

Examiners' Report/  
Principal Examiner Feedback

Summer 2013

Principal Learning

Engineering  
EG308 Paper 01

Mathematical Techniques and  
Applications for Engineers

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# Unit EG308

## Mathematical Techniques and Applications for Engineers

### General Comments

The June 2013 paper, like previous series, had a strong engineering context throughout. From marking and feedback, it was clear that some students had prepared well for this paper, demonstrating confident working across the range of tasks, although some basic errors were observed in relatively straightforward tasks. Overall, there were fewer mathematical errors seen in the student working with some evidence of checking and proving answers.

### Question 1(a)(i)

Overall this was answered well, although some basic errors were noticed in some student transposition.

### Question 1(a)(ii)

Students were able to substitute the values and calculate the value of 'r'. A minority did not find the square root and left the task in the unsolved state, missing out on the single mark for this.

### Question 1(b) & (c)

Students are showing that they can apply the laws of logarithms correctly, although there were some problems with the natural logarithm task. A minority attempted to solve the first task using a calculator and did not demonstrate a good understanding of the laws.

### Question 2(a)

Students were able to plot the points for the given data. As in previous series, the calculation of the gradient proved a problem for some students. Basic principles were not applied at this stage and also for the intercept which had to be calculated in this task. Some students tried to extend the plotted line to the y axis and incorrectly stated the intercept.

### Question 2(b)

Some confident working was observed, with students identifying that the quadratic formula was required to solve this task. A minority of students simply added or cancelled out values for  $t$ , in this task.

### Question 2(c)

Students struggled to identify both values for this task, although the majority managed to show that  $x=2$  and substituted this for the second part of the task.

### **Question 3(a)**

This relatively straightforward task proved difficult for some students. Although the diagram showed a jack lifting a crate, the geometry was a right angled triangle that could be solved by basic trigonometry.

### **Question 3(b)**

This was a straightforward sine rule problem. However, many students did not attempt to solve it, or tried to solve it as a right angled triangle. Again, there was evidence of confident application of the sine rule to correctly solve the problem.

### **Question 3(c)**

The value for  $b = 2$  was obtained by many students. The follow on calculation produced some accurate values, with some students obtaining a not so accurate value by reading from the graph.

### **Question 4(a)**

There was some confident application of a range of techniques to correctly solve this task. Some students used the correct part area formulae, but multiplied the two values instead of adding.

### **Question 4(b)**

Students struggled with the format of this task, with the angle stated using  $\pi$  (pi). A number of students used a variety of techniques to convert the value to get the correct answer.

### **Question 4(c)**

This straightforward task proved a problem for some students. The technique should be practised in centres. Many students had the conversion technique in the reverse order, or divided twice, by 60 and by  $2\pi$ .

### **Question 5(a-d)**

Some basis errors were seen for the cumulative frequency task. However, these were generally plotted for the second part of the question. Many students did not demonstrate that they could obtain the median value from the graph. Similarly, problems were evident in determining the mean. For both these parts, there were some confident solutions that showed a good understanding of the techniques.

### **Question 5(e)**

Overall, students were able to suggest at least one benefit of the use of statistical data.

### **Question 6(a)**

The technique to differentiate, although shown in the formulae page of this paper, was not applied well. Many students struggled with this task. There was also some confident working showing a good understanding by some students.

**Question 6(b)**

There were some tangent errors evident here, although the majority of students had drawn an accurate tangent on the graph, many did not draw the tangent. Often the slope was left as a positive value. Students should observe the decrease in values and remember that the rate of change will be a negative one.

**Question 6(c)**

Many students simply substituted values in an attempt to solve this task, even when the instructions asked for the expression to be differentiated. In contrast there was some confident working to obtain the correct values. It was also observed that some students differentiated correctly and then tried to solve the problem using the quadratic formula.

**Question 6(d)**

There was evidence of some good working in this task. Some clear integration was seen; however a large number of students missed the question out, or attempted to substitute the values into the expression without integrating it. There were also some basic errors when integrating. Centres need to ensure that students practise both calculus techniques more in order to avoid these errors.

## **Grade Boundaries**

Grade boundaries for this, and all other papers, can be found on the website on this link:

<http://www.edexcel.com/iwant to/Pages/grade-boundaries.aspx>

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