their effective interest per month. A number of the more successful candidates went on to use the calculated effective simple interest rates in the simple interest formula with a chosen principal (such as $1000) to demonstrate clearly that the higher effective interest rate resulted in Martha gaining more interest. Most candidates attempted to calculate Martha's effective interest, but many forgot to convert her *r* and *n* values to monthly values, and many more did not convert the monthly value back to an annual rate that could be correctly compared with the stated annual rate of 6.68% for Paul.

Some candidates ignored the value of Paul's effective interest rate that was given in the question and instead used valuable examination time attempting to recalculate the value, often incorrectly. Other candidates ignored the direction in the question to compare the effective simple interest rates and instead compared the investments using the compound interest formula and a chosen principal.

Many candidates assumed that this question involved comparing two loans and incorrectly concluded that a smaller effective interest rate meant a better deal. Overall, candidates

needed to be clearer and more succinct in their explanations. Often, those who wrote lengthy explanations contradicted themselves. A large number of poorer responses contained a paragraph answer with no evidence of the calculation of the effective interest rate – a significant gamble in a question worth four marks!

Question 26

(a) (i) A closed quadrilateral was required, oriented correctly and not reflected. Many candidates drew sketches that were neither neat nor accurate. It is recommended that candidates use a ruler to draw diagrams.

(ii) The great majority of candidates demonstrated that they were competent in the use of Pythagoras' theorem. Identifying the correct sides to use from the offset survey was not done well.

(b) (i) There was no penalty for ignoring the words 'no floor'. A spatial understanding of the correctly flattened shape was required.

(ii) The area of the walls was generally obtained successfully by candidates. Poorer responses then used the volume of a pyramid, or gave the area of one or more triangles.

(c) (i) Most candidates were successful in obtaining the correct answer.

(ii) Candidates who may have gained their answer by correct methods were not rewarded unless there was evidence that they obtained their answer legitimately. This meant that they needed to show their working. This was the case because 86%, correctly obtained from $\frac{74}{86}$ (= 86.0465…%), could be gained from the incorrect methods $\frac{(74+12)}{100}$ or $\frac{(74+98)}{200}$.

(iii) The emphasis here was on obtaining a number of people, not a fraction. Weaker responses included some candidates converting their answers to a fraction or percentage (usually $\frac{7}{50}$ or 14%). A number of candidates simply added 12 and 98 to obtain 110.

(d) Many candidates did not show their working and so were unable to gain part marks. A significant number of candidates appeared to think that there are 12 hours in a day, and/or had no concept of the reasonableness of an answer. The term 'ignore time zones' confused some candidates. Poorer responses used the latitudes to calculate time difference, or used both, and then added or subtracted them.

Question 27

(a) (i) Many candidates answered this part correctly, although there were some common incorrect responses. These included $130 000 and 25 years (the repayment *closest* to $1000) and $80 000 and 10 years (the highest possible repayment under $1000, rather than the highest possible loan). Several candidates identified $130 000 as the maximum amount Liliana could borrow, but neglected to specify the period of the loan. Some candidates gave an answer of $160 000, either confusing this part with part (ii) or just giving the maximum loan specified in the table. Many gave more than one pair of answers.

(ii) This part was successfully answered by the majority of candidates. Common incorrect responses included $190.74 (the difference between the two repayments) or a calculation that involved this value. Another common answer was $3830.40 (obtained by multiplying the repayment by the number of years only and ignoring the months). Some candidates tried to use their answer from part (i) in some way. Many candidates lost one or both marks by rounding their answers part way through their calculations, while others did not complete the final subtraction required.

(b) (i) Many candidates had some idea of the concept (that zero height is meaningless) but could not express themselves clearly. A common error was to say that the line did not cross the y-axis. Many assumed that the y-intercept was always zero and that the graph was in some way faulty.

(ii) Many candidates gave a range (3–4 cm was common) rather than a specific value. It was common for candidates to assume that 19 cm and 25 cm were the measurements for Harry and George, resulting in an answer of 6 cm, or to give 22 cm as the foot length for one of the brothers and not answer the actual question, which asked for the *difference* in the lengths. Some candidates understood ‘difference’ in a non-mathematical sense and gave the foot lengths of each brother, but did not subtract. Many tried to use the graph to estimate the difference despite it being labelled ‘not to scale’.

(iii) This part was very poorly answered as many responses showed a lack of understanding of the correlation coefficient. The concept of skewness was very often inappropriately mentioned by candidates. While they were probably referring to the slope or direction of the line, students need to be more aware of the correct use of specific mathematical terms.

Better responses identified the incorrect sign of the coefficient. Many candidates stated incorrect reasons for the correlation being positive, usually related to the sign of the data on the graph. Only a very small number of responses identified a problem with the magnitude of Sam’s answer, many saying that it needed to be much greater than 1.2. Some candidates claimed that correlations cannot be given as a decimal. Many tried to calculate the gradient, confusing their answer with the correlation coefficient.

(c) (i) This part was answered well, with most candidates giving the correct answer. Common incorrect responses included $18 000 (by subtracting another $6000) and $12 656 (by using declining balance method of depreciation rather than straight-line method).

(ii) Many candidates were able to use their answer from part (i) correctly in the declining balance formula, but there were several variations in their final answers. A common error was to subtract their answer from either \$24 000 or \$30 000, thinking that the formula gives the amount of depreciation rather than the value (of the car). Many candidates continued with straight-line depreciation for another four years (giving \$16 000). Other common errors were the use of $n = 7$, and \$30 000 instead of \$24 000.

(iii) Very few candidates were able to produce the correct-shaped graph with its straight section followed by a curved section. Many candidates calculated the values for each year (some correctly, some incorrectly) despite being told otherwise in the question. A major issue was the sloppiness of many graphs, both with regard to the shape of the graph itself and the scale along the axes. Many candidates did not appear to realise that a question worth 3 marks would require some attention to detail in order to maximise their mark. A significant number of candidates seem to think that *sketch* implies a rough graph rather than just not using grid paper. Many candidates confused horizontal and vertical and so placed the axes the wrong way round. Poorer responses had small graphs produced without a ruler that were difficult to read and interpret.

Question 28

(a) (i) This part was done well by most candidates. Better responses identified each of the combinations very clearly either by using pictures of coins labelled with their value, by listing each combination on a separate line, or by using a table to list the possible combinations of coins. Weaker responses did not list all combinations. Many candidates misunderstood the question and made a list or tree diagram of the possible permutations of using just one of each coin (eg \$2, \$1, 50c; \$1, \$2, 50c; and so on). Others stated the actual number of combinations without listing them.

(ii) The best responses generally included a clearly-labelled tree diagram and showed correct working, including the fractions that needed to be multiplied and then added.

Very few candidates recognised that this was a two-stage probability question. Many gave their answer as a simple fraction with denominator 11, not realising that for 3 marks much more was required. A number of candidates had a correct tree diagram but gave the probability as $\frac{2}{9}$ (because there were two favourable outcomes out of nine outcomes that they assumed were all equally likely), despite the information on their tree diagram. Some candidates initially added the fractions along the branches ($\frac{3}{11} + \frac{2}{10}$) rather than multiplying. Other candidates overlooked that *P*(\$2, 50c) and *P*(50c, \$2) were required, but even if they remembered, they were unable to add the probabilities 'down' the tree diagram. Many candidates incorrectly counted the number of coins or neglected to reduce the number of coins at the second choice.

(iii) The answer to this part of the question was to be expressed in dollars, not cents (ie *50w* had to be expressed as $\frac{w}{2}$ or equivalent) and the pronumerals had to be those given. Poorer responses included \$*x* + \$*y* + \$*w* or $\$2\,x + \$1\,y + 50c\,w$ (or equivalent). A number of candidates used incorrect pronumerals.

(b) (i) This part was generally done very well, with most candidates being awarded the mark. A small number of candidates attempted to combine the toll from part (a) by adding this to the correct answer of $12 (to obtain $14.50). In some cases, candidates carried this error through to some (or all) of the remaining parts of the question.

(ii) This part was done well by most candidates, with most providing clear working to show how they calculated their answers. Some candidates gave an answer of 3500, neglecting to multiply the 3500 cars by 5 to obtain the total income from the toll. A number of candidates used 2500 cars to calculate the income (neglecting to subtract the 2500 from 6000).

(iii) This was one of the most difficult parts of Question 28, although a number of candidates managed to write the equation correctly. Candidates should be encouraged to look for the connections between parts (i), (ii), (iii) etc of a question, as the substitution of numerical values in (b)(ii) was designed to help candidates with (b)(iii). Many candidates failed to recognise the connection between these two parts, even though they may have been awarded full marks in (b)(ii).

The majority of candidates did not seem to understand the terminology '*v* in terms of *d*', or if they did, were not able to translate the numerical concepts into algebra. Many candidates did not realise that 6000 and 500 needed to be in the equation. Some candidates who seemed to have the correct concepts did not gain full marks because they reversed the *d* and *v* in the equation. Others did not gain full marks because they wrote the (correct) expression containing *d* rather than an equation containing both *d* and *v*.

(iv) Many candidates were able to answer this part of the question very well. For full marks, candidates had to show (with calculations) that the income decreased if the toll was large enough. They also had to identify $18 000 as the maximum income. This required the evaluation of the income from the tolls for (at the very least) two or three different levels of toll.

It was particularly important to show working in this question. The importance of candidates setting out their work clearly, showing all necessary steps, cannot be overstated. In the case of graphs, it is important to ensure that scales are accurate and that all points are plotted carefully and accurately.

Better responses generally had a table with three columns showing the toll, number of cars, and the daily income for values of toll from $0 to $12 and/or a graph labelled with the toll in dollars (or the number of cars) along the horizontal axis, the income on the vertical axis, and an accurate scale clearly shown on both axes. Careful graphing should have resulted in a neatly drawn parabola. The maximum income had to be clearly stated as $18 000.

A large number of candidates did not calculate the income from the tolls. No marks were awarded to students who just calculated the number of cars for each dollar value of the toll, and hence showed that the number of cars was decreasing as the toll increased, or who then said 'Anne is incorrect as an increasing toll means decreasing vehicles'. Many candidates neglected to identify that the maximum income was $18 000, even though they may well have known it. Candidates should quickly re-read a question once they have completed it, to check that they have done what is required.

General Mathematics

2006 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I			
1	1	PB1 – The language of chance, p40	P3
2	1	AM1 – Basic algebraic skills, p44	P2, P7
3	1	M6 – Right-angled triangles, p66	H2
4	1	DA4 – Summary statistics, p30 DA3 – Displaying single data sets, p28	P2, P4
5	1	FM1 – Earning money, p16	P2
6	1	PB4 – Applications of probability, p72	H10
7	1	AM2 – Modelling linear relationships, p46	P3, P5
8	1	DA5 – Interpreting sets of data, p58	H4
9	1	M6 – Applications of trigonometry, p66	H6
10	1	PB2 – Relative frequency and probability, p42	P2, P10
11	1	M1 – Units of measurement, p32	P2
12	1	DA4 – Summary statistics, p30	P2
13	1	M6 – Applications of trigonometry, p66	H6
14	1	AM4 – Modelling linear and non-linear relationships, p76	H5
15	1	PB3 – Multi-stage events, p70	H4
16	1	FM5 – Annuities and loan repayments, p52	H5
17	1	DA6 – The normal distribution, p60	H4
18	1	AM3 – Algebraic skills and techniques, p74	H2
19	1	M7 – Spherical geometry, p68	H6
20	1	M1 – Units of measurement, p32 M5 – Further applications of area and volume, p64	H2, H6
21	1	FM5 – Annuities and loan repayments, p52	H5, H8
22	1	FM3 – Taxation, p22	P8

Question	Marks	Content	Syllabus outcomes
Section II			
23 (a)	2	AM3 – Algebraic skills and techniques, p74	H2
23 (b) (i)	1	DA5 – Interpreting sets of data, p58	H4
23 (b) (ii)	1	DA5 – Interpreting sets of data, p58	H4
23 (b) (iii)	1	DA5 – Interpreting sets of data, p58	H4
23 (c) (i)	1	DA2 – Data collection and sampling, p26	P9
23 (c) (ii)	2	DA4 – Summary statistics, p30	P2
23 (d) (i)	1	AM2 – Modelling linear relationships, p46	P4
23 (d) (ii)	1	AM4 – Modelling linear and non-linear relationships, p76	H2, H5
23 (d) (iii)	2	AM4 – Modelling linear and non-linear relationships, p76	H2, H5
23 (d) (iv)	1	AM2 – Modelling linear relationships, p46	P5
24 (a)	2	DA3 – Displaying single data sets, p28	P7, P11
24 (b) (i)	2	M4 – Right-angled triangles, p38	P2, P6
24 (b) (ii)	2	M6 – Applications of trigonometry, p66	H6
24 (c)	3	DA3 – Displaying single data sets, p28	P4
24 (d) (i)	2	M5 – Further applications of area and volume, p64	H2, H6
24 (d) (ii)	2	M5 – Further applications of area and volume, p64	H2, H6
25 (a) (i)	1	PB1 – The language of chance, p40	P10
25 (a) (ii)	1	PB2 – Relative frequency and probability, p42	P10
25 (a) (iii)	1	PB2 – Relative frequency and probability, p42	P10
25 (b) (i)	1	FM4 – Credit and borrowing, p50	H8
25 (b) (ii)	2	FM4 – Credit and borrowing, p50	H2, H8
25 (c) (i)	1	PB2 – Relative frequency and probability, p42	P10
25 (c) (ii)	2	PB3 – Multi-stage events, p70	H10
25 (d)	4	FM2 – Investing money, p18 FM4 – Credit and borrowing, p50	P8 H8, H11

Question	Marks	Content	Syllabus outcomes
26 (a) (i)	1	M6 – Applications of trigonometry, p66	H6
26 (a) (ii)	2	M6 – Applications of trigonometry, p66 M2 – Applications of area and volume, p34	H6 P7
26 (b) (i)	1	M2 – Applications of area and volume, p34	P2
26 (b) (ii)	2	M2 – Applications of area and volume, p34	P6
26 (c) (i)	1	PB4 – Applications of probability, p72	H4
26 (c) (ii)	2	PB4 – Applications of probability, p72	H10
26 (c) (iii)	1	PB4 – Applications of probability, p72	H4
26 (d)	3	M7 – Spherical geometry, p68	H6
27 (a) (i)	1	FM5 – Annuities and loan repayments, p52	H8
27 (a) (ii)	2	FM5 – Annuities and loan repayments, p52	H5
27 (b) (i)	1	DA7 – Correlation, p62	H11
27 (b) (ii)	1	DA7 – Correlation, p62	H4, H5
27 (b) (iii)	2	DA7 – Correlation, p62	H11
27 (c) (i)	1	FM6 – Depreciation, p56	H5
27 (c) (ii)	2	FM6 – Depreciation, p56	H5
27 (c) (iii)	3	FM6 – Depreciation, p56	H2
28 (a) (i)	1	PB3 – Multi-stage events, p70	H3
28 (a) (ii)	3	PB3 – Multi-stage events, p70	H10
28 (a) (iii)	1	AM4 – Modelling linear and non- linear relationships, p76	H2
28 (b) (i)	1	AM4 – Modelling linear and non- linear relationships, p76	H5
28 (b) (ii)	2	AM4 – Modelling linear and non- linear relationships, p76	H5
28 (b) (iii)	2	AM4 – Modelling linear and non- linear relationships, p76	H3
28 (b) (iv)	3	AM4 – Modelling linear and non- linear relationships, p76	H11

BOARD OF STUDIES
NEW SOUTH WALES

2006 HSC General Mathematics
Marking Guidelines

Section II

Question 23 (a)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct simplified answer	2
• Progress towards correct answer, eg $\frac{4ab^2w}{3bw}$	1

Question 23 (b) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 23 (b) (ii)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 23 (b) (iii)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 23 (c) (i)

Outcomes assessed: P9

MARKING GUIDELINES

Criteria	Marks
• Correct description of a valid method	1

Question 23 (c) (ii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of average hours of homework or correct numerical expression	2
• Progress towards correct answer	1

Question 23 (d) (i)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 23 (d) (ii)

Outcomes assessed: H2, H5

MARKING GUIDELINES

Criteria	Marks
• At least ONE correct example of weights of parcels for which both companies charge same amount	1

Question 23 (d) (iii)

Outcomes assessed: H2, H5

MARKING GUIDELINES

Criteria	Marks
• Full correct answer	2
• Part of correct answer, eg 'between 4 and 6 kg'	1

Question 23 (d) (iv)

Outcomes assessed: P5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 24 (a)

Outcomes assessed: P7, P11

MARKING GUIDELINES

Criteria	Marks
• Two correct items	2
• One correct item	1

Question 24 (b) (i)

Outcomes assessed: P2, P6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of size of angle	2
• Progress towards correct answer, eg $\cos\theta = \frac{44}{130}$	1

Question 24 (b) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of value of x	2
• Progress towards correct answer, eg correct substitution into cosine rule	1

Question 24 (c)

Outcomes assessed: P4

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of five number summary and box and whisker plot drawn	3
• Progress towards correct answer	2
• Calculation of any one of the three quartiles (Q1, Q2 (median), Q3)	1

Question 24 (d) (i)

Outcomes assessed: H2, H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of volume of trough in litres	2
• Progress towards correct answer, eg wrong units	1

Question 24 (d) (ii)

Outcomes assessed: H2, H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of depth of trough or correct numerical expression	2
• Progress towards correct answer, eg correct formula	1

Question 25 (a) (i)

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 25 (a) (ii)

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of probability or correct numerical expression or correct from previous answer	1

Question 25 (a) (iii)

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of probability or correct numerical expression or correct from previous answer	1

Question 25 (b) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of number of days	1

Question 25 (b) (ii)

Outcomes assessed: H2, H8

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of interest, or correct numerical expression	2
• Substantial progress towards correct answer, eg incorrect number of days used	1

Question 25 (c) (i)

Outcomes assessed: P10

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of probability of winning first prize or correct numerical expression	1

Question 25 (c) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of probability of winning both prizes or correct numerical expression	2
• Progress towards correct answer	1

Question 25 (d)

Outcomes assessed: P8, H8, H11

MARKING GUIDELINES

Criteria	Marks
• Correct answer by calculating Martha's effective interest rate and making correct conclusion and comparison	4
• One error in calculating Martha's effective interest rate (eg 0.5635%) followed by a consistent conclusion OR • Correct calculation with no conclusion or inconsistent conclusion	3
• Two errors in calculating Martha's effective interest rate followed by a consistent conclusion OR • One error in calculating Martha's effective interest rate with no conclusion or inconsistent conclusion	2
• Some progress towards correct calculation, eg using $n = 48$	1

Question 26 (a) (i)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Diagram of quadrilateral with vertex *B* higher than vertex *D*	1

Question 26 (a) (ii)

Outcomes assessed: P7, H6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of *CD* including correct rounding	2
• Progress towards correct answer. This may include using 47 m even if it is not shown on diagram in (i)	1

Question 26 (b) (i)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Sketch of a possible net	1

Question 26 (b) (ii)

Outcomes assessed: P6

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of surface area of greenhouse or correct numerical expression	2
• Progress towards correct answer	1

Question 26 (c) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of value of A	1

Question 26 (c) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of probability that a carrier tests positive or correct numerical expression	2
• Progress towards correct answer, eg correct numerator	1

Question 26 (c) (iii)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of the number of inaccurate results	1

Question 26 (d)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer or correct numerical expression	3
• Substantial progress towards correct answer	2
• Some progress towards correct answer, eg correct calculation of time difference or correct calculation of time between departure and arrival	1

Question 27 (a) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Correct answer OR • Identification of \$953.89	1

Question 27 (a) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of extra interest paid	2
• Progress towards correct answer eg total repaid for 20 years only	1

Question 27 (b) (i)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Valid explanation for 'nonsensical' y-axis intercept	1

Question 27 (b) (ii)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer ignore units	1

Question 27 (b) (iii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Two valid reasons	2
• One valid reason	1

Question 27 (c) (i)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer or correct numerical expression	1

Question 27 (c) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Progress towards correct answer eg correct numerical expression	1

Question 27 (c) (iii)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct graph with two distinct segments, one straight, one curved in correct position with correct vertical and horizontal axis	3
• Graph with two distinct segments, one straight, one curved. Error with position on axes or scale on axes OR • Graph with two distinct segments, one straight and curved section in straight line segments with correct position on axes and scale on axes	2
• Graph in correct position but no clear distinction between straight and curved segment	1

Question 28 (a) (i)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Correct list of three or four possible combinations	1

Question 28 (a) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of probability of selecting exact toll with two coins	3
• Significant progress towards correct answer, eg tree diagram	2
• Some progress towards correct answer	1

Question 28 (a) (iii)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct expression for number of dollars	1

Question 28 (b) (i)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct calculation of toll	1

Question 28 (b) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct total income from tolls	2
• Correct total number of vehicles or correct numerical expression	1

Question 28 (b) (iii)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Correct equation for the number of vehicles	2
• Progress towards correct equation, eg $6000 – 500d$	1

Question 28 (b) (iv)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Correct calculation and identification of maximum daily income	3
• Significant progress towards correct answer, eg table or graph with maximum daily income located at \$6 toll	2
• Some calculations to show the total income	1