

4. A study was made of adult men from region A of a country.

It was found that their heights were normally distributed with a mean of 175.4 cm and standard deviation 6.8 cm.

- (a) Find the proportion of these men that are taller than 180 cm.

(1)

(a) Let H_A be height of a man from region A.

$$H_A \sim N(175.4, 6.8^2)$$

$$P(H_A > 180) = \left[\begin{array}{l} \text{(calculator)} \\ \text{MENU Distribution} \\ \text{Normal CD} \\ \text{Lower: 180 / Upper: 1000} \end{array} \right] = 0.2493... = 0.249 \text{ (3sf)}$$

very big number

A student claimed that the mean height of adult men from region B of this country was different from the mean height of adult men from region A.

A random sample of 52 adult men from region B had a mean height of 177.2 cm

The student assumed that the standard deviation of heights of adult men was 6.8 cm both for region A and region B.

- (b) Use a suitable test to assess the student's claim.

You should

- state your hypotheses clearly
- use a 5% level of significance

(4)

(b) Let H_B be height of a man from region B.

$$H_B \sim N(\mu, 6.8^2)$$

$$H_0: \mu = 175.4$$

$$H_1: \mu \neq 175.4 \text{ (a two-tailed test)}$$

Under H_0 , the mean of a sample of 52, $\bar{H}_B \sim N(175.4, \frac{6.8^2}{52})$

$$P(\bar{H}_B \geq 177.2) = \left[\begin{array}{l} \text{(calculator)} \\ \text{MENU Distribution} \\ \text{Normal CD} \\ \text{Lower: 177.2 / Upper: 1000} \end{array} \right] = 0.02814...$$

5% sig. level for two-tailed test $\Rightarrow 2\frac{1}{2}\%$ sig. level in each tail

$0.02814... > 2\frac{1}{2}\%$, so insufficient evidence to reject H_0 .

Insufficient evidence to support claim that mean height in region B is different from region A.

- (c) Find the p-value for the test in part (b)

(1)

(c) The p-value is the probability of obtaining results as extreme as observed, if H_0 was true.

$$\begin{aligned} \text{Here, } p\text{-value} &= 2 \times 0.02814... \text{ (two-tailed test)} \\ &= 0.05628... = 5.63\% \text{ (3sf)} \end{aligned}$$