

FSMQ 2001

June Series



Report on the Examination

Free-Standing Mathematics Qualifications

- Managing Money (6981)
- Working in 2 and 3 Dimensions (6982)
- Making Sense of Data (6983)
- Calculating Finances (6984)
- Solving Problems in Shape and Space (6985)
- Handling and Interpreting Data (6986)
- Using Algebra, Functions and Graphs (6988)
- Using and Applying Statistics (6990)
- Working with Algebraic and Graphical Techniques (6991)
- Modelling with Calculus (6992)

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Kathleen Tattersall, Director General

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Coursework Portfolios (6981, 6982, 6983)

Foundation

General

It was pleasing to note that, possibly as a result of the standardisation meetings, the majority of centres assessed the work at the correct standard. However, it was noticeable that centres differed widely on the amount of annotation which they gave to the work. Annotating the work is helpful to candidates as it provides them with feedback and this feedback can often identify which parts of the criteria they need to include within the next part of their portfolio.

It was also apparent that a few centres had marked theme 2 too highly. It is essential that checking takes place, and is seen to have taken place, before high marks can be awarded in this theme.

It was noticeable that many of the candidates had seen the relevance in their other studies, or in the real world, of significant parts of the required portfolio and had thus gained considerable benefit from studying the Qualification.

There was a wide variation in the quality of portfolios submitted from those, the vast majority, who produced excellent work, to a few who clearly had little enthusiasm for their year's study. The portfolios for the qualification '*Managing Money*' were generally of a higher quality than for '*Making Sense of Data*'.

The problems which did arise in marking were:

Theme 2, *Using Appropriate Mathematics and Working Accurately*, caused candidates the most problem. Candidates found it difficult to show explicitly where checking had taken place. It was noticeable that candidates did not score highly in this theme.

In theme 3, *Interpreting Mathematics*, candidates would have gained higher marks if they had interpreted their solutions in each of the situations investigated, rather than in just one situation.

Administration

It was noticeable that the paper work this year was often not completed correctly. A number of centres did not enclose the Centre Declaration Sheet (CAW/CDS) stating that internal moderation had taken place. The administrative arrangements re: Centre Mark Sheets (CMS) caused major difficulties this year; sometimes three copies, two copies or one copy arrived, and quite often no copies were sent. This clearly delayed the moderation process.

Managing Money (6981)

Foundation

Paper 6981/2

General

It was pleasing to see a considerable increase in the number of candidates entered for this qualification and the reduction in the percentage of absent candidates.

Most candidates found the paper accessible, with the majority of candidates scoring well. Relatively few candidates scored less than 10 in total. In common with previous sessions, it was noticeable that the statistical question was attempted badly on this predominantly financial paper.

Question 1

(a) Payments from students of £1 350 (b) £750

In part (a), candidates rarely included all of the information relating to the transaction identified. Part (b) was usually completed correctly. Part (c) was completed successfully by most. However, a number of candidates gave the details correctly, but listed the amounts in only one column, and a few listed only two of the three transactions on the statement.

Question 2

4

Very few candidates appreciated that the student paid £594 in instalments which meant that only £756 was paid in 'total' payments.

Question 3

(a) Column D, 29.18, 26.53, 26 (b) Economy (c) $= \frac{C3}{B3} \times 100$

Candidates understood what was required in this question, but in part (a), the weight in grams in B4 was often given as 1.2 instead of 1200. In column C, the amount was often left in pounds rather than pence as required, and a few in column D divided the two items inversely. A number of candidates truncated, and hence could not distinguish between the Family and Economy as the best buy. Part (b) was completed correctly as a follow through, but few candidates could identify the formula required in part (c).

Question 4

(a) £20 (b) £14.98 (c) £16

Parts (a) and (b) were normally completed correctly. In part (c), the answer £32 was often given, rather than £16. It was common that $\frac{2}{3}$ was approximated to 66%, 67% or even 60%.

Working in 2 and 3 Dimensions (6982)

Foundation

Paper 6982/2

General

Candidates were generally more successful answering questions involving calculations than with the questions requiring the use of drawing skills. A surprising number of candidates used drawing instruments carelessly. It was clear, however, that the vast majority of candidates were able to make sound use of their calculators even though some careless rounding of intermediary results were seen.

Question 1

- (a) 6 (b) 12

Very few candidates failed to score at least one mark in this question after correctly applying the scale factor to their measurement made in part (a). The majority of candidates scored full marks in this question.

Question 2

- (a) 480 cm^3 (b) 78.5 cm^2

Candidates generally scored well in part (a), displaying a sound knowledge of the volume of a cuboid. In part (b), the calculation of the area of the circle proved problematic for a number of candidates. Common errors included “314” after candidates used the diameter, “31.4” after calculating the circumference instead of the area, and “62.8” when the formula $2\pi d$ was used.

Question 3

This question, requiring an accurate use of drawing instruments, was very poorly answered in the majority of cases. Although candidates generally understood the need to produce a plane drawing, (very few isometric drawings were seen), few candidates scored full marks.

Candidates sometimes varied the scale within their drawing, yet the circle and semi-circular parts were often scaled in a consistent manner and concentrically positioned. A number of candidates placed the centres 5 cm from the top of the base and the sloping sides often met the base at the wrong points. Many candidates did score for a symmetrically drawn elevation.

Question 4

- (b) Orders 4, 2 and 2

Most candidates correctly placed the lines of symmetry on *A* but a fair number placed too many on *B* or gave diagonals as lines of symmetry.

In part (b) the modal mark was 2, generally gained from giving the correct order for *A* and *B*. Design *C* was often quoted as having order 1 or 4.

Question 5

- (a) 56 (b) Pentagon (c)(i) 900 (c)(ii) 196 (c)(iii) 176

On the whole this question was answered well. The majority of candidates correctly provided the perimeter and area of X , were able to quote the name of Y , and calculated the area of the complete design.

Candidates met with mixed success in the final part. When the connection between this part and the previous two parts was understood, candidates had few problems with the calculations. Some candidates, however, failed to appreciate the need to divide by 4 to obtain the area of one of the polygons.

Question 6

- (b) 3:1

In part (a)(i) candidates sometimes struggled to draw the circle accurately. In addition, candidates generally knew the construction method for a hexagon, but they were often careless when scribing arcs around the circumference of the circle. Consequently, in a number of cases, hexagons were poorly drawn.

The correct response was usually given in part (b) and a fair proportion of candidates gave clear explanations in the last part of the question. The printed diagram was often used along with the reference to quadrilaterals. Some candidates resorted appropriately to using triangles. Very few candidates referred to external angles.

Question 7

- (a) 12.5 (b) 250

Whilst a fair number of candidates provided the correct solution to part (a), some failed to halve “ 5×5 ”. A few candidates attempted to calculate the length of AC believing this to be the perpendicular height for their area calculation.

Calculating the volume of the box in part (b) was usually undertaken successfully with candidates showing an understanding of ‘cross-section \times length’ for volume.

Question 8

- (a) Cylinder (b) 113

The correct response of ‘cylinder’ in part (a) was seen in the majority of scripts. A number of candidates calculated volume again in part (b) but a sizeable number of candidates were unable to make a start on the problem at all.

Making Sense of Data (6983)

Foundation

Paper 6983/2

General

Candidates found Question 1 to be a good introductory question to this paper, enabling them to show their skills. However, a significant proportion of the candidates found this paper challenging. Often, candidates did not attempt the last question. Whether this was a result of the paper being slightly long, or whether the candidates were not able to attempt this question, is unclear.

Question 1

- (a) £145.50 (b) £143.50 (c) £140 (d) 33

Candidates were usually successful in this question, but often found difficulty remembering which average was which. Part (a) was usually completed correctly, although many gave the answer as £145.5 rather than £145.50, but this was not penalised in this case. In part (b), the candidates usually appreciated that the median was between £140 and £147, although a proportion could not find its actual value. Parts (c) and (d) were usually completed correctly.

Question 2

49.8%

This question was rarely completed correctly. A few candidates found the discount to be £119, but most who made a realistic attempt at this question obtained 50.2%, which was the actual price as a percentage, rather than the discount as a percentage.

Question 3

- (a) 60% (b) 30%

Part (a) was completed correctly by a significant proportion of the candidates, but part (b) was usually incorrect, even though the answer to part (b) was obtained simply by dividing the percentage in part (a) by 2. In part (c), most found the angles correctly, but a significant proportion of candidates only divided the pie chart into four regions, not five.

Question 4

- (a) $\frac{3}{25}$ (b) 0.12

In part (a), a significant proportion of candidates obtained $\frac{12}{100}$, but did not simplify it to $\frac{3}{25}$. Part (b) was usually completed correctly.

Question 5

8.8%

There were few correct answers to this question, as candidates found it difficult to express one item as a percentage of another.

Question 6

Part (a) was usually completed correctly, although a minority of students did not plot all the points correctly. About half the candidates stated correctly why the two numbers were not directly proportional to each other, regardless of what their graph showed. In part (b)(ii), most gave an acceptable answer – for example, different dates of purchase leading to different exchange rates, cost of commission, etc.

Question 7

This question was usually completed correctly, although inaccuracies were common in the height of bars, where 49p was often closer to 45p than to 50p. In part (b) most candidates completed column D correctly, although a number inserted 60 for D5 instead of –60. Conversely, column E was very rarely completed correctly. In particular, the finding of 66 as a percentage of 265 was found to be difficult.

Part (c) was very rarely completed correctly, but part (d) was usually answered by a slightly appropriate sentence. A few noticed that there could be many other supermarkets in Britain, or that the selection of items, just four in number, need not be representative of all the goods on sale in the shop.

Coursework Portfolios (6984, 6985, 6986, 6988)

Intermediate

General

It was pleasing to note that, possibly as a result of the standardisation meetings, the majority of centres assessed the work at the correct standard. However, it was noticeable that centres differed widely on the amount of annotation which they gave to the work. Annotating the work is helpful to candidates as it provides them with feedback and this feedback can often identify which parts of the criteria they need to include within the next part of their portfolio.

It was noticeable that candidates who used work from other curriculum areas generally produced much better portfolios. This was seen particularly in the algebraic qualification, '*Using Algebra, Functions and Graphs*' where there were a number of centres who used experimental work clearly obtained from Physics which often produced excellent portfolios making the students appreciate that they were gaining benefit in their other subjects from following the FSMQ course.

The problems which did arise in marking were:

Candidates who did not complete all the work were sometimes given in theme 1, *Structuring and Presenting the Work*, a mark of zero, in spite of the fact that a substantial amount of the work had been done.

Theme 2, *Using Appropriate Mathematics and Working Accurately*, caused candidates the most problem. Candidates found it difficult to show explicitly where checking had taken place. It was noticeable that candidates did not score highly in this theme.

In theme 3, *Interpreting Mathematics*, candidates would often have gained higher marks if they had interpreted their solutions in each of the situations investigated, rather than in just one situation.

At Intermediate Level, it was noticeable that there were few weak portfolios with the majority obtaining creditable marks.

Administration

It was noticeable that the paper work this year was often not completed correctly. A number of centres did not enclose the Centre Declaration Sheet (CAW/CDS) form stating that internal moderation had taken place. The administrative arrangements re: Centre Mark Sheets (CMS) caused major difficulties this year; sometimes three copies, two copies or one copy arrived, and quite often no copies were sent. This clearly delayed the moderation process.

Calculating Finances (6984)

Intermediate

Paper 6984/2

General

It was pleasing to note that the entry for this unit had grown considerably in number since the Summer 2000 examination, and also that the entry was of a higher standard. Most of the candidates in this unit were suitably entered at the Intermediate level, but there was a significant minority of candidates who were not entered at the appropriate level.

There were a few candidates who scored well on the paper but there was significant proportion with a total mark of less than 10. Candidates found the paper to be of a suitable standard with a full range of marks being obtained. Questions 5b, 6 and 8 were found to be the most challenging questions.

Question 1

Candidates were usually successful in this question. Only a minority did not show the results of their calculations and this minority usually constructed a pie chart which had its angles drawn inaccurately.

Question 2

39.75%

This question was well answered but few candidates gave their answer to four significant figures.

Question 3

(a) £66 300 (b) £505.87 (c) £151 761

Part (a) was well answered, but £11 700 was frequently given. However, part (b) was often incorrect, frequently due to decimal point errors. Candidates all found £7.63 as the monthly repayment for £1 000 borrowed but often numbers close to 66.3 were used such as 66, 67, or even 60 and 70, for the multiplication. Part (c) was normally correct on ‘follow through’.

Question 4

(a) £1 024 (b) £302.50

This question was usually answered well.

Question 5

(a)(i) £640.90 (a)(ii) £560.79 (b) £1400

Candidates were successful in part (a)(i) and most also obtained £560.79 in part (a)(ii).

Some tried $\frac{984}{35} \times 100$ to find 35% of £984 and others tried to use the £200 in part (a)(ii). In part (b) relatively few candidates appreciated that $£392 \approx 28\%$ of the premium. Those who did, frequently obtained the digits 14 but the decimal point was rarely correct.

Question 6

£175.23

Virtually no candidates could use linear interpolation to find the monthly repayment for 28 months. A few correctly found the difference between the 24 and 36 month repayments (£55.30) but were usually unable to proceed further.

Question 7

(a) £34 795 (b) £8 623.60

Part (a) of this question was answered well by most candidates. However, a proportion of candidates could not obtain £6 395 to be the amount of income charged at the 40p rate. This was commonly as a result of subtracting £1 520 (not £152) or £26 880 - £1 520 (at the 22% rate) from the annual taxable income.

Question 8

19%

This question was found challenging by most candidates. A few found the sale price reduction to be 51% of the cost price but rarely realised that this meant that the sale price was 1.19 of the cost price. Those who did, frequently gave the answer to be 11.9% rather than 19%.

Question 9

(a) 0.05 (b) £110

Part (a) was usually answered correctly but in part (b) the value of $0.05 \times £2\,200$ was often found incorrectly.

Question 10

£8 059.26

The substitution of the data into the given formula caused significant problems, particularly since the annual rate was given as 5.25% whereas the formula used the annual rate, R , as a decimal. The consequence was that many attempted to find $6\,240 \times (1 + 5.25)^5$ with the result being too large so that $(1 + 5.25)^5$, or £9 536.74, was often given as the answer.

Solving Problems in Shape and Space (6985)

Intermediate

Paper 6985/2

General

The majority of candidates appropriately provided solutions to computational problems with full methods shown. The need to use trigonometry or Pythagoras' theorem was recognised with pleasing regularity although the direct use of the cosine rule in the final question eluded all but the strongest candidates.

Work involving geometrical construction was undertaken with less success as was the accurate drawing of a front elevation.

Question 1

(a)(i) Hexagon (a)(ii) 6 (c)(i) 40 (c)(ii) 480

Candidates generally responded well to all parts of this question. Very few failed to gain the marks in parts (a) and (b) and the majority of candidates were successful in part (c). Only a few candidates used the sloping edge of length 6 cm in a calculation resulting in little progress being made.

Question 2

(c) 33 km

The correct position of C was appropriately found with the use of a pair of compasses in the majority of cases. Few candidates, however, were able to correctly construct the perpendicular bisectors necessary to find T . In most cases correct measurement and scaling, (irrespective of the position of T) gave candidates the opportunity to gain the last two marks available. Consequently only a minority of candidates failed to gain these marks.

Question 3

(b) 29.7° (c) 81 (d) 2.8 (e) 6.72

A surprising number of candidates could not make the connection between the thickness of the walls and the internal width of the shed. In part (b) some good responses were seen, although common

errors included " $\tan x = \frac{0.7}{0.4}$ and $\tan x = \frac{0.4}{1.4}$ ". A good number of candidates used Pythagoras'

theorem correctly to obtain the result in (c) but too often failed to round the answer to the nearest centimetre.

The calculation of the cross-sectional area and the volume in parts (d) and (e) produced a number of incorrect responses. The most common errors were to omit the " $\times \frac{1}{2}$ " for the triangle, or to simply evaluate " 1.4×2.2 " for the area. A volume was usually calculated from the result to part (d) but some candidates failed to realise the need to refer to the Data Sheet for the depth of the shed. Out of those who did retrieve the '2.5 metres', a number did not correct to the internal dimension of 1.4 metres.

Question 4

On the whole, candidates did not perform well in this question. The majority appropriately scaled their drawing but the legs and/or the shelf were often incorrectly placed. Candidates rarely showed hidden detail and some attempts at an isometric drawing were seen.

Question 5

(a) 49.0 (b)(i) 3790 to 3800 (b)(ii) 142 to 152 (c) 196 000 000

Part (a) was answered well on the whole and parts (b) and (c) also resulted in some good responses from candidates. In all parts, however, a number of candidates failed to heed the request for certain levels of accuracy to be given and candidates often lost marks here.

Only a few candidates were successful with part (c). It was more normal to see attempts at a solution through the use of trigonometry in the right-angled triangle, but candidates rarely made progress in this way.

Handling and Interpreting Data (6986)

Intermediate

Paper 6986/2

General

The candidates entered for this qualification frequently did not show the skills required at FSMQ Intermediate level. Candidates rarely showed ability in handling the majority of the topics studied at this level. It was common to find question 5, on cumulative frequency, badly attempted as well as question 3 on comparative pie charts. The explanation given in questions 7 and 8 was often weak and frequently these questions were not attempted. A number of candidates made significant progress only in question 1, on scatter diagrams, question 2a, on modal class, and question 6, on reading data from a table, all of which questions could have been on a foundation tier GCSE paper.

Question 1

(a)(i) 42.96 m (a)(ii) 40.15 m (d) 45 m

Most candidates correctly found the mean of the lengths and the mean of wing spans. The majority of candidates could also plot the scatter diagram for the data with the drawing of a suitable line of best fit and a suitable estimate in part (d).

Question 2

(a) 12 to 16 kg. (b) 14.6 kg (c) $\frac{1}{5}$

Most candidates were able to identify the modal class. The majority of candidates appreciated the method required to find the mean rate but there were a number of arithmetical errors, particularly 0×2 for the first rate category equalling 2. The probability in part (c) was usually found correctly.

Question 3

(a) 850 (b) 648 (c) 198

The majority of candidates answered part (a) correctly. However, parts (b) and (c) which depended on the comparative pie charts caused candidates major problems, with only a minority appreciating that the number of pickers depended on the square of the radii.

Question 4

$\frac{3}{5}$

Most candidates appreciated that they had to subtract $\frac{2}{5}$ from 1, but a significant proportion were unable to gain $\frac{3}{5}$ as a result.

Question 5

(b)(i) 455-460 (b)(ii) 515 – 525 (b)(iii) 400 – 405 (b)(iv) 120

It was surprising that a significant proportion of the candidates were unable to draw a cumulative frequency curve. Those who did appreciate the concept of cumulative frequency generally plotted all the points correctly and gained full marks for part (b). These candidates also produced a box and whisker diagram which was also correct. The minority of candidates who were incorrect usually used inappropriate tails, which should have been from 200 to 700.

Question 6

(a) 1 677 900 (b) 30 869 100

Most candidates could find the number of cars in Denmark, but a significant proportion did not identify Italy as the country with the greatest number of cars. Those who did identify Italy, often found the subtraction of 1 677 900 from 32 547 000 difficult.

Question 7

False zero

The candidates often looked for complicated reasons as to ways in which the graph was misleading. The required answer of a false zero was not given by many. A pollution table with London at the lowest end of the pollution index clearly disturbed a large number of candidates. The common accepted inspirational answer was that the population of each city was not given.

Question 8

A pleasing proportion of candidates appreciated that the increases in the height of the bars did not reflect the increases in the actual number of miles, with many commenting that the increase from 1997 to 1998 of 10 miles was far less of an increase on the bar chart than the increase of 8 miles from 1996 to 1997. Part (b) was usually answered well, as there were so many sensible reasons as to why the chart could be misleading.

Using Algebra, Functions and Graphs (6988)

Intermediate

Paper 6988/2

General

On the whole candidates displayed a firm grasp of the use of algebraic techniques to solve problems. However, whilst the drawing and use of graphs was carried out confidently, the derivation and solving of a quadratic equation proved to be beyond the majority of candidates. Most candidates had a sound knowledge of standard index form and were able to work appropriately with a large number but negative powers of numbers was often misunderstood.

Question 1

(b)(i) 250 (b)(ii) 1780 (c) 15 000 (d)(iii) >2525

A sizeable number of candidates scored well on this question. Part (a) was usually answered well with accurate plotting and a smooth curve drawn through the points. Only a few candidates failed to start the distance axis at zero but in general, the graph was appropriately labelled.

Candidates rarely failed to obtain correct answers in part (b) but part (c) produced a variety of responses. When an error was made it was usually due to the candidate using values of their own read from the graph, to obtain a value for k . It was pleasing to see, however, that candidates generally understood the need to use values for c and d in order to obtain k and the vast majority of candidates were able to correctly solve the ensuing equation for k .

About half of the candidates gave an appropriate response in part (d)(i) by referring to proportionality of powers of c and d and the majority of candidates correctly plotted two or more points to produce the line in part (d)(ii). In the final part to the question, candidates rarely appreciated that the answer involved was ‘greater than’ their intersection of the two graphs. The common response was to simply quote the distance for the intersection.

Question 2

(b) 4

This question proved too demanding for the majority of candidates and very few candidates achieved more than half marks here. In part (a)(i), whilst some candidates correctly obtained the expansion of the two brackets, few correctly applied the negative sign to their expansion. A number of candidates fell at the first step when they failed to obtain the $4m^2$, usually leaving this as ‘ $4m$ ’. In part (ii) few candidates went far enough with their reasons and very few candidates could adequately explain that if the conditions were not met then the hollow would not exist.

A fully correct response to part (b) of the question was not seen. Correct substitution of the given values presented few problems but candidates were unable to obtain a quadratic equation – simply attempting to rearrange for m before multiplying the bracket out. Some candidates did obtain the correct answer through trial and error.

Question 3

- (a) 480 (b) 817.89

Part (a) was answered correctly by the majority of candidates but success with part (b) was variable. Most candidates approached the problem in the correct manner but very often careless rounding of the intermediate value ‘0.5869’ often took candidates’ final answers too far away from the actual answer.

Question 4

- (a) 2.28×10^8 (b) 1.10×10^{12} (c)(i) 6 000 000 (c)(ii) $M = \frac{dR^2}{c}$
(c)(iii) 4.8×10^{24}

Most candidates achieved the mark in part (a) and at least two marks in part (b). The common error seen in part (b) was where candidates failed to round the answer to 3 significant figures.

Part (c)(i) was usually correct but in part (c)(ii) approximately half of the candidates failed to obtain the result for M . Follow through was usually available in part (c)(iii) and candidates were generally able to obtain the marks here. A number of candidates started from the original formula printed in part (c)(ii) and some candidates did achieve success in this matter.

Question 5

- (a) 500 (b)(i) 370 (c)(i) 500

Only a minority of candidates obtained the correct answers to parts (a) and (b). In part (a) most candidates failed to realise that observations first started when $t = 0$ and in part (b) the negative power of 2.72 caused problems for many candidates. There was, however, a higher frequency of correct responses in parts (b)(ii) and (b)(iii).

The final part of the question was well answered by the majority of candidates. Candidates who failed to score in part (c)(i) did so through failing to draw a tangent. Even these candidates did appreciate how to calculate a gradient and it was very rare not to see right-angled triangle constructions with $\frac{y}{x}$ clearly evaluated. Approximately half of the candidates correctly identified a meaning for the tangent.

Coursework Portfolios (6990, 6991, 6992)

Advanced

General

It was pleasing to note that, possibly as a result of the standardisation meetings, the majority of centres assessed the work at the correct standard. However, it was noticeable that centres differed widely on the amount of annotation which they gave to the work. Annotating the work is helpful to candidates as it provides them with feedback and this feedback can often identify which parts of the criteria they need to include within the next part of their portfolio.

It was noticeable that candidates who used work from other curriculum areas generally produced much better portfolios. There was a number of centres who used experimental work which had clearly been obtained in Physics and these portfolios were often excellent, and it made the students feel that they were gaining benefit from following the FSMQ course.

At Advanced Level, it was noticeable that there were few weak portfolios with the majority obtaining creditable marks.

Administration

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Using and Applying Statistics (6990)

Advanced

Paper 6990/2

General

There was a small entry for this paper and, in general, performance on this paper was disappointing. Many candidates could not cope with relatively straightforward calculations, such as those required in questions 1, 2 and 4, based on data from the Data Sheet.

Question 1

(b) 25 700 000

Part (a) of this question was answered correctly by the majority of candidates. However, a number took the year 2000 as the base year in their calculations. The response to part (b) was very disappointing with only a small minority knowing how to proceed.

Question 2

(a) £492 (b) £409

Although many candidates were able to correctly calculate answers to parts (a) and (b), a substantial number attempted to find the mean amount spent by the different travellers using 4 as the value in the denominator of their calculation, which gave answers in millions of pounds. Presumably the value 4 was chosen because of the four quarters of the year. Few decent attempts to interpret the negative trade balance were made in answer to part (c), although one or two very good explanations were given.

Question 3

(b) 39.3

With age as the continuous variable in this question, candidates demonstrated that this allows for much scope in making errors with calculations and construction of the required histogram. A substantial number used the wrong class widths (for example, thinking that 1 – 4 years has an interval of 3 years), but the vast majority made a good attempt at calculating frequency densities. In drawing the graph most candidates correctly used a continuous linear scale on the horizontal axis but some did not manage to do this. Others drew a bar chart leaving gaps between their bars. The calculation of an estimate of the mean age in part (b) was not well done. Many candidates did not know how to start this calculation; those who did often used the incorrect mid-points of the age intervals.

Question 4

(a)(i) 3650 (a)(ii) 624 000 (b) 645 000

Very few candidates correctly calculated the expected number of deaths of children under the age of one-year. Most assumed that one can simply add the death rates for males and females in the population without taking account of the relative sizes of the two distinct populations. In part (b), a common error was to interpret the age group 1 – 4 as having an interval of 3 years. Although few candidates answered both parts (a)(ii) and (b) correctly, a number were able to go on and interpret why their answers to these parts would be different.

Question 5

This question was entirely concerned with candidates' abilities to interpret data. Many were successful with parts (a) and (b) indicating that they clearly understood the data and its presentation. However, part (c) was badly answered; this question required thinking of the type required to answer 4(a)(i) which was also badly done.

Question 6

(b)(i) $\bar{x} = 169$, $\bar{y} = 47.5$ (b)(ii) 0.936 (b)(iii) $y = 32.1 + 0.0911x$

In many cases the scatter diagram was well drawn but some candidates did not take care when labelling axes, and a number plotted some of the points inaccurately; candidates were often not helped by their choice of scales. In part (b) a number of candidates did not use the statistical functions of their calculators to quickly find the values required. There was no need for candidates to spend time doing long calculations. Only a few candidates successfully plotted the line of best fit on their graph and only a small number of these ensured that this passed through the point (\bar{x}, \bar{y}) .

Question 7

Some candidates only gained up to two marks for direct description of the graphs or data; better responses, gaining up to an additional two marks, included interpretation of what the evident correlation means in terms of the emission of the two types of pollution.

Question 8

(a)(i) 815 (a)(ii) 840.27 (a)(iii) 790.29 (a)(iv) 754

Responses to this question were invariably disappointing with only a few candidates realising that they could calculate *expected eye-to-seat* heights by assuming they fit a normal distribution with the given parameters. Many candidates attempted to work with the real data at this stage, finding the probabilities associated with the values given for a distribution with the same mean and standard deviation. There was evidence that candidates could work with the normal distribution but this was not often worthy of credit in the context of the question.

Question 9

Only a few candidates – those who had fully engaged with, and understood the data – were able to write successful answers to this question. The best answers to part (b) referred to the lack of correlation between the different measures presented on the Data Sheet.

Working with Algebraic and Graphical Techniques (6991)

Advanced

Paper 6991/2

General

This paper was accessible to candidates with many showing that they were well prepared. They had adequate time to complete the examination. The graphical questions were better attempted than the algebraic questions. Some candidates did not use the Data Sheet as a preparation for the types of graphs expected on the answer paper. Some centres did not send the candidate's Answer Sheet as well as the Answer Book to the examiner. Some did not give their answers to 3 significant figures. All candidates found the first three questions much easier than the last two questions.

Question 1

- (a) 50m (b)(ii) 128(.125)m (c) 4.44 (d)(i) 0.2 to 0.3
 (d)(iii) 0.6 to 0.7

Part (a) was usually correct but $50 + \frac{5}{8}$ was seen. Most of the candidates could draw the graph correctly in part (b) but some used the graph to predict the maximum height rather than the model. Most candidates knew how to calculate the percentage error in part (c) but again used the graph rather than the model. A considerable number of candidates did not draw the tangents in part (d) but did vertical/horizontal with readings from the graph.

Question 2

- (a)(iv) $A = 970$ to 1010 , $k = 0.19$ to 0.21 (b)(i) Initial Population (b)(ii) 22 319
 (b)(iii) 4 years, 8 months

Not many candidates attempted part (a)(i) but those that did usually answered it correctly. Parts (a)(ii) and (a)(iii) were well done with all candidates knowing what to do. Most candidates gave the value of k correctly but gave $A = 6.9$ instead of $\ln A = 6.9$.

A number of candidates got part (b)(i) correct, and knew to substitute $t = 9$ into the formula for part (b)(ii), but a few used the formula from part (a) of the question. Very few candidates were able to do part (b)(iii) correctly as they were unable to set up a correct equation. Answers such as $\ln 6000 = \ln 1500 \times 0.3t$ or $\ln 6000 = \ln (1500 \times 0.3)t$ often appeared.

Question 3

- (a)(i) 294 feet (a)(ii) 2.56 minutes (b) $H = 500$
(c)(iii) 30 to 38, 52 to 60, 46 to 49

Most candidates could do part (a) correctly but some made errors when solving the trigonometric equation with answers such as $100 / (500\sin 4.5)$. Many candidates did not understand part (b) and did not attempt to answer it. Most could draw the graph in part (c)(i) but some did not give the answers to part (c)(ii) as intervals but just stated when the model differed from the real height by 20 feet. Part (c)(iii) was usually answered correctly.

Question 4

- (a)(i) $15 = 100a + 10b$ (a)(ii) $a = 0.05$ or $\frac{1}{20}$, $b = 1$ (b) 96.25
(c)(ii)

All candidates could do part (a)(i) correctly but most could then make no further progress. Even those candidates who obtained another equation failed to recognise them as a pair of simultaneous equations. All those who got values for a and b knew what to do in part (b).

Question 5

- (a) $n = 5, p = -2.5$ so $y = 0.1(x + 5)^2 - 2.5$

This question was poorly answered with most candidates not even attempting it and none could make any progress towards completing the square in part (a). Some candidates could sketch the graph in part (b) but none gave the turning points correctly. Others interpreted the 0.1 correctly in part (c) but none interpreted all 3 transformations correctly.

Modelling with Calculus (6992)

Advanced

Paper 6992/2

General

There was a very small entry for this unit, with candidates showing mixed success. Question 1 was found to be a suitable introduction to the paper, while question 4 was found to be challenging.

Question 1

- (a)(i) 100 (a)(ii) 238 (b) 31 (c) 352 (d)(i) -6
 (d)(ii) maximum (f)(i) $0 \leq t \leq 20$

Candidates were successful in part (a), and appreciated that they needed to find $\frac{dp}{dt}$ for part (b). This was found well, and in part (c), the value of t when $\frac{dp}{dt} = 0$ was found correctly. Part (d) was also completed well. Answers to (e) and (f) lacked the required precision.

Question 2

- (a) 13 (c)(i) $-\frac{6\pi}{6.2} \sin \frac{\pi t}{6.2}$ (c)(ii) 3.04

Parts (a) and (b) were completed successfully, though the justification in (b) was shown by candidates as showing that h was a maximum when $t = 12.4$. Part (c)(i) was attempted well, although part (c)(ii) caused problems with candidates not appreciating when $-\sin \theta$ was a maximum.

Question 3

- (a)(i) 42 (a)(ii) 6 (b)(i) £26 (b)(ii) 168 (b)(iii) greater

Candidates showed that they knew how to find the maximum value of the shares. The integration in part (b), both exact and using the trapezium rule, caused difficulties due to the arithmetical or/and algebraic manipulation required.

Question 4

- (a) $\ln m = -kt + c$ (b) $m = 20e^{-kt}$ (c) 0.139 (d) 1.25 g

The question, using e^{-kt} , caused significant problems to the candidates who appreciated the method required, but found the algebraic manipulation difficult.

Mark Ranges and Award of Grades

Foundation Level

6981 Managing Money

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6981/1	51	51	20.4	11.3
Written Paper 6981/2	40	51	28.6	8.2

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6981/1	51	40	32	24	17	10
Boundary Mark 6981/2	40	33	29	25	21	17

Provisional statistics for the qualification as a whole (467 candidates)

	A	B	C	D	E
Cumulative %	1.96	11.76	36.03	61.76	83.33

6982 Working in 2 and 3 Dimensions

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6982/1	51	51	20.4	6.1
Written Paper 6982/2	40	51	25.2	8.9

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6982/1	51	40	32	24	17	10
Boundary Mark 6982/2	40	29	25	21	18	15

Provisional statistics for the qualification as a whole (64 candidates)

	A	B	C	D	E
Cumulative %	0.00	6.45	27.42	62.90	90.32

6983 Making Sense of Data

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6983/1	51	51	18.1	9.2
Written Paper 6983/2	40	51	18.6	9.2

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6983/1	51	40	32	24	17	10
Boundary Mark 6983/2	40	31	27	23	19	16

Provisional statistics for the qualification as a whole (80 candidates)

	A	B	C	D	E
Cumulative %	0.00	8.70	14.49	34.78	68.12

Intermediate Level

6984 Calculating Finances

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6984/1	51	51	19.1	11.7
Written Paper 6984/2	50	51	20.8	9.6

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6984/1	51	40	32	24	17	10
Boundary Mark 6984/2	50	39	34	29	24	20

Provisional statistics for the qualification as a whole (119 candidates)

	A	B	C	D	E
Cumulative %	3.6	9.91	26.13	43.24	67.57

6985 Solving Problems in Shape and Space

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6985/1	51	51	19.3	10.6
Written Paper 6985/2	50	51	21.7	14.6

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6985/1	51	40	32	24	17	10
Boundary Mark 6985/2	50	39	34	29	24	20

Provisional statistics for the qualification as a whole (12 candidates)

	A	B	C	D	E
Cumulative %	12.50	12.50	25.00	37.50	62.50

6986 Handling and Interpreting Data

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6986/1	51	51	17.4	10.1
Written Paper 6986/2	50	51	24.5	12.0

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6986/1	51	40	32	24	17	10
Boundary Mark 6986/2	50	41	36	31	26	22

Provisional statistics for the qualification as a whole (119 candidates)

	A	B	C	D	E
Cumulative %	0.00	11.46	28.13	40.63	69.79

6988 Using Algebra, Functions and Graphs

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6988/1	51	51	25.6	10.1
Written Paper 6988/2	50	51	29.0	9.7

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6988/1	51	40	32	24	17	10
Boundary Mark 6988/2	50	41	35	30	25	20

Provisional statistics for the qualification as a whole (47 candidates)

	A	B	C	D	E
Cumulative %	4.55	18.18	47.73	77.27	90.91

Advanced Level

6990 Using and Applying Statistics

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6990/1	51	51	41.5	5.0
Written Paper 6990/2	60	51	14.8	4.3

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6990/1	51	40	32	24	17	10
Boundary Mark 6990/2	60	44	38	32	26	21

Provisional statistics for the qualification as a whole (21 candidates)

	A	B	C	D	E
Cumulative %	0.00	21.05	78.95	100.00	100.00

6991 Working with Algebraic and Graphical Techniques

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6991/1	51	51	29.5	10.92
Written Paper 6991/2	60	51	19.7	8.6

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6991/1	51	40	32	24	17	10
Boundary Mark 6991/2	60	44	38	32	27	22

Provisional statistics for the qualification as a whole (39 candidates)

	A	B	C	D	E
Cumulative %	12.12	15.15	24.24	66.67	81.82

6992 Modelling with Calculus

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Coursework Portfolio 6992/1	51	51	12.0	7.0
Written Paper 6992/2	60	51	22.5	10.6

Grade	Max. Mark	A	B	C	D	E
Scaled Boundary Mark 6992/1	51	40	32	24	17	10
Boundary Mark 6992/2	60	49	43	37	31	25

Provisional statistics for the qualification as a whole (2 candidates)

	A	B	C	D	E
Cumulative %	0.00	0.00	0.00	50.00	50.00

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade.

Mean Mark: is the sum of all candidates' marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates' marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidates lie in a range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).