4) b

Step 1: Null & Alternative Hypotheses:

$H_0 : \mu \leq \mu_0$

$H_1 : \mu > \mu_0$

[$\mu_0 = 20 \rightarrow$ The standard potato yield ~~from~~ the for the given Variety]

a) ~~Given~~ $\therefore H_0 : \mu \leq 20$

$H_1 : \mu > 20$

Given that, the farming Company believes that there is an improvement in the standard potato yield by the introduction of a new fertilizer.

In the above mentioned case sample size $(n = 12)$ and their mean yield is 22.

Standard deviation of potato yields is 3.

Step 2: Calculate T-statistic

$$T = \frac{\bar{X} - \mu_0}{S/\sqrt{n}}$$

$\bar{X} = 22$ (Sample mean given) $\mu_0 = 20$

$n = 12$ and $S = 3$

$$T = \frac{22 - 20}{3/\sqrt{12}} = \frac{2}{\frac{3}{\sqrt{12}}} = 2.3094$$

Step 3: If $T > t_{n-1, \alpha}$ reject H_0

4 Continuation

(b) $t_{n-1, \alpha} = t_{11, 0.05} = 1.796$

The test we have taken is One-tailed test & the Critical value is given by 1.796

$2.3094 > 1.796$ We reject H_0

Step (3) We can Use P.value to provide Confidence in the rejection region

$P\text{-Value} = P(T > t)$

$P\text{-value} = P(T > 2.3094)$

Using P.value Calculator, we get

$P\text{-value} = 0.020671$

$P \leq 0.05$

If P-value ≤ 0.05 is Considered as a statistically significant region. Therefore, we reject the null hypothesis.

~~H~~ ∴ We accept Alternative hypothesis saying that there is an improvement in the standard potato yield due to the new fertilizer.