

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

1. Y values $-3, -2, \dots, 4$ $\sum y = 5, \sum y^2 = 57$ B1 B1
 $E(Y) = 5 \div 20 = 0.25$ $E(X) = 5E(Y) + 90 = 91.25$ M1 A1
 $\text{Var}(Y) = \frac{57}{20} - \frac{1}{16} = \frac{223}{80}$ $\text{Var}(X) = 25 \text{Var}(Y) = 69.7$ M1 M1 A1
s.d. of $Y = \sqrt{69.7} = 8.35$ A1 8
2. (a) Let $P(\text{miss after hit}) = x$ $0.75 + 0.25x = 0.9$ M1 M1
 $x = 0.6$ $P(H, M) = 0.25 \times 0.6 = 0.15$ A1 M1 A1
(b) $P[(M, M) \mid \text{at least 1 miss}] = (0.75 \times 0.7) \div 0.9 = 0.583$ M1 A1 A1 8
3. (a) $P(X > 1.9) = 0.02$ $P(Z > 0.3/\sigma) = 0.02$ $\sigma = 0.3/2.06 = 0.146$ M1 A1 M1 A1
(b) If $P(X < x) = 0.995$, $(x - 1.6)/0.146 = 2.60$ $x = 1.98$ m M1 M1 A1 A1 8
4. (a) $P(X \leq 5) = \frac{20}{52} = \frac{5}{13}$ B1
(b) Discrete uniform dist. on $\{1, \dots, 13\}$ $E(X) = 7, \text{Var}(X) = 14$ 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) $E(Y) = 3.5$ $E(Y^2) = 1 + 3 + \frac{8}{3} + \frac{25}{6} + 3 = 13.83$ M1 A1 A1
 $\text{Var}(Y) = 1.58$ $\text{Var}(3Y - 2) = 9 \text{Var}(Y) = 14.25$ M1 A1 A1 14
5. (a) Diagram : totals in groups 2, 6, 11, 9, 12, 7, 6, 4, 3; key M2 A4 B1
(b) $Q_1 \approx 17$ $Q_2 \approx 25.5$ $Q_3 \approx 32$ M1 A1 A1 A1
(c) Box plot drawn B4
(d) Negative skew B1 16
6. (a) $h = t(p - qt)$ $\frac{h}{t} = p - qt$ 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
 $\frac{h}{t} - \frac{371}{7} = \frac{7(1342) - 28(371)}{7(140) - 28^2} (t - \frac{28}{7})$ $\frac{h}{t} - 53 = -5.07(t - 4)$ M1 A1 A1
 $\frac{h}{t} = -5.07t + 73.3$ $p = 73.3, q = 5.07$ M1 A1 A1
(d) $t = 10 : h/10 = 22.6$ $h = 226$ Coming down again M1 A1 A1
(e) $r = \frac{-994}{\sqrt{7(20385) - 371^2}} = -0.999$ 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