

Ask the Examiner
6993
Additional Mathematics
Michael Ling
July, 2010

Enrichment!

**Words to help understand what
is wanted**

Write down
Show that.....
Exact value

Understand what is wanted

Working
Graphical calculators

Next year

Online marking means...
Dedicated answer booklet

Training Days

November 10, London
November 19, Manchester
CPD in your own centre

MEI Conference, July 1, 2010

6993 – Additional Mathematics

Ask the Examiner

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6993 – Additional Mathematics

The Specification is an enrichment programme!

That means that the syllabus content is not particularly long or testing for candidates at this level, and opportunities should be taken to work mathematically “outside the box”.

For instance, how many ways are there of developing the equation of a line given certain properties?

E.g. (June 2009).

Find the equation of the line through (1,5) parallel to the line $3x + 5y = 7$.

Some questions will be a little unusual with some thinking to do.

E.g. June 2010, Q10.

Words

There are some words that should be known about in developing the answer to a question..

E.g. “Show that.....”

It is important that the examiner can see the development to the answer. It is easy to simply write down the answer that is given so it must be clear that it has been found and not guessed.

E.g. Exact.

This means that the calculator should not be used!!

E.g. June 2009.

You are given that θ is greater than 90° and less than 360° and that $\cos\theta = \frac{2}{3}$.

Find the exact value of $\tan\theta$.

It should be obvious to the candidates that finding a value for the angle is an approximate process and will receive no marks.

Training days

- November 10, 2010 London
- November 19, 2010 – Manchester

Details from OCR or from me when I know them!

CPD in your centre is possible at your convenience.

Comments on 2010 paper

These comments have been written less than half way through the marking period and do not constitute the final report to centres.

Was the paper too long?

There is evidence that candidates did not finish, but there was also plenty of evidence of time lost doing a question a long way round or following a dead-end.

Examples:

Q2. Working out all the terms and needing to find the coefficients by constructing Pascal's triangle.

Q3 Doing long division twice (did it need to be done at all?)

Q5 Ignoring the given $x = 3$ and solving the quadratic equation by the formula

Working out the nature of the turning point at $x = 3$.

Using the second derivative to determine whether the turning point is a maximum or minimum point is quicker than finding values of the function or of the gradient either side of the stationary value.

Q7(i) This was a one mark part, yet candidates took a page or more to find anything

Q10 Substituting all three coordinates into the equation and getting confused by $0 = k \times 0$.

Multiplying out the function before substituting.

Q11 Using the sine or cosine rules in a right-angled triangle.

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Was the paper too hard?

Marking so far might indicate that the answer is yes. If so this will be taken into account when the grade thresholds are determined.

Problems with the questions evident so far

Q1

Some candidates could not cope with the inequality sign and so replaced it with an equality sign. They then changed it back again at the end but often the wrong way round.

Q2

Candidates will get nowhere and waste a lot of time if they do not know the binomial theorem. Additionally it would help if they knew the ${}^n C_r$ notation and could apply it to find the coefficients.

Q3

A lot of time can be spent doing long division and many possible places for errors to be made. The remainder theorem is on the syllabus!

Q4

This is a topic to be learned. It is an application of the binomial theorem. Many candidates have not covered this topic adequately.

Q5

Giving one stationary value should have made the factorisation of the quadratic function slightly easier but evidence that candidates took any notice of this was scarce. In demonstrating maxima and minima it is not expected that candidates will appeal to knowledge of the shape of a cubic.

Q6

The constant acceleration formulae are usually well known, but the substitution of u and v was often made incorrectly

Q7

Opportunities to test $\sin^2\theta + \cos^2\theta = 1$ are limited. We were generous with the mark for (i); few got marks in (ii).

Q8

Many candidates thought that it was acceptable to ignore the 60. A number confused differentiation with integration, even enclosing the function into an integral sign and then differentiating. Some numerical errors, plus final answers from the errors above yielded some very wild answers which could not possibly have been correct, from 0 to over 30 000 000 m!!

Many candidates who got the answer $\frac{625}{6}$ might have realised their error had they asked themselves whether their answer was realistic.

Q9

(i) The vector representing half the diameter was often given as an answer.
(ii) This is a case where “show that...” is important.

We did not accept $\sqrt{(15-8)^2 + (1-2)^2} = 5\sqrt{2}$ as an answer and wanted to see $\sqrt{50}$.

Q10

The substitution of the point (0, 4) in each part gave the method mark. Fortunately for many candidates the substitutions of (2, 0) and (4, 0) were ignored because they invariably produced a second value for the constants of 0!!

The criterion for a “better model” was “fits the data points better”. Both curves go through three points but the second additionally goes through the point (3, 0.25).

Q11

Finding CF was prone to two problems

- C is taken to be the midpoint of AB.
- In 2009 an altitude was found using the knowledge of another altitude and so working through the area of the triangle. So in this paper many candidates worked through the area of the triangle. If it gave the correct answer then it was perfectly acceptable, but it would have taken much longer and was more prone to errors.

A number of candidates could not visualise the question in 3-D, finding FT by the sine rule involving 10^0 and 50^0 .

Q12

Often it was the area of the triangle that caused the problem!

Q13

The algebra defeated many candidates, particularly (ii).

Q14

Many candidates failed to obtain a good answer to this question. Difficulties were

- in the inequality of (i) – a minimisation problem is not often set!
- in the inability of being able to write down an Objective Function (even though they knew what to do)
- in the inability to visualise what is happening if one restriction is removed.