



Cambridge Technicals Level 3

Engineering

05822-05825 & 05873

Unit 1 Mathematics for Engineering

OCR Report to Centres June 2018

About this Examiner Report to Centres

This report on the 2018 Summer assessments aims to highlight:

- areas where students were more successful
- main areas where students may need additional support and some reflection
- points of advice for future examinations

It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

The report also includes links and brief information on:

- A reminder of our **post-results services** including **reviews of results**
- Link to **grade boundaries**
- **Further support that you can expect from OCR**, such as our CPD programme

Reviews of results

If any of your students' results are not as expected you may wish to consider one of our Reviews of results services. For full information about the options available visit the [OCR website](#). If University places are at stake you may wish to consider priority service 2 reviews of marking which have an earlier deadline to ensure your reviews are processed in time for university applications: <http://www.ocr.org.uk/administration/stage-5-post-results-services/enquiries-about-results/service-2-priority-service-2-2a-2b/>

Grade boundaries

Grade boundaries for this, and all other assessments, can be found on the [OCR website](#).

Further support from OCR



Attend one of our popular CPD courses to hear exam feedback directly from a senior assessors or drop in to an online Q&A session.

<https://www.cpdhub.ocr.org.uk>

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Unit 1 Mathematics for Engineering

General points for candidates

Significant figures

As in previous series, there are a number of answers that are not exact and so an approximate answer is necessary. In such cases, unless the demand states otherwise, 3 significant figures is expected. Usually more than this is acceptable but often fewer significant figures will be penalised. Furthermore, it might be that the answer to one part, given to 3 significant figures, is required for a subsequent part. In such cases the loss of accuracy from the first part will render the answer to the next part out of the tolerance that would normally be allowed. In this series the only place where this occurred was in Question 2(c). An answer of 59 m would be penalised in (i) because of the rounding to 2 significant figures but the accuracy mark in (ii) was given as an “error carried forward” if the answer was half of the answer given in (i).

However, potential engineers should be aware that many calculations will yield a numeric answer that, for the given context, is “good enough” but is not accurate and that they should understand the meaning of the word “exact”. An answer which is exact is not an approximation while any number that is rounded or truncated is an approximation and not exact.

Show that

This examination process is usually used when the answer is required in a later part – by giving the answer, the later part can be done using a correct value instead of a possibly incorrect value that the candidate found in the earlier part. However, if steps leading to the final answer are not shown then the candidate has not demonstrated the correct process – the final line showing the correct answer could simply be the candidate writing down what they have been told. In this

series this only occurred in Question 5(b)(ii). To write $\frac{dy}{dx} = 2 \cos \frac{\pi}{6} - 2 \sin \frac{\pi}{6} = 0$ in this case is not good enough.

Other points

Candidates should be encouraged to write clearly. Some scripts contained text and working that was difficult to read or understand.

When the extra page is used it must be indicated in the appropriate question in the script. If an additional sheet is used it must contain the candidate’s name and question number(s) and referenced in the scripts.

As in January, while candidates generally performed to expectation, there seem to be a number of gaps in their knowledge.

It is hoped that the following points may help centres to prepare future cohorts of candidates for this unit.

Question 1 (Algebra)

Part (a) was generally well done.

Part (b) was also reasonably well done; errors often occurred in the numerator.

Part(c) proved to be beyond most candidates. The general process “multiply throughout by a common denominator to clear fractions, then expand brackets and collect like terms” gave rise to many quite basic errors. A typical example was to multiply by 2 but failing to multiply throughout, yielding steps such as $(x-3) - \frac{1}{3} = 2 - 2x$. It was rare to see candidates multiply correctly by 6; most multiplied by 2 and continuing to work with fractions.

In part (d) a common misunderstanding seen was that at^2 was taken to be $(at)^2$.

Question 2 (Mensuration and Trigonometry)

In part (a), candidates failed to appreciate what the word “exact” means. Part of the specification states that candidates should know the exact value of $\sin 60$. The use of the calculator to give an approximate value for $\sqrt{3} \approx 1.732\dots$ was not therefore the correct response required.

Able candidates multiplied the volume of the plate by $\frac{5}{6}$ to give the correct answer. Others found the volume of the sector and subtracted it from the volume for the whole plate, thus requiring three calculations. A rather odd but very common error was to find the volume of the whole plate correctly but then, in finding the volume of the sector, failing to multiply by the height.

Part (c) required the sine formula, necessitating finding the angle at T to be 10° . Finding CT was usually quite straightforward, though some found the length of the wrong side (i.e. TA)

The answer to part (ii) should have been exactly half the answer given in (i), and if this was the case then full marks were awarded, even if wrong, as error would be carried forward.

Question 3 (Logarithms and Algebra)

Part (a) was the least well answered question in the paper. Candidates seemed to be unaware of the basic logarithm rules and made no progress in spite of the lead given to write the left hand side as a single logarithm.

Part (b) was well answered with many candidates obtaining all 6 marks for parts (i) and (ii). It was good to see many candidates interpreting their answer correctly – i.e. the cost of a plug is 90p and the cost of a socket is £3.50.

Part (c) was a quadratic equation which did not factorise. Most candidates were able to use the formula correctly to obtain the correct two roots. This was a case where the “norm” of three significant figures was change to three decimal places. Consequently, although three significant figures are allowed, some candidates lost the final mark by giving an even more approximate answer.

Question 4 (Statistics)

Responses to part (a) indicated clearly that most candidates had no understanding of histograms and how they differed from bar charts. In this question the data were continuous and the sizes of the groups were different, meaning that a bar chart was inappropriate. The vertical scale was therefore frequency density and the height of the last bar was half the height indicated by the frequency.

A further error caused by candidates being more familiar with bar charts is that in a histogram the horizontal scale is linear. So putting a label $44.5 < l \leq 45.5$ under the first “bar” is incorrect.

Given that candidates are allowed scientific calculators, it was expected that the mean length in (ii) would be done on their calculators and full marks were awarded for a correct answer with no working.

In part (iii) no calculations were required, but simply a requirement to understand what standard deviation represents. The responses “more”, “less” and “the same” occurred equally.

In part (b), candidates were expected to realise that the rolls of the die would be independent of other rolls meant that the answer for one roll ($\frac{1}{8}$) had to be squared for the two (independent) events.

Question 5 (Calculus)

The sketching of the curve in part (a)(i) was usually well done, though it was evident that most candidates actually plotted the curve.

In part (ii) integration was either well done or omitted.

In part (b), while many candidates were able to differentiate the trigonometrical ratios in part (i), full marks to part (ii) was rare. Since candidates could not solve the equation

$2 \cos x - 2 \sin 2x = 0$ within the specification topics this was a verify question which simply

means substitute the value $\frac{\pi}{6}$ into the gradient function and show that the value is 0. This is the

case mentioned above and we expected to see both terms equalling $\sqrt{3}$, to show that the correct calculation had been done rather than just writing down 0. Unfortunately a significant number of candidates failed to realise that calculus of trigonometrical functions requires the use of radians and so failed to switch their calculators. The consequence was that they did not get 0, which was the expected value.

Question 6 (coordinate geometry of the circle)

Part (i) required the use of Pythagoras. Some candidates attempted a vector approach but since they were asked to consider lengths, they gained no marks. A few forgot to draw a conclusion to their calculations.

In part (ii) a step method (or vector method) was required and many candidates obtained the correct answer with little or no working.

Part (iii) was a simple test of what the values a , b and r represented in the standard equation for a circle.

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