2004 HSC Notes from the Marking Centre General Mathematics

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GPO Box 5300
Sydney 2001
Australia

Tel: (02) 9367 8111
Fax: (02) 9367 8484
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2004 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 2004 General Mathematics HSC examination paper. It should be read in conjunction with the 2004 HSC General Mathematics examination paper, the marking guidelines and the *General Mathematics Stage 6 Syllabus.*

General Comments

Just over 29 300 candidates attempted the 2004 General Mathematics HSC examination paper, slightly fewer than the 2003 number of candidates. Responses again indicated the wide range of abilities of candidates sitting 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 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, and only round their answers in the last step of working, not in the middle of a question. 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 2003 and it is clear that candidates are improving the clarity of their expression. This does, however, still present a problem for a significant number of candidates. 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 three-page explanation for a small number of marks is not necessary. Candidates need to pay particular attention to the situation where a question asks them to support their reasoning with calculations or examples, since the wording of the question was intended to be helpful.

More candidates than in the past are using graphics calculators and many 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 need to bring a ruler to the General Mathematics examination for drawing graphs and diagrams accurately.

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 showing 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
- referred correctly to the formulae sheet, were familiar with it and used it carefully where necessary
- drew large, clear diagrams and included given information as well as information calculated while doing the question
- did not round off too early in their calculations.

Section I

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

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

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

Question 23 this year was concerned primarily with measurement calculations, with one section from the algebra component of the syllabus. The marks awarded ranged from 0 to 13, with a large number of candidates achieving marks over 8.

(a) (i) Candidates were asked to 'show that' the area of a quadrilateral was equal to 57 m^2. A diagram showed the dimensions of three right-angled triangles. Most candidates found the area of all three triangles and then added them to obtain 57 m^2. Better responses reduced the problem to finding the sum of the area of two triangles. Use of the formula $A = \frac{1}{2}ab\sin C$ on the formula sheet ensured that '$\sin 90°$' appeared in many responses and led other candidates to attempt to find an acute angle. Common errors included calculating side lengths and the perimeter.

(ii) This part required a volume calculation that involved a unit conversion. It was poorly done. A large proportion of candidates showed that they do not understand unit conversion. The given area or some other answer from part (i) needed to be multiplied by a height to obtain the volume of a right prism. The typical response was 57 (m^2) × 5 (cm) = 285 (m^3) with some zeros placed at the end or with the decimal point in a range of positions.

(iii) In this part candidates were required to calculate the number of bags of straw to be purchased. The correct calculation of $2.85 \div 0.25 = 11.4$ required an unusual rounding up to satisfy the need to buy a whole number of bags. A common incorrect response involved multiplication by 0.25 instead of division by 0.25.

(iv) Candidates were very successful in applying Pythagoras' theorem in this part. However, a common error was to use the product of the squares, rather than the sum of the squares of the other two sides of the triangle.

(b) (i) In this part candidates were required to write down a simple algebraic expression. Many candidates were successful.

(ii) This part required the formulation and solution of an equation. Although the correct numerical answer '150' appeared in many responses, the formation of the relevant equation and completion of its routine solution were very poorly done. Multi-variable equations often appeared and quite confused literary deductions were common.

(c) This part provided candidates with the opportunity to display a range of strategies to solve what was intended to be a problem involving similar triangles. However, the standard similar triangles solution was apparent in only a few scripts. Those who tried to use similar triangles often incorrectly used $\frac{3}{2}$ instead of $\frac{5}{2}$. Using a scale factor was a more common approach. Many candidates used a combination of trigonometry and Pythagoras' theorem with a scale factor, and they were often successful. Other solutions included neatly drawn scale drawings and the unitary method using percentages eg 2 is 74% of 2.7, so 5 is 74% of h, $h = \frac{5}{74} \times 100 = 6.75$.

Question 24

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 gained marks, mostly from part (a).

(a) (i) This part was well answered by candidates. Common errors included misreading the scale or reversing the graph lines, ie reading wind speed as number of raindays and vice versa.

(ii) This part was also well answered. The marking scheme enabled candidates who had reversed the scale to be awarded some marks in this part despite their error in (a)(i).

(iii) Most candidates were able to state a three-month period correctly. A common error involved responses using December. A few candidates misunderstood the term 'three-month period' and gave responses involving three individual months.

(iv) Candidates were required to find a relationship between the wind speed and the number of raindays for the town. It was not sufficient to look at the graphs for a particular month(s) and conclude that one was 'higher' (or 'more') than the other. Some indication of 'high wind, low rain' or vice-versa was expected. Most candidates could identify the pattern and express themselves sufficiently well to communicate this. Sometimes, specific months (more than one month was required) were not included in the answer. Many candidates realised that there was an inverse relationship between wind speed and the mean number of raindays and were able to explain this relationship.

Many candidates gave very long and involved answers, often using unnecessary explanations of meteorological phenomena in an attempt to justify their observations.

(b) (i) The most common incorrect answer was 130°.

(ii) Most candidates were able to add 50 to the answer in (b)(i). Many calculated a distance rather than an angle. Of those who attempted to write the answer as $S5°W$, many were unsuccessful. Many did not realise that a bearing could be written as three figures.

(iii) Most candidates realised that the cosine rule was to be used. The most common error was in substituting into the cosine rule. Of those who substituted correctly, many could not evaluate the angle required.

(c) (i) A common error was to give a mark that fell within the correct range, eg 185. Incorrect calculator work using the z-score formula was common.

(ii) This was not well done by most candidates. Many simply divided 100% by 8 (8 sub-divisions on diagram) or 95% by 4.

Question 25

(a) (i) This was very poorly answered. Most candidates did not show understanding of the term 'tax deduction'. Most used the declining balance formula to find the value of the computer ($3900), but failed to subtract this from the original value ($6500) to give the deduction of $2600. Many candidates calculated the $2600 but then subtracted this from the $6500 to give what they then believed was the tax deduction.

The concept of using the declining balance formula for one year ($n = 1$) seemed to confuse some candidates, with some converting to months ($n = 12$), with or without adjusting the rate of depreciation. Some candidates realised that the deduction could be found directly by $0.4 \times \$6500$.

(ii) This was well answered by most candidates. The use of the declining balance formula was very good overall. Common errors included an inability to use 'financial years'– this caused candidates to use two or four (or even 2.5 or 3.5) years, rather than the required three years. Some could not convert 40% to a decimal (obtaining 0.04 instead of 0.4).

Some candidates attempted to use their answer from part (i) for a further two years. Those who had calculated the \$3900 value of the computer after one year did this correctly, but many incorrectly used the \$2600 depreciation value as their starting value.

A considerable number of candidates decided to use the straight-line depreciation formula, and some selected the future value of an annuity formula. This is a serious error when the question actually specified which formula/method to use.

Those who attempted to calculate the depreciation by longhand mostly did so correctly, although many candidates did not know when to stop. Calculations for two or four years were common.

(b) (i) The majority of candidates gave the correct answer of 6, but some had problems with the need to 'justify with working'. Those who had a grasp of the counting concept gave best answers ($3 \times 2 \times 1$), many listed the six possible arrangements (but some did not realise that repetitions were not allowed), and some tried a probability tree (but many had nine branches).

The basic idea that the same flavour ice cream could not appear more than once confused many. Unfortunately $3 + 2 + 1$ also gave the answer of 6, but this was not considered to show understanding of the question. Common incorrect responses were '$3 \times 3 = 6$' or $3 \times 3 \times 3 = 27$.

A considerable number of candidates listed their six outcomes correctly, but then concluded that there were 9, 12, 18 or 27 different arrangements. Use of $3! = 6$ or ${}^3P_3 = 6$ showed that some candidates were comfortable with counting techniques.

(ii) This part was very well answered. The idea of $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$ was clear to most, however $\frac{1}{3} + \frac{1}{3} = \frac{2}{6}$ was very common. Some candidates referred back to part (i) without realising the differences between the questions. Many candidates had difficulty handling fractions, and did not seem to use their calculator to check their calculations.

(iii) The concept of a dependent probability was understood by about half of the candidates. Some referred back to their answer to part (i) (which could be of some use), but more incorrectly referred back to part (ii) rather than re-calculating $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$. Many candidates correctly noted the fractions $\frac{1}{3}$ and $\frac{1}{2}$, but did not know whether to add or multiply. Some showed both answers.

(c) (i) A number of candidates had no response for this part. Some may have answered on the question paper and so no mark was possible. Those who did copy the table generally did well. Some transposed the columns.

(ii) This part was well done. Some answered both this part and the next in one attempt, causing a problem with their numbering of the parts. Quite a few candidates gave a fraction for the answer rather than giving a number of people. As many candidates with

an incorrect table obtained the correct answer, they may have gone back to the original question instead of using their table.

(iii) This was well done by most candidates. However, a considerable number of candidates showed poor ability in converting a fraction to a percentage.

(iv) Common answers were $\frac{20}{200}$ or $\frac{20}{130}$ rather than the correct $\frac{20}{150}$, even though the table was correct. This shows a basic misunderstanding of reading a two-way table. There was a considerable number of non-attempts on this part.

Question 26

Question 26 provided an opportunity for a large number of candidates to gain a good proportion of the marks available.

(a) (i) This part provided an easy lead-in to the remainder of the question. However, it was surprising to note that some candidates who scored well on the whole question missed out on this mark.

(ii) This section was very well done.

(iii) For the graph, the scales chosen varied considerably from one student to another and with the absence of vertical lines in booklets there were errors with the vertical alignment of plotted points. Candidates often found it difficult to identify the location of the four plotted points and decide whether they were reasonably positioned.

Some candidates felt that a column graph or histogram was a suitable representation of the points. A significant number of candidates wasted time by completing a table of values for n with all integral values of t, $0 \leq t \leq 15$ and plotting all the ordered pairs obtained. Candidates who calculated 15 y-values and plotted these points were at a disadvantage as it was more difficult to draw a smooth curve through these points.

Many candidates did not identify the exponential curve, joining their points with straight-line segments. A number of candidates wrote numbers along the axes without any corresponding graduations to specify the locations of the numbers. Some candidates were unable to choose a scale(s) that would encompass the full range of values to be plotted, some choosing scales that were difficult for them to interpret, eg 1 line space for 71 bacteria.

(iv) Many candidates appeared to be of the opinion that an estimate is a rough guess. Many approximated 7 to 10.

It was interesting to note that a reasonable number of candidates solved an exponential equation using logarithmic change of base.

(b) (i) It is once again obvious that a significant number of candidates still confuse latitude and longitude. Also the mathematical meaning of the word ‘difference’ is not always well understood.

A number of candidates gave responses such as: 'Sorong is further North than Darwin' and similar.

(ii) (1) Many candidates did not understand the concept 'Show that …'. Many drew a diagram of the world to show where Darwin was in relation to Sorong. Candidates need to be reminded of the dangers inherent in starting with what they are asked to show.

eg $1200 \div 1.852 \approx 647.9$
$647.9 \times 1.852 \approx 1199.9 \approx 1200$

(ii) (2) It was clear that a large number of candidates were unsure about nautical miles, knots and their relationship with kilometres and kilometres per hour. 'Knots per hour' was a common incorrect unit. Kilometres ÷ knots × hours and similar calculations were reasonably common. A significant number of candidates arrived at 44 from $1° = 4$ (minutes) so that $11° \times 4 = 44$ and it was often quite difficult to decipher which method had been used.

Question 27

This question was well answered, with many candidates scoring full marks and most scoring some marks. The section on wage calculation was very well answered. There were very few non-attempts. The use of graphics calculators in this question was evident only in a small percentage of the total candidature.

(a) (i) The variety of incorrect answers indicates that many candidates require more practice using repayment tables. Although the majority of candidates could locate the correct value (7.75) from the table, many could not apply it correctly to obtain the answer. The figures in the table were often incorrectly interpreted as percentages or annual repayments. Many candidates failed to divide \$150 000 by 1000, which clearly indicates they had not understood the table well enough. A significant number of candidates used 7.75 in a Simple Interest calculation or failed to use the table altogether, attempting to use Simple Interest based on 7% or using the Present Value formula. Some candidates who successfully multiplied 7.75 by 150 and obtained the correct answer went on to do further calculations (multiplying/dividing by 12 and/or 20) indicating they did not understand the question. Candidates who answered this part correctly generally went on to answer part (ii) and part (iii) correctly.

(ii) This part was not well done with many candidates not seeing the connection with part (i). Far too many candidates incorrectly used Simple Interest: $\$150\,000 \times 0.07 \times 20 = \$210\,000$, with some then following up with a subtraction of the principal from this amount giving \$60 000. A large number of candidates who correctly multiplied their answer to (a) (i) by 240 failed to subtract the principal, indicating that they either did not read the question carefully or they could not distinguish between interest and total amount repaid. Some candidates tried incorrectly to apply compound interest, compounding monthly or annually.

(iii) Candidates who had correctly answered (a) (i) and (a) (ii) generally answered this part correctly as well. Many candidates could not answer this question correctly because they either had poor understanding of interest and repayments or they had difficulty using their incorrect answers in parts (i) and (ii). Some candidates whose calculations resulted

in obviously incorrect answers or who found the interest for 15 years to be greater than the interest for 20 years acknowledged that this was incorrect, with some going on to seek alternate solutions in the hope of coming up with a more reasonable answer.

A great percentage of candidates are still giving bald answers for two-mark questions. Candidates who showed full working and clearly indicated which calculation was the interest and which was the repayment had a greater chance of being awarded full or part marks.

(b) (i) This part was answered very well by most candidates and showed that most had a very good understanding of penalty rates. The most common errors included miscounting the number of hours between stated times, neglecting to remove the unpaid break from the paid hours or adding the unpaid breaks to the time differences. The most successful approach was to calculate the pay for each day separately. Some candidates simply gave bald answers for this three-mark question – again there is a clear need to show all necessary working.

(ii) Many candidates who correctly answered (b) (i) did not correctly answer this part. The simplest approach to answer this question was to divide the Saturday earnings by 18 or to multiply the Saturday hours worked by 1.5.

(c) Although this part was attempted by a great majority of the candidates there were several, often incorrect, different approaches used to answer the question. Many candidates identified the Future Value formula as the correct formula but a significant proportion of those used incorrect values for the rate and/or the number of terms. The use of $r = 6$ and/or $n = 4$ was common. Those who did not recognise the correct formula went on to use either Present Value (both forms), Compound Interest or Simple Interest. Candidates who, incorrectly, used the Compound Interest formula often saw their result appear to be too small and proceeded to multiply by 2400 or 9600 to achieve a more realistic value.

Some candidates correctly calculated the future value of Sanjeev's investment, but did not complete the question by stating whether or not he reached his goal and by how much.

Question 28

(a) (i) This question was generally well done by those who converted the height to metres. Many candidates left it in centimetres. Another common error was to express the height as the square root instead of the square.

(ii) Those working in centimetres often came up with answers that were nonsensical; some realised and adjusted their answers. *Guess and check* was used frequently, with candidates often stopping before reaching the correct value. Some failed to give a conclusion, not declaring *loss* or *gain*.

(b) (i) The proportion of correct responses to this was low. Many candidates used the sign of proportionality instead of an equation; a large number set up a linear model ($C = kb$).

(ii) Most candidates calculated the correct value of k for their equation.

(iii) Candidates were able to score some marks in this part even if they had incorrect models by showing some correct mathematical progress towards the result. Those correct in parts (i) and (ii) usually did well in this part. Many candidates confused k and C.

(c) (i) Many candidates calculated the means of the x and y coordinates instead of the medians. Few gave both values correctly. Often the median height was correct, but not the median weight.

(ii) The response to this part varied by examination centre. Candidates from many centres were able to correctly articulate the process; in other centres almost no-one could.

(iii) (1) This part was quite well answered, with substitutions and evaluation carried out successfully. However, *guess and check* was frequently used. A common incorrect answer was 83.3 cm, coming from an inability to distinguish between dividing and multiplying by $\frac{2}{3}$.

(iii) (2) Many appeared to have an idea but could not express it sufficiently well. For example, 'people have varying heights and weights', when they may have meant 'people of the same height have varying weights'. Most candidates answered in terms of weight and/or body shape. A few used mathematical concepts, such as limited data range or small sample.

General Mathematics

2004 HSC Examination Mapping Grid

Question	Marks	Content		Syllabus outcomes
Section I				
1	1	PB2	Relative frequency and probability	P10
2	1	AM2	Modelling linear relationships	P5
3	1	AM3	Algebraic skills and techniques	H2
4	1	FM1	Earning money	P11
5	1	M4	Right-angled-triangles	P2
6	1	DA3	Displaying single data sets	P4
7	1	DA4	Summary statistics	P2
8	1	DA3	Displaying single data sets	P4
9	1	M6	Applications of trigonometry	H6
10	1	FM3	Taxation	P2, P8
11	1	AM3	Algebraic skills and techniques	H7
12	1	DA3	Displaying single data sets	P4
13	1	M1	Units of measurement	P2
14	1	PB4	Applications of probability	H4, H10
15	1	M5	Further applications of area and volume	H2, H6
16	1	AM4	Modelling linear relationships	H5
17	1	FM3	Taxation	P2, P8
18	1	PB3	Multi-stage events	H10
19	1	FM4	Credit and borrowing	H5, H8
20	1	FM1	Earning money	P2, P8
21	1	AM4	Modelling linear and non-linear relationships	H5
22	1	M1	Units of measurements	P2

Question	Marks	Content		Syllabus outcomes
Section II				
23 (a) (i)	2	M2, M5	Further applications of area and volume	P6, H6
23 (a) (ii)	2	M2, M5	Further applications of area and volume	H6
23 (a) (iii)	2	M1	Units of measurement	P2
23 (a) (iv)	2	M4	Right-angled triangles	P6
23 (b) (i)	1	AM1	Basic algebraic skills	P3
23 (b) (ii)	2	AM3	Algebraic skills and techniques	H2
23 (c)	2	M3	Similarity of two-dimensional figures	P6
24 (a) (i)	1	DA5	Interpreting sets of data	H4
24 (a) (ii)	1	DA5	Interpreting sets of data	H4
24 (a) (iii)	1	DA5	Interpreting sets of data	H4, H5
24 (a) (iv)	2	DA5	Interpreting sets of data	H5, H11
24 (b) (i)	1	M6	Applications of trigonometry	H6
24 (b) (ii)	1	M6	Applications of trigonometry	H6
24 (b) (iii)	3	M6	Applications of trigonometry	H6
24 (c) (i)	1	DA6	The normal distribution	H4
24 (c) (ii)	2	DA6	The normal distribution	H4
25 (a) (i)	1	FM6	Depreciation	H5
25 (a) (ii)	2	FM6	Depreciation	H5
25 (b) (i)	2	PB1, PB3	Multi-stage events	P10, P11, H4
25 (b) (ii)	1	PB3	Multi-stage events	H10
25 (b) (iii)	2	PB3	Multi-stage events	H10
25 (c) (i)	2	PB4	Applications of probability	H4
25 (c) (ii)	1	PB4	Applications of probability	H4
25 (c) (iii)	1	PB4	Applications of probability	H2, H4
25 (c) (iv)	1	PB4	Applications of probability	H2, H4

Question	Marks	Content		Syllabus outcomes
26 (a) (i)	1	AM4	Modelling linear and non-linear relationships	H2
26 (a) (ii)	1	AM4	Modelling linear and non-linear relationships	H5
26 (a) (iii)	4	AM4	Modelling linear and non-linear relationships	H3
26 (a) (iv)	1	AM4	Modelling linear and non-linear relationships	H5
26 (b) (i)	1	M7	Spherical geometry	H2
26 (b) (ii) (1)	2	M7	Spherical geometry	H2, H6
26 (b) (ii) (2)	3	M7	Spherical geometry	H2, H7, H11
27 (a) (i)	2	FM4	Credit and borrowing	H5
27 (a) (ii)	2	FM4	Credit and borrowing	H5
27 (a) (iii)	2	FM4	Credit and borrowing	H5, H8
27 (b) (i)	3	FM1	Earning money	P2, P8
27 (b) (ii)	1	FM1	Earning money	P2
27 (c)	3	FM5	Annuities and loan repayments	H5, H8, H11
28 (a) (i)	1	AM1 AM4	Basic algebraic skills Modelling linear and non-linear relationships	P2, H2
28 (a) (ii)	2	AM1 AM4	Basic algebraic skills Modelling linear and non-linear relationships	H5
28 (b) (i)	1	AM4	Modelling linear and non-linear relationships	H3
28 (b) (ii)	1	AM4	Modelling linear and non-linear relationships	H3
28 (b) (iii)	2	AM4	Modelling linear and non-linear relationships	H5, H11
28 (c) (i)	2	DA7	Correlation	H4
28 (c) (ii)	2	DA7	Correlation	H4, H9
28 (c) (iii) (1)	1	AM4	Modelling linear and non-linear relationships	H5
28 (c) (iii) (2)	1	AM4	Modelling linear and non-linear relationships	H5, H11

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Marking Guidelines

Section II

Question 23 (a) (i)

Outcomes assessed: P6, H6

MARKING GUIDELINES

Criteria	Marks
• Correct numerical expression (CNE)	2
• Progress toward CNE (eg calculation of area of one triangle)	1

Question 23 (a) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer OR • Correct from previous answer (CFPA)	2
• Incorrect (or non) conversion of units to m^3 eg $57 \times 5 = 285$ OR • CNE	1

Question 23 (a) (iii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct number of bags OR • CFPA	2
• Correct answer incorrectly rounded (ie incorrect conclusion of 11 bags needed) OR • Progress towards correct answer	1

Question 23 (a) (iv)

Outcomes assessed: P6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• CNE for AB or AB^2 OR • 62.01	1

Question 23 (b) (i)

Outcomes assessed: P3

MARKING GUIDELINES

Criteria	Marks
• Correct expression	1

Question 23 (b) (ii)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct equation correctly solved or CFPA	2
• Trial and error leading to \$150 OR • Incorrect equation correctly solved OR • Correct equation	1

Question 23 (c)

Outcomes assessed: P6

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• CNE OR • One error in otherwise correct solution eg $\frac{h}{3}=\frac{2.7}{2} \quad \therefore h=4.05$	1

Question 24 (a) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer (allow approximation)	1

Question 24 (a) (ii)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 24 (a) (iii)

Outcomes assessed: H4, H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 24 (a) (iv)

Outcomes assessed: H5, H11

MARKING GUIDELINES

Criteria	Marks
• Relationship of high wind to low rain with an example	2
• Relationship of high wind to low rain with no example cited	1

Question 24 (b) (i)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct angle size	1

Question 24 (b) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct bearing of R from A or CFPA	1

Question 24 (b) (iii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer for $\angle PAB$	3
• Significant progress towards finding $\angle PAB$, with one error	2
• Some progress towards finding $\angle PAB$	1

Question 24 (c) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 24 (c) (ii)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• CNE	2
• Progress towards correct answer (eg 27%)	1

Question 25 (a) (i)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• CNE	1

Question 25 (a) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CFPA	2
• CNE OR • Some progress towards correct answer	1

Question 25 (b) (i)

Outcomes assessed: P10, P11, H4

MARKING GUIDELINES

Criteria	Marks
• Correct complete list of arrangements or $3 \times 2 \times 1$ means 6 different arrangements	2
• Number of arrangements without working OR • Incomplete list	1

Question 25 (b) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE	1

Question 25 (b) (iii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE	2
• Progress towards correct answer	1

Question 25 (c) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Complete table with all four values correct	2
• Any two values correct	1

Question 25 (c) (ii)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE OR • CFPA	1

Question 25 (c) (iii)

Outcomes assessed: H2, H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE OR • CFPA	1

Question 25 (c) (iv)

Outcomes assessed: H2, H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE OR • CFPA	1

Question 26 (a) (i)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct answer	1

Question 26 (a) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Answer between 713 and 714	1

Question 26 (a) (iii)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Graph with features: correctly plotted points, correct labelling of axes, appropriate scales (CFPA), smooth exponential curve rather than line segments	4
• Most features correct, exponential curve with minor error	3
• Some features correct	2
• One feature correct	1

Question 26 (a) (iv)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct estimate from graph drawn in 26 (a) (iii) OR • Correct answer from another method eg solving or trial and error	1

Question 26 (b) (i)

Outcomes assessed: H2

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE	1

Question 26 (b) (ii) (1)

Outcomes assessed: H2, H6

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE, or CFPA	2
• Progress towards CNE	1

Question 26 (b) (ii) (2)

Outcomes assessed: H2, H7, H11

MARKING GUIDELINES

Criteria	Marks
• Calculation leading to correct answer for time taken, followed by a correct conclusion or CFPA	3
• Calculations leading to correct answer for time or distance or speed taken with no conclusion OR • Correct answer for time taken or distance or speed (no calculation shown) with correct or consistent conclusion OR • Incorrect (non-trivial) calculation (correctly evaluated) with consistent conclusion	2
• CNE with or without conclusion	1

Question 27 (a) (i)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• CNE	2
• Progress towards CNE eg using $7.75 from the table	1

Question 27 (a) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• CNE or CFPA	2
• Progress towards correct answer	1

Question 27 (a) (iii)

Outcomes assessed: H5, H8

MARKING GUIDELINES

Criteria	Marks
• CNE or CFPA	2
• Progress towards correct answer	1

Question 27 (b) (i)

Outcomes assessed: P2, P8

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE	3
• Substantial progress towards answer (eg not considering unpaid breaks correctly)	2
• Some progress towards answer	1

Question 27 (b) (ii)

Outcomes assessed: P2

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CFPA or CNE	1

Question 27 (c)

Outcomes assessed: H5, H8, H11

MARKING GUIDELINES

Criteria	Marks
• Correct calculation and conclusion	3
• Correct calculation, without conclusion or with inconsistent conclusion OR • Incorrect calculation (with one variable error), with consistent conclusion	2
• CNE (or list of variables for Graphics calc) without conclusion OR • Correct conclusion consistent with PV, FV, CI calculations in preceding calculation	1

Question 28 (a) (i)

Outcomes assessed: P2, H2

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE	1

Question 28 (a) (ii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct weight and loss or CFPA	2
• Progress towards correct answer, eg height of 1.5 m used	1

Question 28 (b) (i)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Correct equation	1

Question 28 (b) (ii)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Correct calculation or CNE of k (or CFPA)	1

Question 28 (b) (iii)

Outcomes assessed: H5, H11

MARKING GUIDELINES

Criteria	Marks
• Correct answer supported by calculations or CFPA	2
• Correct calculation with inconsistent or missing conclusion OR • Incorrect calculation with consistent conclusion	1

Question 28 (c) (i)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Correct answer	2
• Either value correct	1

Question 28 (c) (ii)

Outcomes assessed: H4, H9

MARKING GUIDELINES

Criteria	Marks
• A statement indicating that the line is to be parallel to AB and in the correct position	2
• A statement indicating one of the correct features	1

Question 28 (c) (iii) (1)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Correct answer or CNE	1

Question 28 (c) (iii) (2)

Outcomes assessed: H5, H11

MARKING GUIDELINES

Criteria	Marks
• A valid limitation of the model	1