Q1. Work out an estimate for $\frac{10.1 \times 29.7}{5.9 - 3.1}$

.....

(Total 3 marks)

Q2. (a) Use your calculator to work out the value of $2.58 \times \sqrt{2}$.

Write down all the figures on your calculator display.

.....

(1)

(b) Write your answer to part (a) correct to 1 decimal place.

.....

(1)

(Total 2 marks)

Q3. Work out an estimate for $\frac{302 \times 9.96}{0.51}$

.....

(Total 3 marks)

Q4. Use a calculator to work out

$$\sqrt{\frac{21.6 \times 15.8}{3.8}}$$

(a) Write down all the figures on your calculator display.

.....

(2)

(b) Give your answer to part (a) correct to 3 significant figures.

.....

(1)
(Total 3 marks)

Q5. Work out an estimate for the value of

$$\frac{6.8 \times 191}{0.051}$$

.....

(Total 3 marks)

Q6. (a) Work out $\frac{4.6 + 3.85}{3.2^2 - 6.51}$

Write down all the numbers on your calculator display.

.....

(2)

(b) Give your answer to part (a) correct to 1 significant figure.

.....

(1)
(Total 3 marks)

M1.

Working	Answer	Mark	Additional Guidance
$\frac{10 \times 30}{6 - 3}$	100	3	**M1** for two of 10, 30, 6, 3 **A1** for $\frac{300}{3}$ or for $\frac{330}{3}$ **A1** for answer in range 100 – 110
			Total for Question: 3 marks

M2.

	Working	Answer	Mark	Additional Guidance
(a)	2.58 × √2 =	3.648670991	1	**B1** for 3.648... cao
(b)		3.6	1	**B1** ft for "3.6"
				Total for Question: 2 marks

M3.

Working	Answer	Mark	Additional Guidance
$\frac{300 \times 10}{0.5} = \frac{3000}{0.5}$	5890 – 6040	3	**M1** for any two of 300, 10 or 0.5

			M1 for $\frac{3000}{0.5}$ or 300 × 20 or 600 × 10 or $\frac{3020}{0.5}$ or 302 × 20 or 604 × 10 **A1** for 5890 – 6040 SC: **B2** for answer of 1500 or 1510
			Total for Question: 3 marks

M4.

	Working	Answer	Mark	Additional Guidance
(a)	$\sqrt{\frac{21.6 \times 15.8}{3.8}}$ =	9.476841579	2	**M1** for 89.81052 …. or 341.28 or 4.86151… or $\frac{8532}{95}$ or $\frac{8532}{25}$ **A1** for 9.47684..... SC: **B1** for 9.476841579… truncated or rounded to at least 1 decimal place
(b)	$\sqrt{89.81052632}$	9.48	1	**B1** ft from (a) with at least 4 significant figures
				Total for Question: 6 marks

M5.

Working	Answer	Mark	Additional Guidance
$\frac{7 \times 200}{0.05} = \frac{1400}{0.05}$	28000	3	**B1** for any two of 7, 200 or 0.05 **M1** for correct processing of at least two of 7, 200 or 190 and 0.05 or 0.1 **A1** 26600 – 28000

	Total for Question: 3 marks

M6.

	Working	Answer	Mark	Additional Guidance
(a)	4.6 + 3.85 = 8.45 3.2^2 – 6.51 = 3.73 8.45 ÷ 3.73 =	2.26541555	2	**M1** for $\frac{169}{20}$ or $\frac{256}{25}$ or $\frac{373}{100}$ or 3.73 or 10.24 or 8.45 seen **A1** for 2.265(41555); accept $\frac{845}{373}$
(b)		2	1	**B1** ft for 2 or follow through their answer to part (a) NB: 2.0 gets **B0**
				Total for Question: 3 marks

E1. Foundation

Candidates often struggle with approximation questions and this was certainly the case here. Many candidates gained one mark for writing two of the numbers to one significant figure but few candidates could then go on to gain all three marks. It was common to see the answer left as 300/3.

Higher

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E2. A poorly answered question with many candidates not gaining the mark for (a) but picking up the mark in (b) for writing their answer to (a) correct to one decimal place. A frequent response to (a) was to write the square root of 2 as the answer.

E3. Foundation

Very few candidates gained full marks for this question. Many were able to round 302 and 9.96 to 300 and 10 respectively but the denominator of 0.51 was often rounded to 1 or somehow became 50. Sadly, the majority of those candidates who did get as far as 3000/0.5 were unable to evaluate this as 6000. Most chose to divide by 2 so that 1500 and 1510 were very common incorrect answers. Too many candidates failed to recognise the need to approximate and embarked on long multiplication and then division in the search for an answer.

Higher

The vast majority of candidates were able to score at least one mark in this question but less than half managed to get full marks. Common errors were to round 0.51 to 1 (leading to an answer of 3000) and to calculate 3000/0.5 as 1500 (common) or 4500. A significant number of candidates did not round 302 to 300, but were still able to gain full marks for 6040. Candidates should be advised to round all numbers to one significant figure when doing an approximation.

E4. Only just under 40% of candidates were able to attain full marks for this very early question. Marks were generally lost due to an inability to use a calculator correctly. Taking the square root of just the numerator rather than the whole fraction was the most common error.

E5. The majority of candidates gained one mark for rounding at least two of the numbers correctly to one significant figure and a further mark for the correct processing of two of the numbers, most usually $7 \times 200 = 1400$. Most candidates, though, were unable to divide correctly by 0.05 with only a few realising that dividing by 0.05 is the same as multiplying by 20. Far too many candidates lacked the understanding that dividing by a number less than 1 makes the final answer larger than the original number. Another common error was for the denominator, 0.051, to be rounded to 0.1 or, less commonly, to 0.5, 1 or 0.

E6. The advice given to many candidates is to calculate the numerator and denominator separately before dividing to get the final answer.

This advice was ignored by many candidate who just put the numbers into their calculator in the order given in the question and hoped for the best, which was usually no marks as a result. A significant number doubled 3.2 rather than squaring. In part (b) most students did not understand what 1 significant figure meant, and gave their answer to 1dp instead. Many who gave a negative answer in (a) rounded their answer to a positive answer in (b).