

Question 4

Jan

(25 marks)

- (a) A Bernoulli experiment is a random experiment that satisfies certain conditions. Name any three of these conditions.

- Set number of trials
- Outcomes independent of each other
- Only 2 possible outcomes for each trial
- Prob. of success is constant

- (b) The median annual household income in Ireland is €32 000. Among 10 randomly selected Irish households, find the probability that:

- (i) eight or more had an income exceeding this,

Either 8 or 9 or 10 successes.

$$\binom{10}{8} \left(\frac{1}{2}\right)^8 \left(\frac{1}{2}\right)^2 + \binom{10}{9} \left(\frac{1}{2}\right)^9 \left(\frac{1}{2}\right)^1 + \binom{10}{10} \left(\frac{1}{2}\right)^{10} \left(\frac{1}{2}\right)^0$$

$$= \boxed{0.054}$$

- (ii) at least two households had an income exceeding this.

$$P(\text{at least } 2) = 1 - P(0 \text{ or } 1)$$

$$= 1 - \binom{10}{0} \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^{10} - \binom{10}{1} \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^9$$

$$= \boxed{0.989}$$