STATISTICS 1 (A) TEST PAPER 10 : ANSWERS AND MARK SCHEME

1. (a) $P(A \cap B) \neq 0$, so not mutually exclusive — B1

   (b) $0{\cdot}65 = 0{\cdot}3 + P(B) - 0{\cdot}15$ $\quad P(B) = 0{\cdot}5$ — M1 A1

   $P(A) \times P(B) = 0{\cdot}3 \times 0{\cdot}5 = 0{\cdot}15 = P(A \cap B)$, so independent — A1 — 4

2. (a) (i) e.g. score on a die (ii) e.g. ages in a population — B1 B1

   (b) Discrete uniform (discrete), normal distribution (continuous) — B1 B1 — 4

3. (a) $P(X = x) = \frac{k}{x}$ $\quad \frac{k}{1} + \frac{k}{2} + \frac{k}{3} + \frac{k}{4} = 1$ $\quad 25k = 12$ $\quad k = \frac{12}{25}$ — M1 M1

   so $P(1) = \frac{12}{25}$ $\quad P(2) = \frac{6}{25}$ $\quad P(3) = \frac{4}{25}$ $\quad P(4) = \frac{3}{25}$ — A1 A1 A1

   (b) $E(X) = \frac{4 \times 12}{25} = 1{\cdot}92$ — M1 A1

   $E(X^2) = \frac{12 + 24 + 36 + 48}{25} = 4{\cdot}8$ $\quad \text{Var}(X) = 4{\cdot}8 - 1{\cdot}92^2 = 1{\cdot}11$ — M1 A1 A1 — 10

4. (a) $P(X < 16) = P(Z < -1/\sigma)$ $\quad -0{\cdot}33 = -1/\sigma$ $\quad \sigma = 3{\cdot}03$ — M1 A1 M1 A1

   (b) $P(X > 20) = P(Z > 3/3{\cdot}03) = P(Z > 0{\cdot}99) = 1 - 0{\cdot}839$ — M1 A1 M1

   $= 0{\cdot}161$, so would expect 12 to be over 20 — A1 M1 A1 — 10

5. (a) $P(\text{C.S.}) = 1 - \frac{3}{8} - \frac{1}{5} = \frac{17}{40}$ — M1 A1

   (b) $P(\text{both do the same}) = \frac{3^2}{8} + \frac{1^2}{5} + \frac{17^2}{40} = 0{\cdot}361$ — M1 A1 A1

   (c) $P(1 \text{ games, other 2 not}) = \frac{3}{8} \times \frac{5}{8} \times \frac{5}{8} \times 3 = 0{\cdot}439$ — M1 A1 A1

   (d) Let $P(\text{Boy does P.S.}) = p$ $\quad$ By tree diagram or otherwise,

   $\frac{3}{5}p + \frac{1}{10} = \frac{1}{5}$ $\quad p = \frac{1}{6}$ — M1 A1

   So $P(\text{Boy} \mid \text{P.S.}) = (\frac{3}{5} \times \frac{1}{6}) \div \frac{1}{5} = \frac{1}{2}$ — M1 M1 A1 — 13

6. (a) $S_{yy} = 810{\cdot}104$ $\quad S_{xy} = 0{\cdot}8 \times 810{\cdot}104 = 648{\cdot}0832$ — B1 M1

   $\sum xy = S_{xy} + (\sum x \sum y)/10 = 1835{\cdot}2$ — M1 A1

   (b) $S_{xx} = 862{\cdot}075$ $\quad y - 11{\cdot}36 = \frac{648{\cdot}0832}{862{\cdot}075}(x - 10{\cdot}45)$ — M1 A1 A1

   $y = 0{\cdot}752x + 3{\cdot}50$ — M1 A1

   (c) $r = \sqrt{(0{\cdot}776 \times 0{\cdot}8)} = 0{\cdot}776$ $\quad$ (d) Moderate positive corr. — M1 A1 A1; B1 — 13

7. (a) (i) Median = 30th value $\approx 20 + \frac{17}{18}(10) = 29{\cdot}4$ — M1 A1

   (ii) $Q_1 \approx 20 + \frac{1}{9}(10) = 21{\cdot}1$ $\quad Q_3 \approx 40 + \frac{2}{9}(10) = 42{\cdot}2$ — A1 A1

   so IQR $\approx 21{\cdot}1$ $\quad$ (iii) $20 + \frac{6{\cdot}8}{18}(10) = 23{\cdot}8$ — A1 M1 A1

   (b) Outliers range from $-10{\cdot}55$ to $73{\cdot}9$, so 79 is an outlier — B1

   Box plot drawn $\quad$ (c) Positive skew — B4; B1

   (d) Median and IQR, as they are not affected by the outlier — B1 B1

   (e) Box plot $\quad$ Second set slightly higher overall, with wider spread — B4 B1 B1 — 21