STATISTICS 1 (A) TEST PAPER 8 : ANSWERS AND MARK SCHEME

1. Y values $-3, -2, \ldots, 4$ $\quad \sum y = 5,\ \sum y^2 = 57$ — B1 B1

$E(Y) = 5 \div 20 = 0{\cdot}25$ $\quad E(X) = 5E(Y) + 90 = 91{\cdot}25$ — M1 A1

$\text{Var}(Y) = \frac{57}{20} - \frac{1}{16} = \frac{223}{80}$ $\quad \text{Var}(X) = 25\ \text{Var}(Y) = 69{\cdot}7$ — M1 M1 A1

s.d. of Y $= \sqrt{69{\cdot}7} = 8{\cdot}35$ — A1 — 8

2. (a) Let P(miss after hit) $= x$ $\quad 0{\cdot}75 + 0.25x = 0.9$ — M1 M1

$x = 0{\cdot}6$ $\quad$ P(H, M) $= 0{\cdot}25 \times 0{\cdot}6 = 0{\cdot}15$ — A1 M1 A1

(b) P[(M, M) | at least 1 miss] $= (0{\cdot}75 \times 0{\cdot}7) \div 0{\cdot}9 = 0{\cdot}583$ — M1 A1 A1 — 8

3. (a) $P(X > 1{\cdot}9) = 0{\cdot}02$ $\quad P(Z > 0{\cdot}3/\sigma) = 0{\cdot}02$ $\quad \sigma = 0{\cdot}3/2{\cdot}06 = 0{\cdot}146$ — M1 A1 M1 A1

(b) If $P(X < x) = 0{\cdot}995$, $\quad (x - 1{\cdot}6)/0{\cdot}146 = 2{\cdot}60$ $\quad x = 1{\cdot}98$ m — M1 M1 A1 A1 — 8

4. (a) $P(X \le 5) = \frac{20}{52} = \frac{5}{13}$ — B1

(b) Discrete uniform dist. on $\{1, \ldots, 13\}$ $\quad E(X) = 7,\ \text{Var}(X) = 14$ — B1 B1 M1 A1

(c)

y	2	3	4	5	6
$P(Y = y)$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{12}$

— M1 A1 A1

(d) $E(Y) = 3{\cdot}5$ $\quad E(Y^2) = 1 + 3 + \frac{8}{3} + \frac{25}{6} + 3 = 13{\cdot}83$ — M1 A1 A1

$\text{Var}(Y) = 1{\cdot}58$ $\quad \text{Var}(3Y - 2) = 9\ \text{Var}(Y) = 14{\cdot}25$ — M1 A1 A1 — 14

5. (a) Diagram : totals in groups 2, 6, 11, 9, 12, 7, 6, 4, 3; key — M2 A4 B1

(b) $Q_1 \approx 17$ $\quad Q_2 \approx 25{\cdot}5$ $\quad Q_3 \approx 32$ — M1 A1 A1 A1

(c) Box plot drawn — B4

(d) Negative skew — B1 — 16

6. (a) $h = t(p - qt)$ $\quad \frac{h}{t} = p - qt$ — B1

(b)

t	1	2	3	4	5	6	7
$\frac{h}{t}$	68	64	58	54	48	42	38

— M1 A1

Scatter graph drawn — B3

(c) $\sum t = 28,\ \sum t^2 = 140,\ \sum t(\frac{h}{t}) = \sum h = 1342$ — B1 B1

$\frac{h}{t} - \frac{371}{7} = \frac{7(1342) - 28(371)}{7(140) - 28^2}\left(t - \frac{28}{7}\right)$ $\quad \frac{h}{t} - 53 = -5{\cdot}07(t - 4)$ — M1 A1 A1

$\frac{h}{t} = -5{\cdot}07t + 73{\cdot}3$ $\quad p = 73{\cdot}3,\ q = 5{\cdot}07$ — M1 A1 A1

(d) $t = 10$: $h/10 = 22{\cdot}6$ $\quad h = 226$ $\quad$ Coming down again — M1 A1 A1

(e) $r = \dfrac{-994}{\sqrt{(7(20385) - 371^2)}} = -0{\cdot}999$ — M1 M1 A1

Shows that the formula is a very good fit to the data and confirms that $\frac{h}{t}$ decreases as t increases. — A1 — 21