Stats 2 Estimation Questions

3 The time, T minutes, that parents have to wait before seeing a mathematics teacher at a school parents' evening can be modelled by a normal distribution with mean μ and standard deviation σ.

At a recent parents' evening, a random sample of 9 parents was asked to record the times that they waited before seeing a mathematics teacher.

The times, in minutes, are

5 12 10 8 7 6 9 7 8

(a) Construct a 90% confidence interval for μ. *(7 marks)*

(b) Comment on the headteacher's claim that the mean time that parents have to wait before seeing a mathematics teacher is 5 minutes. *(2 marks)*

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2 The weights of lions kept in captivity at Wildcat Safari Park are normally distributed.

The weights, in kilograms, of a random sample of five lions were recorded as

46 48 57 49 54

(a) Construct a 95% confidence interval for the mean weight of lions kept in captivity at Wildcat Safari Park. *(6 marks)*

(b) State the probability that this confidence interval does **not** contain the mean weight of lions kept in captivity at Wildcat Safari Park. *(1 mark)*

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1 Alan's journey time, in minutes, to travel home from work each day is known to be normally distributed with mean μ.

Alan records his journey time, in minutes, on a random sample of 8 days as being

36 38 39 40 50 35 36 42

Construct a 95% confidence interval for μ. *(5 marks)*

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5 Members of a residents' association are concerned about the speeds of cars travelling through their village. They decide to record the speed, in mph, of each of a random sample of 10 cars travelling through their village, with the following results:

33 27 34 30 48 35 34 33 43 39

(a) Construct a 99% confidence interval for μ, the mean speed of cars travelling through the village, stating any assumption that you make. *(7 marks)*

(b) Comment on the claim that a 30 mph speed limit is being adhered to by most motorists.

Stats 2 Estimation Answers

3(a)	$\bar{x} = 8.0$	B1		
	$S = 2.121$	B1		
	$\nu = 8$	B1		
	$t = 1.860$	B1√		(on their ν)
	90% confidence interval for μ			
	$= 8 \pm 1.860\left(\frac{2.121}{3}\right)$	M1		
	$= 8 \pm 1.315$	A1ft		
	$= (6.68, 9.32)$	A1	7	(6.68 to 6.69, 9.31 to 9.32)
(b)	The Headteacher's claim seems to be slightly optimistic	E1ft		Headteacher's claim isn't supported by the evidence **and**
	because value of 5 outside the confidence interval	E1ft	2	It appears that the mean time to see a mathematics teacher is greater than 5 minutes
	Total		**9**	

2(a)	$\bar{x} = \frac{254}{5} = 50.8$	B1		
	$s = 4.55$	B1		
	$\nu = 5 - 1 = 4$	B1		
	$t_{crit} = 2.776$	B1		
	95% confidence interval			
	$= 50.8 \pm 2.776 \times \frac{4.55}{\sqrt{5}}$	M1√		ft their values
	$= 50.8 \pm 5.648$			
	$= (45.2, 56.4)$	A1	6	
(b)	0.05	B1	1	
	Total		**7**	

1	$\bar{x} = 39.5 \quad s = 4.84 \quad (s^2 = 23.4)$	B1B1		$\sigma = 4.53 \quad (\sigma^2 = 20.5)$
	$t_{crit} = 2.365$	B1		
	95% CI for μ			
	$= \bar{x} \pm t_{crit} \times \frac{s}{\sqrt{n}}$			
	$= 39.5 \pm 2.365 \times \frac{4.84}{\sqrt{8}}$	M1		$39.5 \pm 2.365 \times \frac{4.53}{\sqrt{7}}$
	$= 39.5 \pm 4.05$			
	$= (35.5, 43.5)$	A1√	5	
	Total		**5**	

5(a)	Assumption that the speeds of the cars passing through the village are normally distributed	B1		
	$\bar{x} = 35.6$	B1		
	$s^2 = 38.27 \quad (s = 6.186)$	B1		$(\sigma^2 = 34.44 \quad (\sigma = 5.869))$
	99% Confidence Interval for μ			
	$= 35.6 \pm 3.250 \times \frac{6.186}{\sqrt{10}}$	B1		or use of $\frac{\sqrt{34.44}}{3}$
	$= 35.6 \pm 6.36$	M1		
		A1√		on their mean and standard deviation
	$= (29.2, 42.0)$	A1	7	CAO (29.24, 41.96)
(b)	Confidence interval includes 30 mph	B1√		
	80% of sample exceed 30 mph limit	B1		
	Speed limit **not** adhered to	B1	3	dependent on previous B1
	Total		**10**	
