

## **Oxford Revise | Edexcel A Level Maths | Answers**

- Method (M) marks are awarded for showing you know a method and have attempted to apply it.
- Accuracy (A) marks should only be awarded if the relevant M marks have been awarded.
- Unconditional accuracy (B) marks are awarded independently of M marks. They do not rely on method.
- The abbreviation **o.e.** means 'or equivalent (and appropriate)'.

Please note that:

- efficient use of advanced calculators is expected
- inexact numerical answers should be given to three significant figures unless the question states otherwise; values from statistical tables should be quoted in full
- when a value of g is required, it is taken as  $g = 9.8 \text{ m s}^{-2}$  unless stated otherwise in the question.

## **Chapter 33 Hypothesis testing**

Question	Answer	Extra information	Marks
33.1 (a)(i)	B(40, 0.08)	Writing or using a binomial with $p = 0.08$	M1
	P(X=3) = 0.231	Correct answer	A1
33.1 (a)(ii)	P(X > 5) = 1 - 0.9033		
	= 0.0967	Correct answer	A1



Question	Answer	Extra information	Marks
33.1 (b)	H <sub>0</sub> : $p = 0.08$ , H <sub>1</sub> : $p < 0.08$	Correct hypotheses exactly as shown	B1
	B(70, 0.08)		
	$P(X \le 1) = 0.0207$ or 0.0206 or 0.021	Attempting to find the correct probability	M1
	2.07% < 5%	Allow 0.0206 or 0.021	A1
	Sufficient evidence that the proportion of bags of flour with a hole is less than 8%	Correct conclusion in context. Allow 'Sufficient evidence to support supplier <i>B</i> 's claim.'	A1
	Total		7 marks
33.2 (a)	Number each person registered at the surgery and select the first person at random.	Numbering and selecting first at random	B1
	Then select every 125th person.	Must include interval 125	B1
	H <sub>0</sub> : $p = 0.17$ , H <sub>1</sub> : $p \neq 0.17$	Correct hypotheses exactly as shown	B1
	$P(X \ge 12) = 1 - 0.9699$	Attempting to find the correct probability	M1
33.2 (b)	= 0.0301	Allow 0.030	A1
0012 (0)	3% > 2.5%		
	Insufficient evidence that the proportion of people with the allergy is different from 17%	Correct conclusion in context. Allow 'Insufficient evidence to support the doctor's claim.'	A1
	Total		6 marks
	$P(X \le 7) = 0.0073$ or $P(X \le 22) = 0.9877$	Attempting to find either probability	M1
33.3 (a)	Critical values 7 and 23	Correct critical values	A1
	Critical region $X \le 7 \cup X \ge 23$	Critical region expressed correctly. Must use X	A1
33.3 (h)	0.0073 + (1 - 0.9877) = 0.0196 or $1.96%$	Adding probabilities found in (a)	B1
33.3 (D)		Also allow 0.0195 or 1.95%	



Question	Answer	Extra information	Marks
	Total		4 marks
33.4 (a)	decametre	Also accept 'dam'	B1
33.4 (b)	H <sub>0</sub> : $\rho = 0$ , H <sub>1</sub> : $\rho < 0$ Critical value ±0.5155 -0.53 < -0.5155 so there is sufficient evidence to support the researcher's claim.	Correct hypotheses exactly as shown Looking up critical value. ±0.5155 seen. Correct conclusion in context. Also allow 'sufficient evidence to suggest that there is a negative correlation between humidity and visibility.'	B1 M1 A1
	Total		4 marks
33.5 (a)	$H_0: \rho = 0, H_1: \rho > 0$	Correct hypotheses exactly as shown	B1
33.5 (b)	r > 0.6215	Critical region expressed correctly. Must use r	B1
33.5 (c)	0.649	Correct answer	B1
33.5 (d)	There is sufficient evidence to support the director's claim.	Conclusion in context. Also allow 'sufficient evidence of a positive correlation between discount and number of T–shirts sold.'	B1
	Total		4 marks
	$H_0: \mu = 28, H_1: \mu < 28$	Correct hypotheses exactly as shown	B1
33.6	$\overline{X} \sim N\left(28, \frac{8^2}{20}\right)$ P( $\overline{X} < 25$ ) = 0.0467 4.67% < 5% so reject H <sub>0</sub> ; there is evidence to support the manager's belief.	Writing or using correct distribution of $\overline{X}$ Attempting to calculate correct <i>p</i> -value Correct <i>p</i> -value Correct conclusion in context	M1 M1 A1 A1



Question	Answer	Extra information	Marks
	Total		5 marks
33.7 (a)	$X \sim N(17.3, 3.9^2)$	Writing or using a Normal distribution with correct mean and standard deviation	M1
	P(X > 14) = 0.801  or  80.1%	Correct answer	A1
33.7 (b)	13, 15, 16.5, 17.5, 19, 21	Writing or using midpoints. Can be implied by a correct answer.	M1
	$\overline{x} = 18.2$	Correct answer	A1
33.7 (c)	H <sub>0</sub> : $\mu = 17.3$ , H <sub>0</sub> : $\mu \neq 17.3$	Correct hypotheses exactly as shown	B1
	$\overline{X} \sim N\left(17.3, \frac{2^2}{60}\right)$	Writing or using correct distribution of $\overline{X}$	M1
	$P(\bar{X} > 18.2) = 0.00025$	Attempting to calculate correct <i>p</i> -value. Follow through answer from (b).	M1A1
	0.025% < 2.5% so reject H <sub>0</sub> , sufficient evidence that the mean width of cauliflower has changed.	Correct conclusion in context	A1
	Total		9 marks
33.8 (a)	Knots	Also allow kn	B1
33.8 (b)	H <sub>0</sub> : $\mu = 9.4$ , H <sub>1</sub> : $\mu \neq 9.4$	Correct hypotheses exactly as shown	B1
33.8 (c)	$\bar{X} \sim N\left(9.4, \frac{3.3^2}{35}\right)$	Writing or using correct distribution of $\overline{X}$	M1
	P( $\overline{X} < a$ ) = 0.05 or 0.95	Attempting to find critical value. Can be implied by either correct answer.	M1
	Critical value of 8.48 or 10.3	Both critical values correct	A1
	Critical region $\overline{X} < 8.38 \cup \overline{X} > 10.3$	Correct critical region. Must use $\overline{X}$	A1

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Question	Answer	Extra information	Marks
33.8 (d)	There is insufficient evidence that the mean daily windspeed is different this year.	Correct conclusion in context	B1
	Total		7 marks
33.9 (a)	$H_0: p = 0.18, H_1: p \neq 0.18$	Correct hypotheses exactly as shown	B1
	$X \sim B(100, 0.18)$	Writing or using Binomial with $n = 100$ and $p = 0.18$	B1
	$P(X \ge 25) = 1 - P(X \le 24)$	Attempting to find the correct probability	M1
33.9 (b)	= 1 - 0.9504		
	= 0.0496	Correct probability	A1
	4.95% < 5% so reject H <sub>0</sub> , the meteorologist's claim is supported.	Correct conclusion in context	A1
33.9 (c)	The data is only from May to October so cannot be used to predict for the whole year.	Also allow 'a binomial model is not suitable since the probability of rain will be different throughout the year and may not be independent of the nearby days.'	B1
	Total		6 marks
	$\frac{1}{k} + \frac{2}{k} + \frac{3}{k} + \frac{4}{k} + 0.1 + 0.1 = 1$	Forming equation	M1
33.10 (a)	$\frac{10}{k} = 0.8$		
	<i>k</i> = 12.5	Correct answer	A1
33.10 (b)	$P(V > 3) = \frac{4}{'12.5'} + 0.1 + 0.1$	P(V = 4) + P(V = 5) + P(V = 6)	M1
	$=\frac{13}{25}$ or 0.52	Correct answer	A1



Question	Answer	Extra information	Marks
33.10 (c)	$0.2  imes rac{1}{6}$	Writing or using $P(T = t) = \frac{1}{6}$ for any value of t	B1
	$=$ $\frac{1}{2}$	Multiplying probabilities	M1
	30	Correct answer	A1
	Total		7 marks
	$P(Z > \frac{68 - \mu}{6}) = 0.7$ or $P(Z < \frac{68 - \mu}{6}) = 0.3$	Standardising	M1
33.11 (a)	$68 - \mu$ 0.524	-0.524 or 0.524 seen	B1
55.11 (u)		Forming correct equation and attempting to solve	M1
	$\mu = 71.1$	Correct answer	A1
33.11 (b)	P(X < 64) = 0.118	Finding $P(X < 64)$ or $P(X > 70)$ or $P(64 < X < 70)$	M1
	P(X > 70) = 0.573		
	P(64 < X < 70) = 0.309		
	$P[(X < 64) \cup (X > 70)] = `0.118' + `0.573'$	Also allow 1 – '0.309'	M1
	= 0.691	Correct answer	A1
	Total		7 marks