# Revision answers: Statistics and probability (Topic 5)

## Coursebook chapters: 16–18

**1.** Use the midpoint to create a frequency table:

| Midpoint | Frequency |
|---|---|
| 9 | 26 |
| 14.5 | 18 |
| 19.5 | 45 |

From GDC: mean=15.4, S.D. = 4.54 *[4 marks]*

**2.** Using Venn diagram or formula:

$$P(C \cup I) = \frac{16}{20} = P(C) + P(I) - P(C \cap I) = \frac{6}{20} + \frac{14}{20} - P(C \cap I)$$

$\Rightarrow$ $P(C \cap I) = 0.2$ *[5 marks]*

**3.** (a) P(walk) = 1 − P(rain or late) = 1 − (P(rain) + P(late) − P(rain and late))

As they are independent, P(rain and late) = 0.3 × 0.6 = 0.18, so P(walk) = 0.28

(b) $P(\text{rain}|\text{bus}) = \frac{P(\text{rain and bus})}{P(\text{bus})} = \frac{P(\text{rain})}{P(\text{bus})} = \frac{0.3}{0.72} = 0.417$ *[6 marks]*

**4.** Using GDC:

(a) $r = 0.822$

(b) $y = 0.490x + 5.46$

(c) When $y = 28$, $x = 46$

**5.** $X \sim \text{N}(0.3, 0.04^2)$

(a) $\text{P}(X > 0.36) \times \text{P}(X > 0.36) = 0.00446$

(b) $2 \times \text{P}(X < 0.4) \times \text{P}(X > 0.4) = 0.0123$ *[6marks]*

**6.** $X \sim \text{N}(50, 4)$, P(double-yolked) $= 0.1 \times \text{P}(X > 60) = 0.000210$

$Y \sim \text{B}(12, 0.000210)$, $\text{P}(Y = 1) = 0.00740$ *[5marks]*

**7.** (a) $X \sim \text{B}(4, p)$, $\text{P}(X = 3 \text{ or } 4) = 4p^3(1-p) + p^4 = 4p^3 - 3p^4$

(b) $4p^3 - 3p^4 = 0.05$ when $p = 0.248$ (using GDC) *[5 marks]*

**8.** (a) $\text{E}(X) = 0 \times \frac{1}{2} + 1 \times \frac{1}{3} + 2 \times \frac{1}{6} = \frac{2}{3}$

(b) The possible ways of scoring three points out of four hands are (CHECK THE TABLE!):

| **Distribution of points** | **Combinations** | **Probability** |
|---|---|---|
| 2, 1, 0, 0 | $4 \times 3 = 12$ | 1/72 |
| 1, 1, 1, 0 | 4 | 1/54 |

Out of those, only the ones in the first row contain a two-point hand, so:

$$p = \frac{12 \times \frac{1}{72}}{12 \times \frac{1}{72} + 4 \times \frac{1}{54}} = \frac{9}{13} \text{ or } 0.69$$ *[7 marks]*

**9.** $X \sim \text{N}(252, \sigma^2)$, $\text{P}(X \geq 250) = 0.99$ so $\text{P}(X < 250) = 0.01$

Standardising: $\text{P}\left(Z < \frac{250 - 252}{\sigma}\right) = 0.01 \Rightarrow -\frac{2}{\sigma} = -2.32 \Rightarrow \sigma = 0.860$ g *[5 marks]*

**13.** $\text{E}(a^x) = \sum_{x=0}^{n} \binom{n}{x} p^x (1-p)^{n-x} a^x = \sum_{x=0}^{n} \binom{n}{x} (ap)^x (1-p)^{n-x} = (ap + 1 - p)^n$ *[5 marks]*