Cambridge Assessment

O Level

Mathematics

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ORDINARY LEVEL

MATHEMATICS (SYLLABUS D)

Paper 4004/1

General Comments

There were a few scripts which conveyed the impression that the material necessary for several of the questions towards the end of the paper, had not been covered by the candidates.

There was little improvement in the use of working space. As has been stated before, method marks are available in some questions for working written legibly in the appropriate space; candidates who use loose paper clearly penalise themselves.

Candidates are advised to note that:–

(i) answers corrected to fewer than 3 significant figures lose marks,

(ii) if, in geometry or trigonometry, a calculation is required, no marks are given for answers obtained by scale drawing,

(iii) no questions are set on this paper which require lengthy long multiplication or division; neither the use of the sine formula in Q.15*(b)* nor conversion to decimals in Q.16*(b)* is recommended.

Candidates are reminded that there is no objection whatsoever to deleted and legibly amended figures even in an answer space. Some candidates penalised themselves by painting out errors using correction fluid and then forgetting to return and insert the correct value after the fluid had dried. The use of hard pencils on printed diagrams caused a few problems of legibility and extremes should be avoided in this area.

Comments on particular questions

Q.1 Well done by most candidates; the answer 16 for (ii) was the most common error.

Q.2 Quite well done, though decimal points caused difficulty for some.

Q.3 There was some confusion between the meanings of integer and rational number.

Q.4 (i) Poor; many failed to factorise completely.

(ii) Poor; the less familiar ascending powers caused difficulty and those who reversed the order of the terms usually failed to deal correctly with the signs. Others could only offer $1 - p(1 + 12p)$.

Q.5 Both parts well done but some, in (ii), penalised themselves by poor setting down and forgot to divide by $3\frac{1}{3}$ after correctly evaluating the bracket.

Q.6 *(a)* There was some confusion between significant figures and decimal places.

(b) Better than on some previous occasions. The common wrong answers were $5{\cdot}23 \times 10^{-4}$ and $5{\cdot}2 \times 10^{4}$.

(c) Quite well done but 0·4010205 was seen occasionally.

Q.7 (i) Better than a similar question last year, but some weaker candidates gave $(6 \quad 4)$ or $\begin{pmatrix} 0 & 0 & 6 \\ 0 & 4 & 0 \end{pmatrix}$.

(ii) Well done.

Q.8 *(a)* (i) Well done.

(ii) Poor; fewer than half the candidates were successful.

(b) Poor; fewer than half were successful.

Q.9 *(a)* Well done, though a surprising number gave $3p \times 5p$ as $15p$.

(b) Most reached the penultimate stage successfully, but where this was in the form $-2x = 1$, instead of the easier form $2x = -1$, a remarkable number failed to reach the correct solution.

Q.10 There was some confusion between mean and median and not all appeared to be aware that the answer $7\frac{1}{2}$ was required when the two middle values were 7 and 8.

Q.11 *(a)* Well done.

(b) Poor, with all the usual errors very common. Even those who knew that $84 \times \frac{100}{112}$ was required frequently failed with the calculation.

Q.12 Most candidates displayed only a limited knowledge of fractional and negative indices.

Q.13 Well done, but difficulty was sometimes found by those using matrix methods.

Q.14 (i) Poor.

(ii), (iii) Quite well done.

Q.15 *(a)* Not well known; $2\cos 25^\circ + \cos 65^\circ$ was a common wrong solution.

(b) Only a minority used $4\tan 65^\circ$ and of these, a regrettable number failed with the very simple calculation. Methods using $\frac{4\sin 65^\circ}{\sin 25^\circ}$ or $\frac{4}{\tan 25^\circ}$, with consequent attempts at very heavy arithmetic, were all too common.

Q.16 *(a)* Well done.

(b) Poor. Even those who began with the correct formula were frequently unable to transpose it and simplify the resulting fraction. The use of decimals was disastrous and, frequently, the setting out of those able to reach the correct value for $\frac{77}{8\pi}$ was so poor that they forgot to take the square root.

Q.17 Very poor; failure to draw an adequate diagram was the cause of many problems but the few correct answers even to the easy first part indicated lack of understanding also.

Q.18 (i) Quite well done; $x < 3$ was the most common error.

(ii) Better than on some previous occasions; two separate inequalities were sometimes seen, as was $x + y \geqslant 4$.

Q.19 *(a)* Disappointing. Many found the interior angle and gave this, or half of this, as the answer. The direct method for the exterior angle was seldom used.

(b) Well done.

Q.20 (i) Well done.

(ii) Very poor; the vast majority drew a second straight line. Of those who knew the correct shape, few appreciated the common points of intersection.

Q.21 Fewer discarded the denominator than on some previous occasions but an appreciable number attempted, quite unnecessarily, to multiply it out. This created many unfortunate errors including, as in *Q.9(a)*, $2x \times 5x = 10x$, which resulted in an answer of $\frac{7x + 10}{9x - 2}$.

Q.22 Those who began with the appropriate version of the cosine formula usually reached 96/144 though simplification of this resulted in some surprising errors. Those who began with the other version were much less successful though, pleasingly, only a few put $145 - 144\cos\theta$ equal to $1\cos\theta$.

Most regrettably, the above candidates were completely outnumbered by those who, apparently, assumed the triangle to be right angled and gave the answer as 8/9. Ironically, they were frequently the same candidates who had not taken advantage of the simple right angled triangle in *Q.15*, but had instead used the sine formula.

Q.23 Only a minority knew that a rectangle 4 units high was required across scores 5 and 6; these successful candidates, however, were not always those who were better at other topics. An appreciable number lost a mark by incorporating a frequency polygon into their histogram – apparently thinking that the two are inextricably linked.

Q.24 (i) Well done.

(ii) *(a)* Quite well done, but $4\frac{2}{7}$ was a common error.

(b) Few were successful. This was a question in which candidates who failed to reach the required answer could earn a mark for the use of a correct method. Unfortunately it could rarely be awarded as the working shown was almost invariably inadequate.

Q.25 The whole question was omitted by many candidates but was quite well done by those able to make a serious attempt. Some elected to work in kilometres and, not surprisingly, found the arithmetic involved to be a tremendous burden.

Q.26 (i) All except the weakest candidates were successful.

(ii) This was found more difficult than (iii).

(iv) Only the very best were successful.

Q.26 The whole question was omitted by many candidates.

(i) The most frequent error was the pre-multiplication of the given matrix by $\begin{pmatrix} -1 & 2 \\ -2 & 5 \end{pmatrix}$ so that P(A) was drawn with a rotation 90° clockwise instead of anticlockwise. A similar error was then usually, though not always, made in *(b)*. Since 180° rotations and reflections in each of the axes were also quite common, it appeared that some candidates were attempting to memorise in detail the matrices representing common transformations.

(ii) Some let the matrix be $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ but then found difficulty with the subsequent equations; others were helped by recognising the transformation as a shear.

Q.28 The whole question was omitted by many candidates. Those, however, who had an appreciation of the elementary properties of vectors were able to position Q correctly and the complete the question, though $h = \frac{2}{3}$ was a common error.

Q.29 Very nearly all made an attempt at this question.

(i) Well done.

(ii) Many fundamental errors, particularly $(16 + 12) \div 2$ and $26 \div 1\frac{3}{4}$.

(iii) *(a)* Shape usually correct, but the "rest period" was not always at the correct distance.

(b) Many errors, lines with positive gradient being common; some lorries appear able to travel backwards in time!

A minority of candidates drew the graphs freehand, inevitably resulting in loss of quality; it should surely have been realised that an accurate drawing, using a ruler, was required.

Paper 4004/2

General Comments

On Paper 2 virtually all candidates now use calculators and there appears to be a growing tendency amongst candidates to show either a minimal amount of working or, in extreme cases, no working at all. As a result, in many cases, marks were lost unnecessarily. On the front of the question paper it states quite clearly:–

"All working must be clearly shown.

Omission of essential working will result in loss of marks.

Calculators may be used to evaluate **explicit** *numerical expressions."*

Amongst some candidates premature approximation was rife and led to much inaccuracy, $\sqrt{45}$ (in *Q.3*) being given as 6·7, $\frac{1}{2}PR$ (in *Q.9*) being given as 6 and so on.

Many candidates appear to be unaware that, in order to achieve 3 figure accuracy, it is necessary to work with 4 figures throughout.

Candidates should be made aware too that when a calculation is specified, for example in *Q.7*, a scale drawing is not an acceptable alternative.

Whilst presentation was generally good, there are still some bad habits such as working in pencil, working in two columns, failing to number questions and failing to rule off or leave a space between questions.

Comments on particular questions

Q.1 The most common error in *(a)*, the failure to divide by 12, resulted in many answers of £90 and in *(b)* $\frac{2}{12} \times 112$ was often seen. In (iii) candidates frequently assumed there were 4 sides on each of the 6 faces leading to an answer of 144. It was not uncommon for a net to be drawn.

Q.2 *(a)* A Venn diagram would have been very helpful but few were seen. Incorrect answers of 220 (160 + 60) in (i) and 160 in (ii) were common.

(b) There was some confusion in (i), $\frac{1}{13}$ and $\frac{1}{40 - 3x}$ being seen just as frequently as the determinants themselves. In (ii) $\begin{pmatrix} 2 & 5 \\ -1 & 4 \end{pmatrix}$ was often seen on its own, division by the determinant being overlooked.

Q.3 The first three parts were generally well done though there was a tendency, after reaching the $\sqrt{45}$ stage, to give an answer of 6·7 for (i) and to use this inaccurate value in (ii). It is preferable, of course, for candidates to use the given values rather than their own calculated values. In (iii) weaker candidates often used πr^2 for the circumference and in (iv) the usual answer was 1:2, the ratio 1:8 being rarely seen. Candidates clearly did not understand the principle being tested.

Q.4 Part *(a)* could hardly have been more straightforward, yet there were many errors. In *(b)* the circle properties did not seem to be either widely known or understood. Common errors were to take $A\hat{B}T$ as 32° and $C\hat{X}D$ as 90°.

Q.5 This was, perhaps, a rather demanding Section A question for the average candidate. Many were unable to find the gradient of the straight line though some went on to use 'their' gradient correctly in the final part. More surprising, even when they could find the answers to (ii) and (iii), was the inability of candidates to express their answers in coordinate form.

Q.6 The most popular question in Section B, though many fell at the final hurdle rounding their answers down to £89 000 instead of rounding up to £90 000. In (iv) $\frac{765}{5865} \times 100$ occurred quite frequently.

Q.7 Simple geometrical ideas such as the largest side of a triangle being opposite the largest angle did not appear to be well known and many found both AB and AC before discarding the latter. Similarly all three perpendicular heights were often found. Common misconceptions were that N was the mid-point of AB and that NC bisected $A\hat{C}B$.

Q.8 Part *(a)* was not well done. Whilst many were able, with a lead on the brackets, to obtain a correct expression for the area of the trapezium only the better candidates managed to simplify their expression correctly.

More surprising was the inability of many candidates to solve the given equation either by factorising or by using the formula, where $-$ $-$ 5 proved to be a real stumbling block.

In *(b)*, the final answer of $\frac{1}{2t + 3}$ was rarely seen and, even from the few who correctly obtained $2t - 3$ and $4t^2 - 9$, substitution for $-$ 5 throughout was quite common.

Q.9 Another popular question, though the first three parts appeared to cause more difficulty than the last two. Some ingenious methods of finding the shaded area were seen though many candidates stopped after calculating the area of sector $OPQR$. Premature approximation was widespread.

Q.10 This question was rarely attempted and then usually by either the very good or the weaker candidates. It is possible that some candidates were put off by the introduction of the point $(m, 0)$. The two transformations were often interchanged and frequently candidates gave more than one transformation.

Q.11 It was commonplace to see the limits of the inter-quartile range stated rather than the range itself. In (iii) 65 was the most common answer, many failing to appreciate that if 70% pass only 30% fail, whilst in (iv) candidates often assumed there was a linear relationship, leading to an answer of $\frac{320}{400}$.

In *(b)* errors in the manipulation of fractions were once again quite common and there appeared to be a lack of appreciation of non-replacement of counters. Probabilities greater than one continue to be seen, $2\frac{1}{12}$ being common in (iii). It is pleasing to note that almost all probabilities are now expressed in fractional or percentage form.

Q.12 The first part of the question was usually well done but 'nearer to AC than AB' was clearly a rather difficult idea. In the vector question there were the usual errors arising from candidates' reluctance to use the necessary brackets and many failed to simplify their expressions.

Q.13 A very popular question which, apart from a general inability to state the inequality $20 \leqslant s \leqslant 50$ correctly, and to draw the line $S = C$, was well done. Candidates frequently obtained the correct answer to the final part even after failing to identify the correct region.