

Sampling and Estimation 1 MS

Q1.

<p>2 (i) 0.145 = 87 / n n = 600</p>	<p>B1 M1 A1 [3]</p>	<p>correct mid-point equating their mid-point with 87 / n correct answer</p>
<p>(ii) $0.0321 = z \times \sqrt{\frac{0.145(1-0.145)}{600}}$</p> <p>$z = 2.233 \quad \Phi(z) = 0.9872$</p> <p>width of CI is $1 - 2 \times (1 - 0.9872)$</p> <p>$\alpha = 97.4\%$</p>	<p>B1 M1 M1 A1 [4]</p>	<p>0.0321 seen or implied</p> <p>Equating half-width with $z \times \sqrt{\frac{pq}{n}}$</p> <p>Correct method to find width of CI</p> <p>Correct answer</p>

Q2.

<p>3 (i) (Approx) normal mean 62 $sd = \frac{8.2}{\sqrt{50}} = 1.16$ (3 sfs)</p>	<p>B1 B1 B1 [3]</p>	<p>or var = $\frac{8.2^2}{50} = 1.34$ (3 sfs)</p>
<p>(ii) $\frac{64-62}{"1.16"}$ (= 1.725 or 1.724) $1 - \Phi("1.725")$ = (1 - 0.9577) = 0.0423 (3 sfs)</p>	<p>M1 M1 A1 [3]</p>	<p>For standardising $\div \sqrt{50}$ essential (no CC)</p> <p>For correct area consistent with their mean</p>

Q3.

1	<p>$0.605 \pm z \times \sqrt{\frac{0.605 \times (1-0.605)}{1000}}$</p> <p>$z = 1.645$ seen [0.580, 0.630]</p>	<p>M1 B1 A1 [3]</p>	<p>Allow [0.58, 0.63]. Allow any brackets</p>
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Q4.

3	<p>(i) $29.6 \pm z \times \frac{1.0}{\sqrt{65}}$ $29.6 \pm 2.576 \times \frac{1.0}{\sqrt{65}}$ (29.6 \pm 0.3195) (29.3, 29.9) (3 sfs)</p>	<p>M1 B1 A1 [3]</p>	<p>Allow any value of z For 2.576 seen</p> <p>Allow any brackets or none, but cwo.</p>
	<p>(ii) CI does not include 30 Claim not supported or not justified or probably not true</p>	<p>B1ft B1ft [2]</p>	<p>30 seen or implied</p>
	<p>(iii) CI is a variable oe</p>	<p>B1 [1]</p>	<p>Allow "Sample mean diff" (not population mean).</p>

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Q5.

2 (a) $41.2 \pm z \times \sqrt{\frac{32.6}{50}}$ $z = 1.96$ $[39.6, 42.8]$ (3 sfs)	M1 B1 A1 [3]	Allow any brackets or none, or < or "to" etc
(b) $2 \times \frac{1}{16}$ or $\frac{1}{8}$ or 0.125 or 12.5% $\alpha = 87.5\%$	M1 A1 [2]	or 0.875

Q6.

4	(i)	$\bar{x} = 8.4$ $8.4 \pm z \frac{1.3}{\sqrt{15}}$ $z = 2.576$ $[7.54, 9.26]$	B1 M1 B1 A1 [4]	Accept 2.574 to 2.579 or equiv. Accept 7.53. Accept 9.27
	(ii)	No because pop normal so \bar{X} normally distr	B1 B1 [2]	SR If 'Yes' or no conclusion, but 2 correct statements score B1
	(iii)	8 within CI Claim justified	B1√ B1√ [2]	ft (i)
[Total: 8]				

Q7.

2	(i)	$\frac{18 \times (1 - \frac{18}{70})}{70}$ (= 0.00272886..) $z = 1.645$ $\frac{18}{70} \pm z \times \sqrt{0.00272886}$ 0.171 to 0.343	M1 B1 M1 A1 [4]	Seen
	(ii)	Var (or sd) estimated or $N \sim B$ used	B1 [1]	
[Total: 5]				

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Q8.

<p>2</p> $2 \times z \times \sqrt{\frac{0.35 \times 0.65}{n}} = 0.157$ <p>$z = 2.326$</p> $n = 4 \times 2.326^2 \times 0.35 \times 0.65 \div 0.157^2$ <p style="text-align: right;">(=199.738...)</p> <p>$n = 200$</p>	<p>M1</p> <p>M1</p> <p>B1</p> <p>M1</p> <p>A1</p>	<p>[5]</p>	<p>For $\sqrt{(pq/n)}$ in equation</p> <p>For equation of the form</p> $2 \times z \times f(n) = 0.157$ <p>Rearrange to form $n = \dots$ from a correct equation in n, but allow any z and/or factor of "2" errors</p> <p>cao</p>
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