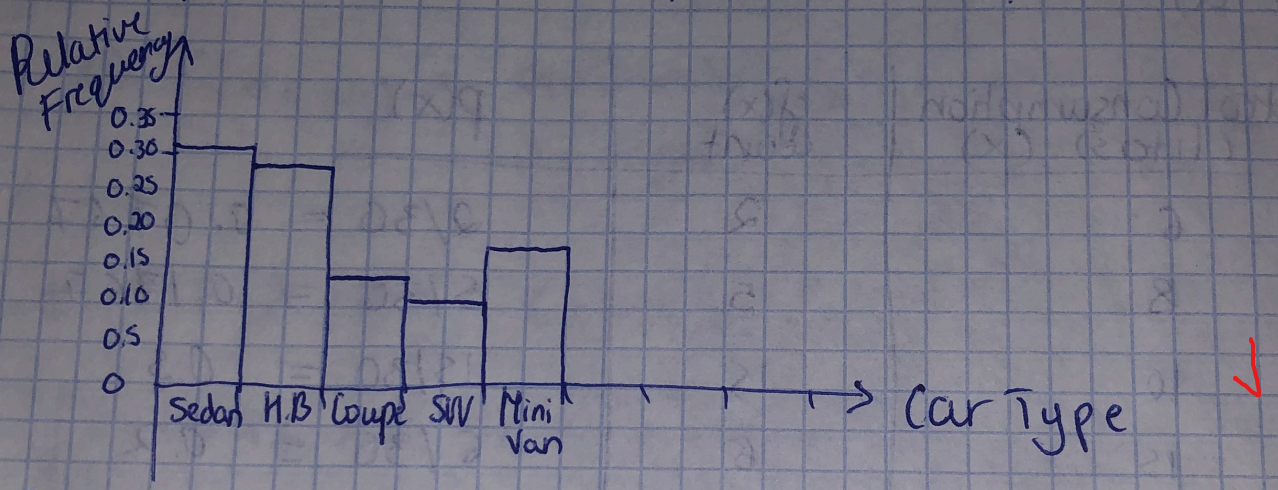
① Preparation for Midterm Exam #1

Relative Frequency:

N	Car Type	# of Cars	Rel. Frequency
1	Sedan	22	0.31 (22/72)
2	Hatchback	20	0.2778 (20/72)
3	Coupe	10	0.14 =
4	SUV	8	0.11 =
5	Minivan	12	0.17 =
Total		72	1



✓

② 7.0; 6.2; 7.7; 8.0; 6.4; 6.2; 7.2; 5.4; 6.4; 6.5; 7.2; 5.4;

1) Mean = $\frac{79.6}{12} = 6.63$ ✓

2) Median = 5.4; 5.4; 6.2; 6.2; 6.4; 6.4; 6.5; 7.0; 7.2; 7.2; 7.7; 8.0;

=> $\frac{12+1}{2} = 6.5$ (position)

$\frac{6.4+6.5}{2} = 6.45$ ✓

3) Mode : (5.4; 6.2; 6.4; 7.2;) ✓

4) Range : 8.0 − 5.4 = 2.6

5) Variance = $(7.0-6.63)^2 + (6.2-6.63)^2 + (7.7-6.63)^2$
$M = 6.63 \;|\; + (8.0-6.63)^2 + (6.4-6.63)^2 + (6.2-6.63)^2$
$+ (7.2-6.63)^2 + (5.4-6.63)^2 + (6.4-6.63)^2$
$+ (6.5-6.63)^2 + (7.2-6.63)^2 + (5.4-6.63)^2$
$= \frac{8.1}{12-1} = 0.74$ ✓

6) St-d deviation : $\sqrt{0.74} = 0.86$ ✓

(3.1) a)

Petrol Consumption (liters) (x)	f(x) count	p(x)
6	2	2/30 = 0.067
8	5	5/30 = 0.167
10	15	15/30 = 0.5
15	6	6/30 = 0.2
20	2	2/30 = 0.067
Total	30	1

b) $\bar{x}$ = 11.08

x	p(x)	
6	× 0.067	= 0.402
8	× 0.167	= 1.3336
10	× 0.5	= 5
15	× 0.2	= 3
20	× 0.067	= 1.434

5

1) x − M

1) $6 - 11.08 = (-5.08)^2 \times 0.067$

2) $8 - 11.08 = (3.08)^2 \times 0.167$

3) $10 - 11.08 = (-1.08)^2 \times 0.5$

4) $15 - 11.08 = (3.92)^2 \times 0.2$

5) $20 - 11.08 = (8.92)^2 \times 0.06$

=> 1) 1.73
2) 1.58
3) 0.58
4) 3.07
5) 5.33

$\sigma^2 = 12.29$

*ASK $\sigma = 3.5$ ✓

c) $P(X<10) = 2+5 = \frac{7}{30}$ ✓

d) $P(X \leq 10) = 2+5+15 = \frac{22}{30} = \frac{11}{15}$ ✓

e) $P(X>10) = 6+2 = \frac{8}{30} = \frac{4}{15}$ ✓

f) $P(8 \leq x \leq 15) = 5+15+6 = \frac{26}{30} = \frac{13}{15}$ ✓

3.2

a) 1. $\bar{x} = (0 \times 0.027) + (1 \times 0.189) + (2 \times 0.441) + (3 \times 0.343)$

$= 2.1$

2. $\sigma = 0.79$

$0 - 2.1 = (-2.1)^2 (0.027) = 4.41 \times 0.027 = 0.12$

$1 - 2.1 = (-1.1)^2 (0.189) = 1.21 \times 0.189 = 0.23$

$2 - 2.1 = (-0.1)^2 (0.441) = 0.01 \times 0.441 = 0.00441$

$3 - 2.1 = (0.9)^2 (0.343) = 0.81 \times 0.343 = 0.28$

$\sigma^2 = 0.63$ $\sigma = \sqrt{\sigma^2}$ ✓

b) 0.189 ✓

c) 0.189 + 0.441 + 0.343 = 0.973 ✓

d) 0.027 ✓

e) 0.441 + 0.343 = 0.784 ✓

(4) a) ~~P(M∩F) = P(M) P(F|M)~~

15 male & 25 female

(6 foreign) (4 foreign)

10 foreign

Male	15
Female	25
Total	40

	Male	Female	
Foreign	6	4	10
Local	9	21	30
	15	25	40

$\Rightarrow P(M \cap F) = P(M)\,P(F|M)$ correct, but it can be found as $P(M \cap F) = \frac{6}{40}$

$\Rightarrow \frac{15}{40} \times \frac{6}{15} = \frac{90}{600} = 0.15$

b) $P(F \cap L) = P(F) \cdot P(L|F)$

$\Rightarrow \frac{25}{40} \times \frac{21}{25} = \frac{525}{1000} = 0.525 = \frac{21}{40}$

c) $P(M \cup F) = P(M) + P(F) - P(M \cap F)$

$\Rightarrow \left(\frac{15}{40} + \frac{10}{40} + \frac{6}{15} \neq \frac{6}{40}\right) - \frac{6}{15} \quad \frac{19}{40}$ ✓ ✓

$= 0.375 + 0.25 - 0.15 = 0.225 + P(F|M)$

$\frac{6}{40} = 0.375$

0,475

d) $P(L|M) = \frac{P(L \cap M)}{P(M)}$

$= \frac{P(L \cap M)}{P(M)} = \frac{\frac{4}{40}}{\frac{15}{40}}$ 9

$= \frac{4}{15} = 0.375$ ~~0.1~~

$\frac{9}{15} = 0,6$

$\Rightarrow 0.267$

e) $P(F|Fem) = \frac{P(F \cap Fem)}{P(Fem)}$

$= \frac{\frac{4}{40}}{\frac{25}{40}} = \frac{4}{25} \Rightarrow 0.16$ ✓

f) $P(M|F) = \frac{P(M \cap F)}{P(F)}$

$= \frac{\frac{6}{40}}{\frac{10}{40}} = \frac{6}{10} = 0.6$ ✓

g) $P(Fem|L) = \frac{P(F \cap L)}{P(L)}$

$= \frac{\frac{21}{40}}{\frac{30}{40}} = \frac{21}{30} = 0.7$ ✓

5. $p = 0.1 \quad n = 25 \quad x = 4$

$P(4) = \frac{25!}{4!(25-4)!} 0.1^4 (1-0.1)^{25-4}$

$\Rightarrow \frac{25!}{4!(25-4)!} = \frac{303,600}{4!}$

$= \frac{25!}{4!\,21!} = \frac{25 \cdot 24 \cdot 23 \cdot 22}{4!} \Big\} 303,600$

$= \frac{303,600}{4!} \cdot 0.1^4 \cdot (0.9)^{21}$

$\Rightarrow 12,650 \cdot 0.0001 \cdot 0,109$

$\Rightarrow \underline{0.138}$

at least 4 means $4, 5, 6 \ldots, 25$

$P(X \geq 4) = 1 - P(X \leq 3)$

$= 1 - (P(0) + P(1) + P(2) + P(3))$

$= 1 - 0,1764 = 0.236$

can be found in Table Binomial distribution

(6) a) $p(x) = \frac{\lambda^x e^{-\lambda}}{x!}$

$x = 0$, $\lambda = 3.8$ $\quad p(x) = \frac{3.8^0 e^{-3.8}}{0!} = \frac{1 \cdot e^{-3.8}}{1} = \frac{1}{e^{3.8}}$

$= \underline{0.02237}$ ✓ This number can be found in Table Poisson distribution

b) $x = 1$, $\lambda = 3.8$

$p(x) = \frac{3.8^1 e^{-3.8}}{1!}$

$= \frac{3.8 \cdot e^{-3.8}}{1} = \frac{0.08500}{1} = \underline{0.08500}$ ✓

can be found in Table Poisson distribution $0.107 - 0.022 = 0,085$