LC 2017: PAPER 2

QUESTION 8 (60 MARKS)

Question 8 (a)

> **FORMULAE AND TABLES BOOK**
> **Statistics and Probability: Probability distribution** (standarding formula) [page 34]
> $$z = \frac{x - \mu}{\sigma}$$
> n = Number in the sample
> σ = standard deviation of the sample

Population: $\mu = 63 \cdot 5$ kg, $\sigma = 10$ kg

(i) Mariska: $X = 50$ kg

$$Z = \frac{x - \mu}{\sigma} = \frac{50 - 63 \cdot 5}{10} = -1 \cdot 35$$

$$P(x > 50) = P(z > -1 \cdot 35) = P(z \leq 1 \cdot 35)$$
$$= 0 \cdot 9115 = 91 \cdot 15\%$$

(ii) Kamal: $X = ?$

$$P(Z > z) = 0 \cdot 015$$
$$1 - P(Z \leq z) = 0 \cdot 015$$
$$P(Z \leq z) = 1 - 0 \cdot 015 = 0 \cdot 985 \Rightarrow Z = 2 \cdot 17$$
$$Z = \frac{X - \mu}{\sigma} \Rightarrow 2 \cdot 17 = \frac{X - 63 \cdot 5}{10}$$
$$21 \cdot 7 + 63 \cdot 5 = X$$
$$X = 85 \cdot 2 \text{ kg}$$

(iii) Null hypothesis H_0: $\mu = 63 \cdot 5$ kg [Weight has **not** changed from 2015 to 2016]

Alternative hypothesis H_1: $\mu \neq 63 \cdot 5$ kg [Weight has changed from 2015 to 2016]

Sample: $n = 150$, $\bar{x} = 62$ kg, $\bar{\sigma} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{150}}$

z statistic: $\bar{z} = \frac{\bar{x} - \mu}{\bar{\sigma}} = \frac{62 - 63 \cdot 5}{\frac{10}{\sqrt{150}}} = -1 \cdot 84$

$\bar{z} = -1 \cdot 84 > -1 \cdot 96$ [Do not reject H_0]

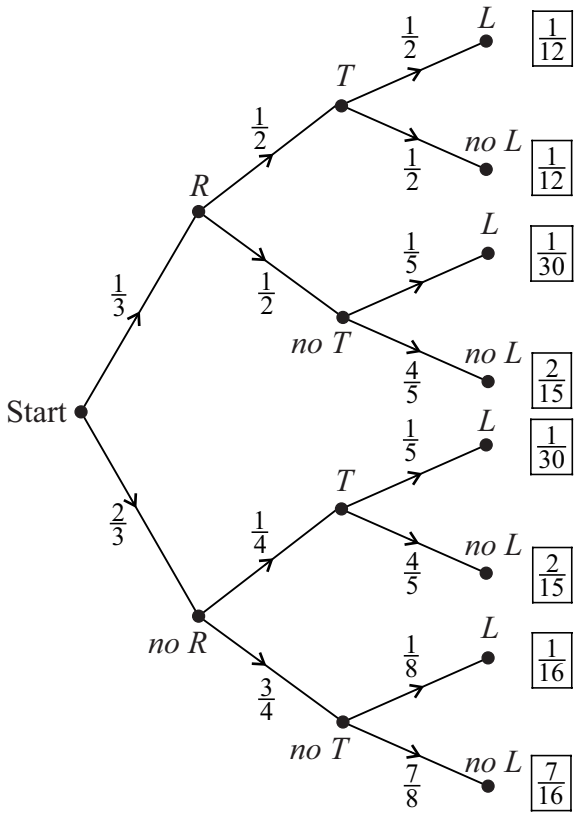
or

$$p = 2\{1 - P(z < |-1 \cdot 84|)\} = 2\{1 - P(z < 1 \cdot 84)\}$$
$$= 2\{1 - (0 \cdot 9671)\} = 0 \cdot 0658$$

$p = 0 \cdot 0658 > 0 \cdot 05$ [Do not reject H_0]

> $\bar{z} = \frac{\bar{x} - \bar{\mu}}{\bar{\sigma}}$, where $\bar{\mu} = \mu$ and $\bar{\sigma} = \frac{\sigma}{\sqrt{n}}$.

Question 8 (b) (i)



Question 8 (b) (ii)

$$P(L) = \frac{1}{12} + \frac{1}{30} + \frac{1}{30} + \frac{1}{16} = \frac{17}{80}$$

Question 8 (b) (ii)

$$\boxed{P(B \mid A) = \frac{P(A \cap B)}{P(A)}}$$

$$P(R \mid L) = \frac{P(R \cap L)}{P(L)} = \frac{P(R \text{ and then } L)}{P(L)}$$

$$= \frac{\frac{1}{12} + \frac{1}{30}}{\frac{17}{80}} = \frac{28}{51}$$