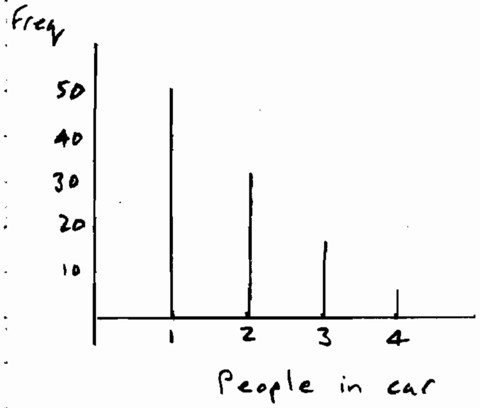
1) i) Total people $= 50+31+16+5$
$= 102$

Median is item $\frac{102+1}{2}$ = item 51.5

Median = 2

Mode = 1

ii)



iii) Positive Skew

2) 14 girls + 11 boys = 25 people

i) $25C5 = 53,130$

ii) $14C3 \times 11C2 = 20,020$

3) $n = 12$, $\Sigma x = 126$

$\Sigma x^2 = 1582$

i) $\bar{x} = \frac{\Sigma x}{n} = \frac{126}{12} = 10.5$

$$s.d = \sqrt{\frac{\Sigma x^2 - n\bar{x}^2}{n-1}}$$

$$s.d. = \sqrt{\frac{1582 - 12 \times 10.5^2}{11}}$$

$s.d. = 4.852$

ii) Mean earnings $= 500 + 100\bar{x}$

$= 500 + 100 \times 10.5$

$= £1550$

s.d earnings $= 100 \times s.d_x$

$= 100 \times 4.852$

s.d earnings $= £485.20$

iii) Marlene earnings mean = £1625

Mean cars $\bar{y}$ given by

$500 + 100\bar{y} = 1625$

$100\bar{y} = 1125$

$\bar{y} = 11.25$

$sd_y = \frac{280}{100} = 2.8$

	$\bar{x}$	sd
Dwayne	10.5	4.852
Marlene	11.25	2.8

On average Marlene sells slightly more cars than Dwayne. Also the number of cars Marlene sells is less variable than the number sold by Dwayne.

4)

r	10	20	30	40
$P(X=r)$	0.2	0.3	0.3	0.2

i) $E(X) = \sum r\,P(X=r)$

$= 10\times0.2 + 20\times0.3$

$+ 30\times0.3 + 40\times0.2$

$= 2 + 6 + 9 + 8 = 25$

ii) $Var(X) = E(X^2) - (E(X))^2$

$E(X^2) = 0.2\times10^2 + 0.3\times20^2$

$+ 0.3\times30^2 + 0.2\times40^2$

$E(X^2) = 730$

$Var(X) = E(X^2) - (E(X))^2$

$Var(X) = 730 - 25^2$

$Var(X) = 105$

5) i) See graph paper

Distance	Freq	Freq Density
$0 \le d < 50$	360	$\frac{360}{50} = 7.2$
$50 \le d < 100$	400	$\frac{400}{50} = 8.0$
$100 \le d < 200$	307	$\frac{307}{100} = 3.07$
$200 \le d < 400$	133	$\frac{133}{200} = 0.665$

ii) 1200 tourists

Median = 600 th item

$600 - 360 = 240$

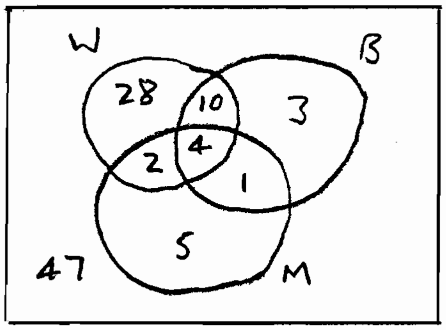
Median is $\frac{240}{400}$ of the way through interval $50 < d \le 100$

Median $= 50 + \frac{240}{400}\times 50$

$= 50 + 30 = 80$

Estimate of median = 80

6)



i) A) P(At most one problem)

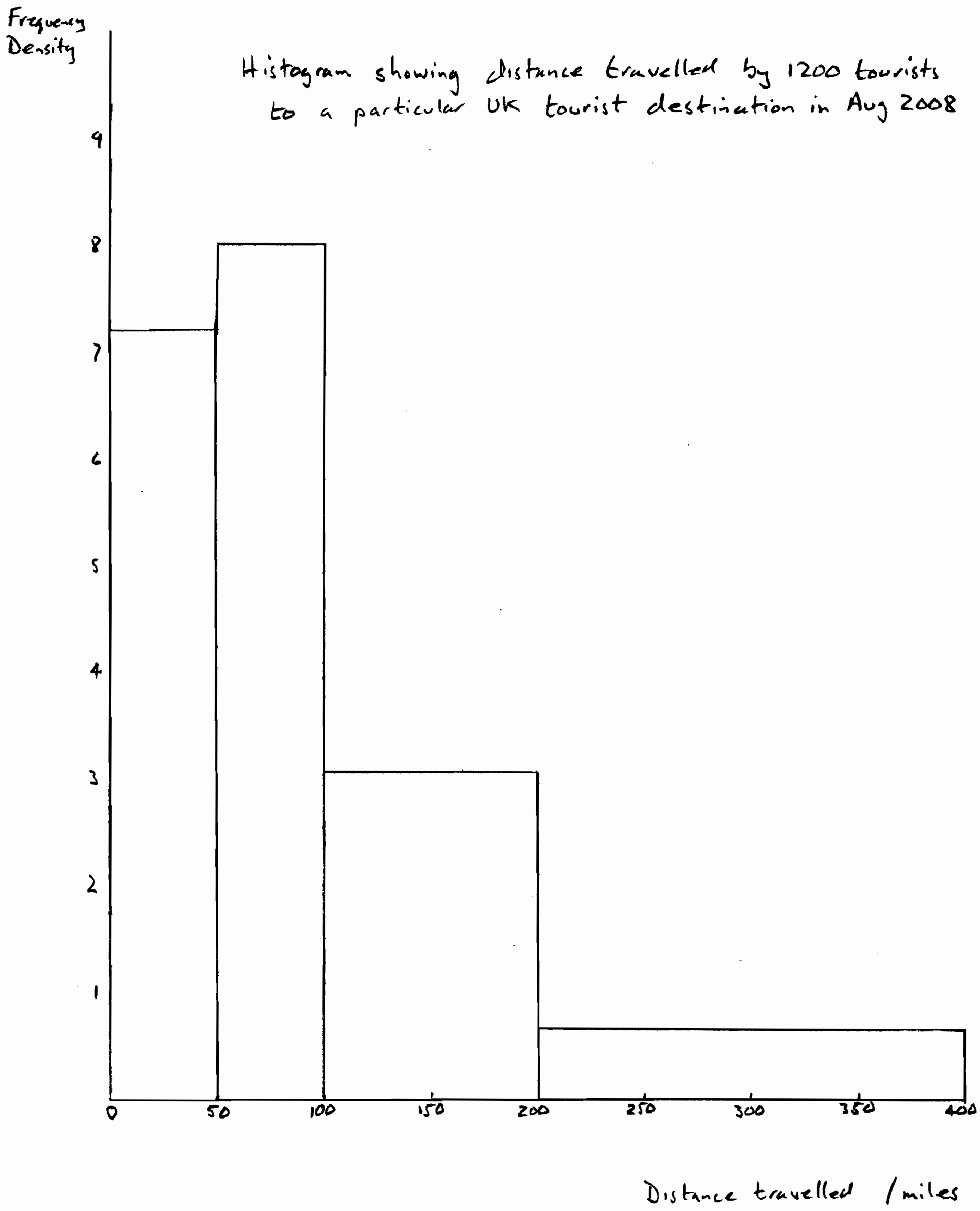
$= \frac{47+28+3+5}{100} = \frac{83}{100}$

B) P(Exactly 2 problems)

$= \frac{2+10+1}{100} = \frac{13}{100}$

ii) P(All 3 have at least one problem)

$= \frac{53}{100}\times\frac{52}{99}\times\frac{51}{98} = 0.1449$


Frequency Density
Histogram showing distance travelled by 1200 tourists to a particular UK tourist destination in Aug 2008
9
8
7
6
5
4
3
2
1
0
50
100
150
200
250
300
350
400
Distance travelled /miles

7) i) $a = 0.8$
$b = 0.85$
$c = 0.9$

---

ii) $P(\text{Not delayed}) = 0.8 \times 0.85 \times 0.9$

$= 0.612$

$\therefore P(\text{Delayed}) = 1 - 0.612$

$= 0.388$

---

iii) $P(\text{Delayed with just one problem})$

$= 0.2 \times 0.85 \times 0.9$

$+ 0.8 \times 0.15 \times 0.9$

$+ 0.8 \times 0.85 \times 0.1$

$= 0.329$

---

iv) $P(\text{Just one problem} / \text{Delayed})$

$$= \frac{P(\text{Just one problem} \wedge \text{Delayed})}{P(\text{Delayed})}$$

$$= \frac{0.329}{0.388} = 0.8479$$

---

v) $P(\text{Delayed} / \text{No tech problem})$

$$= \frac{P(\text{Delayed} \wedge \text{No tech problem})}{P(\text{No tech problem})}$$

$= (0.8 \times 0.15 \times 0.1 + 0.8 \times 0.15 \times 0.9 + 0.8 \times 0.85 \times 0.1) \div 0.8$

$= 0.235$

---

vi) 110 flights, $p(\text{delayed}) = 0.388$

Expected number delayed

$= 110 \times 0.388$

$= 42.68$

---

8) i) $X \sim B(15, 0.2)$

A) $P(X=3) = {}^{15}C_3 \times 0.2^3 \times 0.8^{12}$

$= 0.2501$

B) $P(X \geq 3) = 1 - P(X \leq 2)$

from tables $= 1 - 0.3980$

$= 0.6020$

C) For Binomial Distribution

$E(X) = np = 15 \times 0.2$

$E(X) = 3$

---

8 ii) A) Let p be prob a child eats at least 5 fruit + veg per day

$H_0: p = 0.2$

$H_1: p > 0.2$

B) An increase in p is suspected

8iii) $P(X \geq 5) = 1 - P(X \leq 4)$
$= 1 - 0.8358$
$= 0.1642$ $> 10\%$

$P(X \geq 6) = 1 - P(X \leq 5)$
$= 1 - 0.9389$
$= 0.0611$ $< 10\%$

Critical region is

$\{6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$

7 is in the critical region so reject H_0 and accept H_1

Conclusion in context:

There is sufficient evidence to accept that the probability of a randomly chosen child eating at least 5 portions of fruit and veg per day is now greater than 0.2