

10			See the exemplars at the end of the MS Allow 2 sf throughout				If 1-tail test:
			$H_0: \mu = 0.034$ $H_1: \mu \neq 0.034$ where $\mu =$ (pop) mean pollutant level Allow any letter (except X and \bar{X} : B0B0)	B1 B1	1.1 2.5	Subtract B1 for each error eg: 1-tail B1B0 undefined μ B1B0 not in terms of parameter B1B0 μ = sample mean implied B1B0 Not include value 0.034 B0B0 eg $H_0 = 0.034$ etc: B0B0	$H_0: \mu = 0.034$, defined μ , B1 $H_1: \mu < 0.034$ B0
			$N(0.034, \frac{0.0000409}{50})$ & $\bar{X} < 0.0325$ (condone $>, =$) or $\frac{a-0.034}{0.00640 \div \sqrt{50}} = -1.96$	M1	3.3	Stated or implied eg by 0.0486 or 0.951 or 0.322 (2 sf) even if within incorrect statement eg $P(X = 0.0325) = 0.0486$	As LH column M1
			$P(\bar{X} < 0.0325) = 0.0486$ or CV is 0.0322 or acceptance region is 0.0322 to 0.0358 or $P(\bar{X} > 0.0325) = 0.951$	A1*	3.4	BC or $\frac{0.0325-0.034}{0.00640 \div \sqrt{50}} = -1.66$	$P(\bar{X} < 0.0325) = 0.0486$ or CV is 0.0325(1) A1
			$0.0486 > 0.025$ or $0.0325 > 0.0322$ or 0.0325 is in AR or $0.951 < 0.975$ A1A1	A1	1.1	or $1.66 < 1.96$ or $-1.66 > -1.96$ dep A1* Must be seen, allow on diag	Comp 0.05 or ± 1.645 A1 or $0.0325 < 0.0325(1)$ or 0.0325 is within CR No more marks
			Do not reject H_0 Or Insufficient (or No) evidence to reject H_0 Allow Accept H_0	M1	1.1	Dep 0.0486 or 0.0322 or -1.66 <u>or</u> $0.951 < 0.975$ seen, <u>or</u> $P(\bar{X} < 0.0325)$ stated or implied (possibly with wrong prob leading to opposite conclusion**)	May be implied by conclusion Condone Reject H_1
			Insufficient (or No) evidence that (mean) pollutant level has changed oe or eg "It is unlikely that level has changed"	A1f	2.2b	In context. Context may be implied by eg "level" or "pollutant"	Not "There is evidence that mean level has not changed" A0 Not definite, eg

			"We can assume that level hasn't changed"			ft only ** above	"Mean level has not changed "A0
				[7]			

Exemplars for Q10

Hypotheses

A	H ₀ : $\mu = 0.034$ H ₁ : $\mu \neq 0.034$ where μ = (pop) mean pollutant level	B1B1
B	H ₀ : $\mu = 0.034$ H ₁ : $\mu \neq 0.034$	B1B0
C	H ₀ : The (pop) mean pollutant level is 0.034 H ₁ : The (pop) mean pollutant level is not 0.034 See Specimen paper q10 MS "Must be in terms of parameter values"	B1B0
D	H ₀ = 0.034 H ₀ \neq 0.034	B0B0
E	H ₀ : $\mu = 0.034$ H ₁ : $\mu = 0.0325$ where μ = (pop) mean pollutant level	B1B0

Probability and conclusion

F	No statement of distribution P($\bar{X} = 0.0325$) = 0.0486 0.0486 > 0.025 Don't reject H ₀ Likely that mean level of pollutant hasn't changed	M1A1 A1 M1 A1
G	P($\bar{X} = 0.0325$) = 0.0486 0.0486 > 0.025 Accept H ₀ There is evidence that mean level of poll'nt hasn't changed	M1A1 A1 M1 A0
H	P($\bar{X} < 0.0325$) = 0.951 0.951 > 0.025 Insufficient evidence that poll't level has changed	M1A0 A0 M0A0

I	$P(\bar{X} > 0.0325) = 0.951$ $0.951 > 0.025$ Sufficient evidence that mean poll't level has changed	M1A1 A0 M0A0
J	$\bar{X} \sim N(0.034, 0.000000818)$ $P(\bar{X} < 0.0325) = 0.013$ $0.013 < 0.025$ Sufficient evidence that level has changed	M1A0 A0 M1A1
K	$\mu \pm 1.96\sigma = 0.0322 \text{ to } 0.0358$ 0.0325 lies within this range Reject H_1 Insufficient evidence that level of poll't has decreased	BOD M1A1 A1 M1 A0
L	$CV = 0.0322$ $0.0325 > 0.0322$ Reject H_0 . Evidence that level of poll't has changed.	M1A1 A1 M0A0
M	$(0.0322 - 0.034) \div \sqrt{0.0000409 / 50} = -1.66$ $1.66 < 1.96$ Don't reject H_0 . Level of poll't hasn't changed.	M1A1 A1 M1A0

1-tail

N	$H_0: \mu = 0.034$ $H_1: \mu < 0.034$ where μ = (pop) mean pollutant level	B1B0
O	$H_0: \mu = 0.034$ $H_1: \mu < 0.034$	B0B0
P	H_0 : The (pop) mean pollutant level is 0.034 H_1 : The (pop) mean pollutant level is less than 0.034	B0B0