

General Certificate of Education

Mathematics 6360

MS2B Statistics 2B

Mark Scheme

2009 examination - June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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М	mark is for method					
m or dM	mark is dependent on one or more M marks and is for method					
А	mark is dependent on M or m marks and is	for accuracy				
В	mark is independent of M or m marks and	is for method a	ind accuracy			
Е	mark is for explanation					
$\sqrt{100}$ or ft or F	follow through from previous					
	incorrect result	MC	mis-copy			
CAO	correct answer only	MR	mis-read			
CSO	correct solution only	RA	required accuracy			
AWFW	anything which falls within	FW	further work			
AWRT	anything which rounds to	ISW	ignore subsequent work			
ACF	any correct form	FIW	from incorrect work			
AG	answer given	BOD	given benefit of doubt			
SC	special case	WR	work replaced by candidate			
OE	or equivalent	FB	formulae book			
A2,1	2 or 1 (or 0) accuracy marks	NOS	not on scheme			
–x EE	deduct <i>x</i> marks for each error	G	graph			
NMS	no method shown	с	candidate			
PI	possibly implied	sf	significant figure(s)			
SCA	substantially correct approach	dp	decimal place(s)			

Key to mark scheme and abbreviations used in marking

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded. However, there are situations in some units where part marks would be appropriate, particularly when similar techniques are involved. Your Principal Examiner will alert you to these and details will be provided on the mark scheme.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

MS2B		1		
Q	Solution	Marks	Total	Comments
1	$H_0: \mu = 768$			
	$H_1: \mu \neq 768$	B1		(Both)
	764.8 – 768			
	Test statistic: $z = \frac{764.8 - 768}{8 \sqrt{18}}$	M1		
	/ √18			
	=-1.70	A1		(-1.697)
	$z_{crit} = \pm 1.96$	B1		$(z_{\rm crit} = 1.96 \text{ or } z_{\rm crit} = -1.96)$
	$2_{crit} = \pm 1.90$	DI		$(2_{\rm crit} - 1.90 \text{ of } 2_{\rm crit} - 1.90)$
	\Rightarrow Accept H ₀	A1		
	\rightarrow Accept Π_0	AI		
	No evidence at the 5% level of			
	significance, to deny Yvonne's claim.	E1	6	
	Total		6	
2(a)(i)	$X \sim \operatorname{Po}(5.0)$			
	$\Rightarrow P(X < 4) = P(X \le 3)$			(0.440 to 0.441) for B1
	= 0.265	B2	2	CAO
(ii)	$Y \sim \operatorname{Po}(1.5)$ $\Rightarrow \operatorname{P}(Y=4) = \frac{e^{-1.5} \times (1.5)^4}{4!}$		2	
	$e^{-1.5} \times (1.5)^4$			
	$\Rightarrow P(Y=4) = \frac{\sqrt{1}}{4!}$			
		M1	2	(0.047 ± 0.0471)
	= 0.0471	A1	2	(0.047 to 0.0471)
2(b)(i)	$T = X + Y \sim \operatorname{Po}(6.5)$	B1		
-(0)(1)				
	$\Rightarrow P(T > 5) = 1 - P(T \le 5)$	B1		(1-0.2237) or $(1-0.5265)$
	=1-0.369			
	= 0.631	B1	3	
(;;)				ft on their <i>p</i> from (b)(i)
(ii)	$p = {}^{8}C_{7} (0.631)^{7} (0.369) +$	M1ft		It on then p from (0)(1)
	$(0.631)^8$	WITT		Either part attempted
				r r r
	p = 0.11758 + 0.02513	A1ft		(both parts correct)
	= 0.143	A1	3	AWFW 1.142 to 0.143 (CAO)
(c)(i)	Mean = 8	B1	_	CAO
	Variance = $s^2 = 16.9$	B1	2	(AWRT)
	(sample variance = 15.2)			
(ii)	Poisson not a good model for data	B1dep		
	Mean ≠ Variance	B1	2	
	Total		14	

Q		Solution	Marks	Total	Comments
3	H_0 : no associat	tion between age and			
	attitude to school	ol reorganisation	B1		
		between age and attitude			
	to school reorga	inisation			
	Age	Against	M1		E's attempted
	Age	ŭ	Al		correctly (at least 6 E's)
	16 - 17	$\frac{O_i}{9} \frac{E_i}{6^{17/5}}$			
	18 - 21	- 765			
		7 05			E_i
	22 - 49	$115 116\frac{9}{13}$			6.262
	50 - 65	41 42 %			15.369
	> 65	3 3 ⁶⁴ / ₆₅			116.692
	Total	185 185			42.692 3.985
	Age	Not Against			
		$O_i \qquad E_i$			
	16 - 17	2 4 ⁴⁸ / ₆₅			E_i
	18 - 21	10 1141/65			4.738 11.631
	22 - 49	90 88 4/13			88.308
	50 - 65	34 32 ⁴ / ₁₃			32.308
	> 65	4 3 ¹ / ₆₅			3.015
	Total	140 140			
	Row totals:	<u>11,27</u> 205, 75.7 (325)			
	Column totals:	185, 140 (325)	B1		Totals correct
	$E_{i}'s < 5$, , ,			
		s 16 – 17 and 18 –21 also	M1		Attempt at combining rows
	50 - 65 and 'ov	ver 65' to give:	A1		Correctly
		$\alpha = O_i - E_i \qquad \alpha^2$			
	$O_i \qquad E_i$	$\alpha = O_i - E_i \qquad \alpha^2 / E_i$			
	26 21.63	4.369 0.8825			
	115 116.69				
	44 46.68		ml		Final column attempted
	12 16.37		1111		(dep M1)
	90 88.31	1.692 0.0324			
	38 35.32 325 325	2.677 0.2029 2.462			
		2.402	A1		2.4 to 2.5
	$X^2 = 2.462$ v = 2		B1		2.4 10 2.3
	v = 2 $\chi^2_{\nu=2} (0.95) = 5.$	991	B1 B1ft		On their <i>v</i>
	Accept H_0	// L	Alft		
	- 0	e at 5% level of			
		suggest any association			
		d attitude to school			
	reorganisation.		E1ft	12	(context)
		Total		12	

MS2B (cont)) Solution	Marks	Total	Comments
<u> </u>	Sketch:	IVIALKS	Total	1 for straight line $0 \le x \le 1$
т(а)				from $(0, 0.5)$ to $(1, 0.5)$
	0.6			1 for straight line $1 \le x \le 3$
	0.4			from (1, 0.5) to (3, 0)
	0.2			1 for axes
		B3	3	[must have at least (0,0.5) (1,0) and (3,0) labelled]
(b)	$P(X \le \eta) = F(\eta) = 0.5$	M1		
(0)	$(\Rightarrow \eta = 1 \text{ (from graph)})$	Al	2	AG
(c)	$1(\mathbf{r}) = 3 (3 - \mathbf{r})$			
	$\mu = E(X) = \int_{0}^{1} \left(\frac{x}{2}\right) dx + \int_{1}^{3} x \left(\frac{3-x}{4}\right) dx$	M1		Both integrals stated
	$= \left[\frac{x^2}{4}\right]_0^1 + \frac{1}{4} \left[\frac{3x^2}{2} - \frac{x^3}{3}\right]_1^3$	4.1		
	$= \left\lfloor \frac{4}{4} \right\rfloor_{0}^{1} + \frac{4}{4} \left\lfloor \frac{2}{2} - \frac{3}{3} \right\rfloor_{1}^{1}$	A1		Either
	$=\frac{1}{4} + \frac{1}{4} \left[\left(\frac{27}{2} - 9 \right) - \left(\frac{3}{2} - \frac{1}{3} \right) \right]$	ml		Correct limits used on both integrals +combined dep M1
	$=\frac{1}{4}+\frac{5}{6} \qquad (0.25+0.83\dot{3})$			
	$= 1 \frac{1}{12}$	A1	4	(CAO)
(d)	Area of \triangle			Alternative: For $1 \le x \le 3$
	$= P\left(X > 2\frac{1}{4}\right) = \frac{1}{2} \times \frac{3}{4} \times \frac{3 - 2\frac{1}{4}}{4}$	M1ft		$F(x) = 1 - \frac{1}{8} (3 - x)^2$ M1ft
		IVIIIt		
	$=\frac{1}{32}\times\frac{1}{4}=\frac{1}{128}$			\Downarrow
	$= \frac{3}{32} \times \frac{3}{4} = \frac{9}{128}$ $\therefore P\left(X < 2\frac{1}{4}\right) = 1 - \frac{9}{128}$	M1ft		$F\left(2\frac{1}{4}\right) = 1 - \frac{1}{8} \times \frac{9}{16} $ M1ft
	$=\frac{119}{128}(0.9296875)$			$=\frac{119}{128}$
	128 \	A1	3	128
				САО

Q	Solution	Marks	Total	Comments	
4(d)	or			Alternative	
	$\int_{2\sqrt{4}}^{3} \frac{3-x}{4} dx \left(= \frac{9}{128} \right) $ M1 ft			$f\left(2\frac{1}{4}\right) = \frac{3}{16} = 0.1875$	
	$2\frac{1}{4}$ 4 (128)			(-4) 16	
	$= 1 \int_{2V}^{3} \frac{3-x}{4} dx$ M1 ft			$P(X < 3\mu - \eta) = P\left(X < 2\frac{1}{4}\right)$	
	$\frac{J}{2\frac{1}{4}}$ 4				
	2				
	$= 1 - \frac{1}{4} \left[3x - \frac{x^2}{2} \right]_{2 \frac{1}{4}}^3$			$= \frac{1}{2} + \left \frac{1}{2} \left(\frac{3}{16} + \frac{1}{2} \right) \times 1 \frac{1}{4} \right $	M
	$4 \begin{bmatrix} 317 \\ 2 \end{bmatrix}_{2\frac{1}{4}}$			$2 \ 2(16 \ 2) \ 4$	
	$\begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} 0 & 9 & 27 & 81 \end{bmatrix}$			$=\frac{1}{2}+\frac{55}{128}(0.4296875)$	M1
	$= 1 - \frac{1}{4} \left[9 - \frac{9}{2} - \frac{27}{4} + \frac{81}{32} \right]$			$-\frac{1}{2}+\frac{1}{128}(0.4290875)$	1011
	$= 1 - \frac{1}{4} \times \frac{9}{32} = \frac{119}{128}$ A1			$=\frac{119}{128}$ (0.930)	А
	1 52 120			128 (0.550)	11
	or $(1-0.0703125 = 0.9296875)$ Total		12		
5(a)(i)		M1	12		
	$=\frac{2}{10}\times\frac{1}{9}+\frac{3}{10}\times\frac{2}{9}+\frac{4}{10}\times\frac{3}{9}$				
	$=\frac{2}{9}$	A1	2	(AG)	
	9	AI	2		
(ii)	$P(p\bar{p} - \bar{p}p) = 1 - 9 - 9 - 1$			1 9 1	
	$P(B\overline{B} \text{ or } \overline{B}B) = \frac{1}{10} \times \frac{9}{9} + \frac{9}{10} \times \frac{1}{9}$	M1		$\frac{1}{10} + \frac{9}{10} \times \frac{1}{9}$	
	$=\frac{1}{5}$		~		
	5	A1	2	(AG)	
ക്രവ					
(b)(i)					
	Same 1 Blue Neither				
	x 135 145 -45	D1			
	$P(X = x) = \frac{2}{9} = \frac{1}{5} = \frac{26}{45}$	B1			
	$P(X=x) \qquad \overline{9} \qquad \overline{5} \qquad \overline{45}$	B1	2		
(ii)	$E(X) = 135 \times \frac{2}{9} + 145 \times \frac{1}{5} + (-45) \times \frac{26}{45}$			Multiply two rows of their	
	, , , , , , , , , , , , , , , , , , , ,	M1		table from (b)(i)	
	= 29 + 30 - 26	A 1	2		
	= 33 pence	A1	2	AG	
(c)(i)	$\mathrm{E}(Y) = 104 - 3\mathrm{E}(X)$	M1			
	$=104 - 3 \times 33$				
	=5 pence	A1			
	: Joanne would expect to win £5	A1	3	OE (eg 500p)	

S(c)(i) $E(X^2) = 9425$ B1 $(4205 + 4050 + 1170)$ $Var(X) = 9425 - 33^2 = 8336$ B1 $sd(X) = 91.30$ $Var(Y) = 9 \times Var(X)$ B1 $9 \times (their Var(X) > 0)$ $= 9 \times 8336$ $9 \times (their Var(X) > 0)$ $or 3 \times (their sd(X))$ \Rightarrow standard deviation $(Y) = 274$ penceA14 $273.9p \text{ or } L2.74$ B1 \Rightarrow standard deviation $(Y) = 274$ penceA1 $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ B1 $s = 2 (s^2 = 4)$ B1Assumption: Weights of boxes are normally distributedB1 $t_{ogrs} = 2.365$ B1 $gsystem (41.8, 45.2)$ A1 (ii) Cl contains mean (45)Bishen's belief probably justifiedB1 dep $Bi dep$ B1 dep $Bi dep$ B1 $[for (35 w of sample less than 45grams)$ $B(b)(i)$ $H_{i}: \mu = 45$ $H_{i}: \mu = 45$ $H_{i}: \mu = 45$ $H_{i}: \mu = 45$ B1 $V = 7 \Rightarrow t_{crit} = -1.895$ \Rightarrow Reject H_{i} $Evidence at the 5% level of significance tov = 7 \Rightarrow t_{crit} = 1.895\Rightarrow Reject H_{i}Evidence at the 5% level of significance tov = 7 \Rightarrow t_{crit} = 1.895\Rightarrow Reject H_{i}V = 7 \Rightarrow t_{crit} = 1.895\Rightarrow Reject H_{i}V = 7 \Rightarrow t_{crit} = 1.895\Rightarrow Reject H_{i}Evidence at the 5% level of significance tov = 7 \Rightarrow t_{crit} = 1.895\Rightarrow Reject H_{i} when H_{i} trueB1B2Clear statemente^{11}$	Q	Solution	Marks	Total	Comments
Var $(Y) = 9 \times Var(X)$ $= 9 \times 8336$ B1B19 × (their Var $(X) > 0$) $or 3 \times (their sd (X))\Rightarrow standard deviation (Y) = 274 penceA14273.9p or £2.746(a)(i)\overline{x} = 43.5s = 2 (s^2 = 4)B1B1I56(a)(ii)\overline{x} = 43.5s = 2 (s^2 = 4)B1B1I6Assumption: Weights of boxes arenormally distributedt_{0.972} = 2.36595\% CI for \mu:B143.5 \pm 1.6723M1B143.5 \pm 1.6723\Rightarrow43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}3 \pm 2.485 \times 2.365 \times \frac{2}{\sqrt{8}}M1B1 depMust be clear use of 45 andnot 43.5(ii)Bis his belief probably justifiedor[Since 45 within C1] but close to upperlimit, there is some evidence that Bishen'sBelief is untrue[but the evidence is not significant at 5 %](75% of sample less than 45grams)(B1)26(b)(i)H_{ij}: \mu = 45H_{ij}: \mu = 45H_{ij}: \mu < 45Test statistic: t = \frac{43.5 - 45}{2\sqrt{8}}\sim Reject H_0B141= -2.12P(t_i < -2.12) = 0.035791< 0.05iiii Type l errorhave/may have rejected H_a when H_0 trueNo errorhave/may have accepted H_0 when H_0 trueNo errorhave/may have accepted H_0 when H_0 trueNo errorhave/may have accepted H_0 when H_0 trueB1B1B1B1Clear statement$	5(c)(ii)	$\mathrm{E}\left(X^{2}\right) = 9425$	B1		(4205 + 4050 + 1170)
Var $(Y) = 9 \times Var(X)$ $= 9 \times 8336$ B1B19 × (their Var $(X) > 0$) $or 3 \times (their sd (X))\Rightarrow standard deviation (Y) = 274 penceA14273.9p or £2.746(a)(i)\overline{x} = 43.5s = 2 (s^2 = 4)B1B1I56(a)(ii)\overline{x} = 43.5s = 2 (s^2 = 4)B1B1I6Assumption: Weights of boxes arenormally distributedt_{0.972} = 2.36595\% CI for \mu:B143.5 \pm 1.6723M1B143.5 \pm 1.6723\Rightarrow43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}3 \pm 2.485 \times 2.365 \times \frac{2}{\sqrt{8}}M1B1 depMust be clear use of 45 andnot 43.5(ii)Bis his belief probably justifiedor[Since 45 within C1] but close to upperlimit, there is some evidence that Bishen'sBelief is untrue[but the evidence is not significant at 5 %](75% of sample less than 45grams)(B1)26(b)(i)H_{ij}: \mu = 45H_{ij}: \mu = 45H_{ij}: \mu < 45Test statistic: t = \frac{43.5 - 45}{2\sqrt{8}}\sim Reject H_0B141= -2.12P(t_i < -2.12) = 0.035791< 0.05iiii Type l errorhave/may have rejected H_a when H_0 trueNo errorhave/may have accepted H_0 when H_0 trueNo errorhave/may have accepted H_0 when H_0 trueNo errorhave/may have accepted H_0 when H_0 trueB1B1B1B1Clear statement$		$Var(X) = 9425 - 33^2 = 8336$			sd(X) = 91.30
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			B1		
$= 75024 \qquad M1 \qquad or 3 \times (\text{their sd}(X))$ $\Rightarrow \text{standard deviation } (Y) = 274 \text{ pence} \qquad A1 \qquad 4 \qquad 273.9 \text{ p or } \pm 2.74$ $= 15 \qquad 15 \qquad 15 \qquad 15 \qquad 16 \qquad 15 \qquad 15 \qquad 15 \qquad$					$9 \times (\text{their Var}(X) > 0)$
$\Rightarrow \text{ standard deviation } (Y) = 274 \text{ pence} \qquad A1 \qquad 4 \qquad 273.9p \text{ or } 52.74 \qquad 73.9p \text{ or } 52.74 \qquad 74.84 \qquad $		= 75024	M1		
Total156(a)(i) $\overline{x} = 43.5$ $s = 2$ ($s^2 = 4$)B1 B1Assumption: Weights of boxes are normally distributed $t_{u,ors} = 2.365$ 95% CI for μ :B1 B1 B1 $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ 43.5 ± 1.6723 B1 B1 Assumption: Veights of boxes are normally distributed $t_{u,ors} = 2.365$ 95% CI for μ :B1 B1 B1 B1 B1(ii)CI contains mean (45) Bishen's belief probably justified or [Since 45 within CI]but close to upper limit, there is some evidence that Bishen's Belief is untrue [but the evidence is not significant at 5 %.] (75% of sample less than 45grams)(B1) B1 B1 (B1)26(b)(i) $H_0: \mu = 45$ $H_0: \mu < 45$ $= -2.12$ B1 $A1$ $= -2.12$ (B1) A1 A1 $= -2.12$ (B1) A1 $P(t_{\gamma} < -2.12.) = 0.035791$ < 0.05 (ii)Type I error have/may have rejected H_0 when H_0 true No error have/may have accepted H_0 when H_0 true No errorB1 B1 B1 B1 B1 B12(iii)Type I error have/may have accepted H_0 when H_0 true No error have/may have accepted H_0 when H_0 trueB1 B1 Clear statement				4	
6(a)(i) $\overline{x} = 43.5$ $s = 2 (s^2 = 4)$ Assumption: Weights of boxes are normally distributed $t_{0,975} = 2.365$ 95% CI for μ : $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ 43.5 ± 1.6723 $\Rightarrow (41.8,45.2)$ (ii) CI contains mean (45) Bishen's belief probably justified or or [Since 45 within CI]but close to upper limit, there is some evidence that Bishen's Belief is untrue [but the evidence is not significant at 5 %.] (75% of sample less than 45grams) $H_0: \mu = 45$ $H_0: \mu = 45$ $H_0: \mu < 45$ Test statistic: $t = \frac{43.5 - 45}{2\sqrt{8}}$ $\pi = -2.12$ $v = 7 \Rightarrow t_{crit} = -1.895$ $\Rightarrow Reject H_0$ Evidence at the 5% level of significance . to support Abi's claim that mean content < 45 grams (ii) Type I error have/may have rejected H_0 when H_0 true No error have/may have accepted H_0 when H_0 true (B1) true (B1) true (B1) true (B1) true (B1) true (B1) true (Clear statement) true (Clear statement)			AI		273.9p of £2.74
$s = 2 (s^{2} = 4)$ Assumption: Weights of boxes are normally distributed $t_{0.975} = 2.365$ B1 $95\% CI \text{ for } \mu:$ $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ A3.5 $\pm 2.365 \times \frac{2}{\sqrt{8}}$ A3.5 ± 1.6723 $\Rightarrow (41.8,45.2)$ A1 6 (AWRT) Must be clear use of 45 and not 43.5 CI contains mean (45) B1 dep B1 dep Sheen's belief robably justified or [Since 45 within CI]but close to upper limit, there is some evidence that Bishen's Belief is untrue [but the evidence is not significant at 5 %.] (75% of sample less than 45grams) (B1) 2 6(b)(i) H_{0}: $\mu = 45$ H_{0}: $\mu < 45$ Test statistic: $t = \frac{43.5 - 45}{2\sqrt{8}}$ M1 $= -2.12$ A1 V = 7 $\Rightarrow t_{erit} = -1.895$ B1 Evidence at the 5% level of significance. to support Ab's claim that mean content < 45 grams (ii) Type 1 error have/may have rejected H ₀ when H ₀ true Or No error No erro	6(a)(i)		B1	10	
Assumption: Weights of boxes are normally distributed $t_{0.975} = 2.365$ B1 $t_{0.975} = 2.365$ B1 95% CI for μ : $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ M1 43.5 ± 1.6723 A1 \Rightarrow $(41.8, 45.2)$ CI contains mean (45) Bishen's belief probably justified or [Since 45 within CI]but close to upper limit, there is some evidence that Bishen's Belief is untrue [but the evidence is not significant at 5 %.] (75% of sample less than 45 grams)B1 6(b)(i) $H_0: \mu = 45$ $H_0: \mu = 45$ $H_0: \mu < 445$ B1Test statistic: $t = \frac{43.5 - 45}{2/\sqrt{8}}$ \Rightarrow M1 $A1$ $V = 7 \Rightarrow t_{crit} = -1.895$ \Rightarrow $Reject H_0$ B1Evidence at the 5% level of significance. to support Ab's claim that mean content < 45 gramsB1 $B1$ (ii)Type I error have/may have rejected H_0 when H_0 true No error have/may have accepted H_0 when H_0 trueB1 $B1$ 2Clear statement	()()	$s = 2 (s^2 = 4)$	B1		
$t_{0.975} = 2.365$ $95\% \text{ CI for } \mu :$ $43.5 \pm 2.365 \times \frac{2}{\sqrt{8}}$ 43.5 ± 1.6723 $\Rightarrow (41.8, 45.2)$ (i) CI contains mean (45) Bishen's belief probably justified or [Since 45 within CI] but close to upper limit, there is some evidence that Bishen's Belief is untrue [but the evidence is not significant at 5 %.] (75% of sample less than 45grams) (B1) 2 (75% of sample less than 45grams) (B1) 2 (B1) 2 (Car statement (Car statement (Car statement (Car statement (Car statement (Car statement		Assumption: Weights of boxes are	B1		
$\begin{array}{ c c c c c c c } \hline & 43.5 \pm 1.6723 & \\ \hline & \Rightarrow & (41.8,45.2) & A1 & 6 & (AWRT) \\ \hline & & (ii) & CI contains mean (45) & BI dep \\ Bishen's belief probably justified & BI dep \\ & or & \\ [Since 45 within CI] but close to upper \\ [imit, there is some evidence that Bishen's Belief is untrue \\ [but the evidence is not significant at 5 %.] \\ (75% of sample less than 45grams) & (B1) & 2 & \\ \hline & & (75\% of sample less than 45grams) & (B1) & 2 & \\ \hline & & & (75\% of sample less than 45grams) & (B1) & 2 & \\ \hline & & & & & \\ \hline & & & & & & \\ \hline & & & &$		$t_{0.975} = 2.365$	B1		
$\begin{array}{ c c c c c c c } \hline & 43.5 \pm 1.6723 & \\ \hline & \Rightarrow & (41.8,45.2) & A1 & 6 & (AWRT) \\ \hline & & (ii) & CI contains mean (45) & BI dep \\ Bishen's belief probably justified & BI dep \\ & or & \\ [Since 45 within CI] but close to upper \\ [imit, there is some evidence that Bishen's Belief is untrue \\ [but the evidence is not significant at 5 %.] \\ (75% of sample less than 45grams) & (B1) & 2 & \\ \hline & & (75\% of sample less than 45grams) & (B1) & 2 & \\ \hline & & & (75\% of sample less than 45grams) & (B1) & 2 & \\ \hline & & & & & \\ \hline & & & & & & \\ \hline & & & &$		$43.5 \pm 2.365 \times \frac{2}{\sqrt{8}} \bigg\}$	M1		
(ii) CI contains mean (45) Bishen's belief probably justified or [Since 45 within CI]but close to upper limit, there is some evidence that Bishen's Belief is untrue [but the evidence is not significant at 5 %.] (75% of sample less than 45grams) (B1) 2 (B1) 2 (B1) 2 (B1) 2 (B1) 2 (B1) 2 (B1) 2 (both) Test statistic: $t = \frac{43.5 - 45}{2/\sqrt{8}}$ r = -2.12 $v = 7 \Rightarrow t_{crit} = -1.895$ \Rightarrow Reject H ₀ Evidence at the 5% level of significance . to support Abi's claim that mean content < 45 grams (ii) Type I error have/may have rejected H ₀ when H ₀ true or No error have/may have accepted H ₀ when H ₀ true (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1) (B1)		43.5±1.6723			
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