1	Normal 31 for mean $\sqrt{31}$ or 5.57 for sd	B1 B1 B1 [3]	 For mean Must be sd
2	**(i)** Only the more committed or less busy etc Only readers of that particular issue	B1 B1 [2]	Any sensible category of readers who will not respond implied
	(ii) Three randomly generated 4-digit numbers given 4975 3952 (0)386	B1 B1dep [2]	Starting with 4975 Accept 4975 0239 5203 and 4975 5203 6088 SC alternative consistent methods producing a set of 3 randomly generated 4 digit numbers can score B1 for the first number and B1dep for all three numbers, all < = 7302
3	**(i)** $29.6 \pm z \times {}^{1.0}/_{\sqrt{65}}$ $29.6 \pm 2.576 \times {}^{1.0}/_{\sqrt{65}}$ (29.6 ± 0.3195) (29.3, 29.9) (3 sfs)	M1 B1 A1 [3]	Allow any value of z For 2.576 seen Allow any brackets or none, but cwo.
	(ii) CI does not include 30 Claim not supported or not justified or probably not true	B1ft B1ft [2]	30 seen or implied
	(iii) CI is a variable oe	B1 [1]	Allow "Sample mean diff" (not population mean).
4	$E(V) = 46 + 53 + 2 \times 25 = 149$ $Var(V) = 19^2 + 23^2 + 4 \times 10^2$ $= 1290$ $\frac{93 - 149}{\sqrt{'1290'}}$ $= -1.559$ $1 - \Phi('-1.559') = \Phi('1.559')$ $= 0.9405$	B1 M1 A1 M1 A1ft M1 A1 [7]	 or $\sqrt{(19^2 + 23^2 + 4 \times 10^2)}$ or $\sqrt{1290}$ or 35.9 With their mean and their variance. ft their mean and variance providing 3 random variables used, allow +/-. Area consistent with their mean Accept 0.940 or 0.941 or 0.94

5	**(i)** $\int_2^4 \frac{x^2}{6}\,dx \quad (= \left[\frac{x^3}{18}\right]_2^4)$		M1	Attempt integ $xf(x)$, ignore limits
	$= \frac{4^3}{18} - \frac{2^3}{18}$		M1	Subst correct limits in $\frac{x^3}{n}$
	$= \frac{28}{9}$		A1 [3]	oe
	(ii) $\int_2^m \frac{x}{6}\,dx \,(= \left[\frac{x^2}{12}\right]_2^m)$	or $\int_m^4 \frac{x}{6}\,dx$	M1	Attempt integ $f(x)$ and = 0.5 (ignore limits).
	$\frac{m^2}{12} - \frac{2^2}{12} = 0.5$	$\frac{4^2}{12} - \frac{m^2}{12} = 0.5$	M1	Attempt integ $f(x)$, limits 2 to unknown or unknown to 4. Or by areas.
	$m = \sqrt{10}$ oe	$m = \sqrt{10}$ oe	A1 [3]	$\sqrt{10}$ or 3.16 (3 sfs)
	(iii) $\int_3^4 \frac{x}{6}\,dx \quad (= \left[\frac{x^2}{12}\right]_3^4 = {}^7/_{12})$		M1*	Attempt integ $f(x)$, one limit must be 3.
	$(\text{“}{}^7/_{12}\text{”})^2$		M1*dep	Square their “$^7/_{12}$”
	$= {}^{49}/_{144}$ or 0.340 (3 sfs)		A1 [3]	

6	**(i)**	$\bar{x} = 43.5/100 = 0.435$	B1	
		$s = \sqrt{\frac{100}{99}} \times \sqrt{\frac{31.56}{100} - 0.435^2}$ (=0.3573) or Var (= 0.128) or 1/99(31.56-(43.5)^2/100)	M1	$s = \sqrt{\frac{31.56}{100} - 0.435^2}$ M0 (= 0.3555), or Var (= 0.126)
		H_0: Pop mean (for B) = 0.336 H_1: Pop mean (for B) ≠ 0.336	B1	Undefined mean: B0, but allow just "μ"
		$\frac{0.435 - 0.336}{\frac{"0.3573"}{\sqrt{100}}}$	M1	$\frac{0.435 - 0.336}{\frac{"0.3555"}{\sqrt{100}}}$ M1 Or x_{crit} = 0.336 +/-"2.576"√(0.12765/100)
		= 2.77 (3 sfs)	A1	Or x_{crit} = (0.244) or 0.428 A1 z = 2.785 (3 sfs) A0
		Z_{crit} = 2.576 (or 2.326 consistent with 1-tail test)	B1	Or use of area – correct 0.005 (2-tail) or 0.01 (1-tail)
		Valid comparison with *z*-value	M1	Valid comp P(z > 2.77) with 0.005 or 0.01 Or comp 0.435 with "0.428"
		Evidence that B amounts diff from A	A1ft [8]	No errors seen. Conclusion consistent with their H_0/H_1.No contradictions.
	(ii)	Must state or imply "No" to score these marks		
		n large	B1	
		$\bar{X}$ approx normally distr or CLT applies	B1 [2]	B0 for "No" with invalid (or no) reason SR both reasons correct but wrong conclusion scores SR B1.

7	**(i)** H_0: mean no. sales = 2.4 H_1: mean no. sales > 2.4	B1	Or "= 0.8 per week" Accept λ, not μ.
	$P(X \geq 5)$ $= 1 - e^{-2.4}(1 + 2.4 + \frac{2.4^2}{2!} + \frac{2.4^3}{3!} + \frac{2.4^4}{4!}$	M1*	Attempted with or without "1–". Allow one end error.
	$(= 1 - 0.9041)$	A1	Allow incorrect λ in otherwise correct expression.
	$= 0.0959$	A1	
	Comp with 0.05	M1*	Indep M. (Allow recovery of above 3 marks at this point if comparison with 0.95 done.)
	No evidence to believe mean sales incr	A1ft dep [6]	Conclusion, no contradictions. SC: $e^{-2.4} \times \frac{2.4^5}{5!} = 0.0602 > 0.05$: max B1M0A0A0M1A0
	(ii) Need 1st x such that $P(X \geq x) < 0.05$	M1*	Attempt sum of at least 3 relevant Poisson terms, with comparison with 0.05 (can be implied). Can be implied, e.g. by $P(X \leq 5) = 0.9643$ identified.
	$P(X \geq 6) = 1 - e^{-2.4}(1 + 2.4 + \ldots + \frac{2.4^5}{5!})$	M1*dep	
	$(= 1 - 0.9643)$ $= 0.0357$	A1 [3]	
	(iii) Mean sales still 0.8 per week, but ≥ 6 sales in 3 weeks, so reject 0.8.	B1 [1]	Conclude mean sales have increased when not true
	(iv) Value of true (new, changed) mean oe	B1 [1]	