Stats 1 – May / June 2010

(1) a) From calculator: $\Sigma x^2 = 158\ 358\ 90$

$r = 0.915044...$

b) Very strong, positive, linear correlation between weight and engine power

(2) a) i) From calculator: $\Sigma x = 18$ $\Sigma x^2 = 1680$

Mean $(\bar{x}) = 1.5$

Sample sd $(s) = 12.258577...$

ii) Mean $= 50 + 1.5 = 51.5$p

sd = same $= 12.2585...$

b) Mean $= 51.5 \times 1.22 = 62.83$ cent

$= 0.6283$ EURO

sd $= 12.258 \times 1.22 = 14.954$ cent

$= 0.1495$ EURO

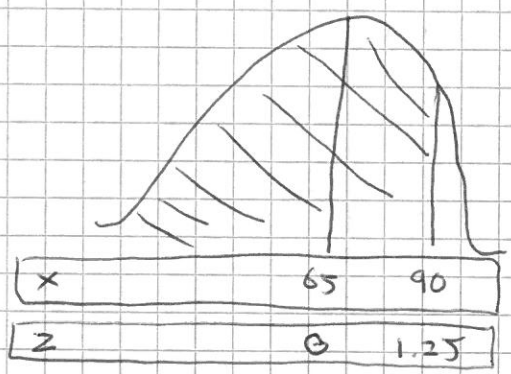
(3) $X \sim N(65, 20^2)$

a i) $P(X < 90)$

$= P(Z < \frac{90-65}{20})$

$= P(Z < 1.25)$

$= 0.89435$



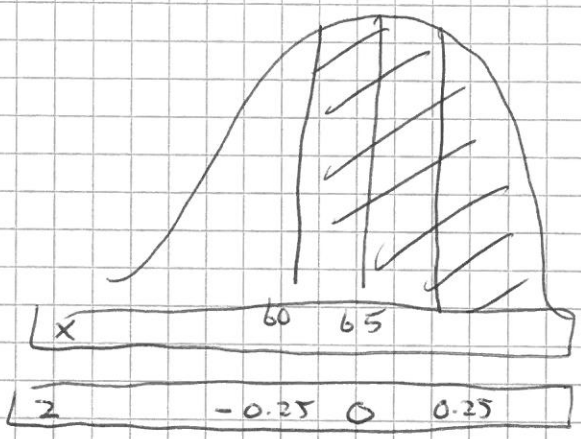
ii) $P(X > 60)$

$= P(Z > \frac{60-65}{20})$

$= P(Z > -0.25)$

$= P(Z < 0.25)$

$= 0.59871$



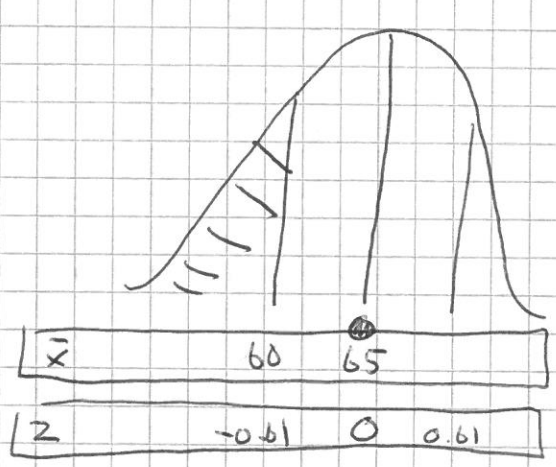
b) i) Exactly! $P(X = 60) = 0$.

ii) From a iii) $P(X < 60) = 1 - 0.59871$

$= 0.40129$

Each day → $0.40129^6 = 0.004175\ldots$

iii) $\bar{X} \sim N(65, 20^2/6)$



$P(\bar{X} < 60)$

$= P(Z < \frac{60 - 65}{20/\sqrt{6}})$

$= P(Z < -0.61\ldots)$

$= P(Z > 0.61)$

$= 1 - P(Z < 0.61)$

$= 1 - 0.72907$

$= 0.27093$

(4) a) $M \sim B(50, 0.15)$

i) $P(M \leq 10) = 0.8801$ (tables)

ii) $P(M \geq 5) = 1 - P(M \leq 4)$

$= 1 - 0.1121 = 0.8879$

iii) $P(6 < M < 12)$

can be: 7, 8 ... 11

$= P(M \leq 11) - P(M \leq 6)$

$= 0.9372 - 0.3613 = 0.5759$

b) $F \sim B(35, 0.11)$

$P(F = 4) = {}^{35}C_4 \times 0.11^4 \times 0.89^{31}$

$= 0.20685$

c) Number of males in sample $= 0.52 \times 2000 = 1040$

Males Mean $= np = 1040 \times 0.15 = 156$

Number of females in sample = $0.48 \times 2000 = 960$

Female Mean = $np = 960 \times 0.11 = 105.6$

$\therefore$ Total = $156 + 105.6 = 261.6$

(5) a) i) $P(J, R) = 0.9 \times 0.7 = 0.63$

ii) $P(J', R') = 0.1 \times 0.8 = 0.08$

iii) $P(\text{at least 1}) = 1 - P(\text{no sous})$

$= 1 - 0.08 = 0.92$

b) i)

	M	M'	TOTAL
D	0.4	0.35	0.75
D'	0.2	0.05	0.25
TOTAL	0.6	0.4	1

ii) (A) $P(D', M') = 0.05$

(B) $P(D, M') = 0.35$

(C) $P(1 \text{ cow}) = 0.35 + 0.2 = 0.55$

(6) a) From calculator: $a = 509.7169...$ (intercept)

$b = 3.2547...$ (gradient)

$\rightarrow y = 509.716 + 3.2547x$

b) i) See mark scheme

$x = 80, \quad y = 769$

$x = 40, \quad y = 639$

ii) (1) There is evidence of a weak, positive linear correlation

(2) E and H are outliers

c) i) See mark scheme.

c) ii) $b = \frac{S_{xy}}{S_{xx}} = \frac{14760}{1272} = 11.603$

$a = \bar{y} - b\bar{x}$

$= 720 - 11.603 \times 60 = 23.7735$

$\rightarrow y = 23.7735 + 11.603$

iii) Less residuals and outliers

More evidence of a stronger positive correlation between age and reaction time.