STATISTICS 1 (A) TEST PAPER 4 : ANSWERS AND MARK SCHEME

1. (a) All cards are equally likely to be drawn — B1

    (b) $E(X) = 31$ $\text{Var } X = 4 \times \dfrac{30^2 - 1}{12} = 299\frac{2}{3}$ — M1 A1 M1 A1 A1   6

2. (a) Frequency density may not be greatest in that class — B2

    (b) 1000 families : 50 cm^2, so 400 families : 20 cm^2 — M1

    Width of '30 - 40' = 2·5 cm, so width of '15 - 20' = 1·25 cm — M1 A1 A1

    Area of '15 - 20' = 15 cm^2, so height $= 15 \div 1.25 = 12$ cm — B1 M1 A1   9

3. (a) $M = (94 + 106) \div 2 = 100$ — B1

    (b) y values : $-20, -17, -12, -10, -3, 3, 5, 8, 12, 20$ — B1

    $E(Y) = -1.4$, so $E(X) = 2(-1·4) + 100 = 97·2$ — M1 A1

    s.d. of $Y = \sqrt{156·44} = 12·5$, so s.d. of $X = 25·0$ — M1 A1 A1

    (c) $E(3X - 5) = 3(97·2) - 5 = 286·6$ — M1 A1 A1   10

4. (a) $k(1 + 2 + \ldots + 8) = 1$ $36k = 1$ $k = \dfrac{1}{36}$ — M1 M1 A1

    (b) $P(X < 0) = \dfrac{6}{36} = \dfrac{1}{6}$ — M1 A1

    (c) $F(X) = \dfrac{1}{36} + \dfrac{2}{36} + \ldots + \dfrac{x+4}{36} = \dfrac{1}{36}(1 + 2 + \ldots [x + 4])$ — M1 A1

    $= \dfrac{1}{2} \times \dfrac{1}{36}(x + 4)([x + 4] + 1) = \dfrac{1}{72}(x + 4)(x + 5)$ — M1 M1 A1 A1   11

5. (a) $0·88 = P(A) + 0·52 - 0·24$ $P(A) = 0·6$ — M1 A1 A1

    (b) (i) No : $P(A \cap B) \neq 0$ (ii) No : $0·6 \times 0·52 \neq 0·24$ — M1 A1 M1 A1

    (c) $P(B \mid A) = 0·24 \div 0·6 = 0·4$ — M1 A1

    (d) $P(A' \mid B') = P(A' \cap B') / P(B') = 0·12 \div 0·48 = 0·25$ — M1 A1 A1   12

6. (a) $P(5 < X < 9) = P(-1·5 < Z < 0·5) = 0·6915 - 0·0668 = 0·625$ — M1 A1 M1 A1

    (b) Need $P(X < k) = 0·9$, so $(k - 8)/2 = 1·28$ $k = 10·56$ — B1 M1 A1

    Range is 5·4 hours to 10·6 hours — A1 A1

    (c) If $P(X > 5) = 0·8$, $(5 - 8)/\sigma = -0·84$ $\sigma = 3·57$ — M1 A1 A1   12

7. (a) $S_{yy} = 109·177$, $S_{xy} = -16·298$ — B1 B1

    $x - \dfrac{12·905}{7} = \dfrac{16298}{109177}\left(y - \dfrac{1082}{7}\right)$ — M1 A1

    $x - 1·84357 = -0·14928(y - 15·4571)$ $x = -0·149y + 4·15$ — M1 A1

    (b) $S_{xx} = 3·1038$ $r = -0·885$ Quite good negative correlation — M1 A1 A1 B1

    (c) $y = 12$ gives $x \approx 2·36$ Not necessarily accurate - — M1 A1

    n is small, which reduces significance of strong correlation — B1

    (d) When y is close to 0, x tends to 4·15, suggesting that a 4·15 litre — B1

    car would travel no km on any amount of fuel – meaningless — B1   15