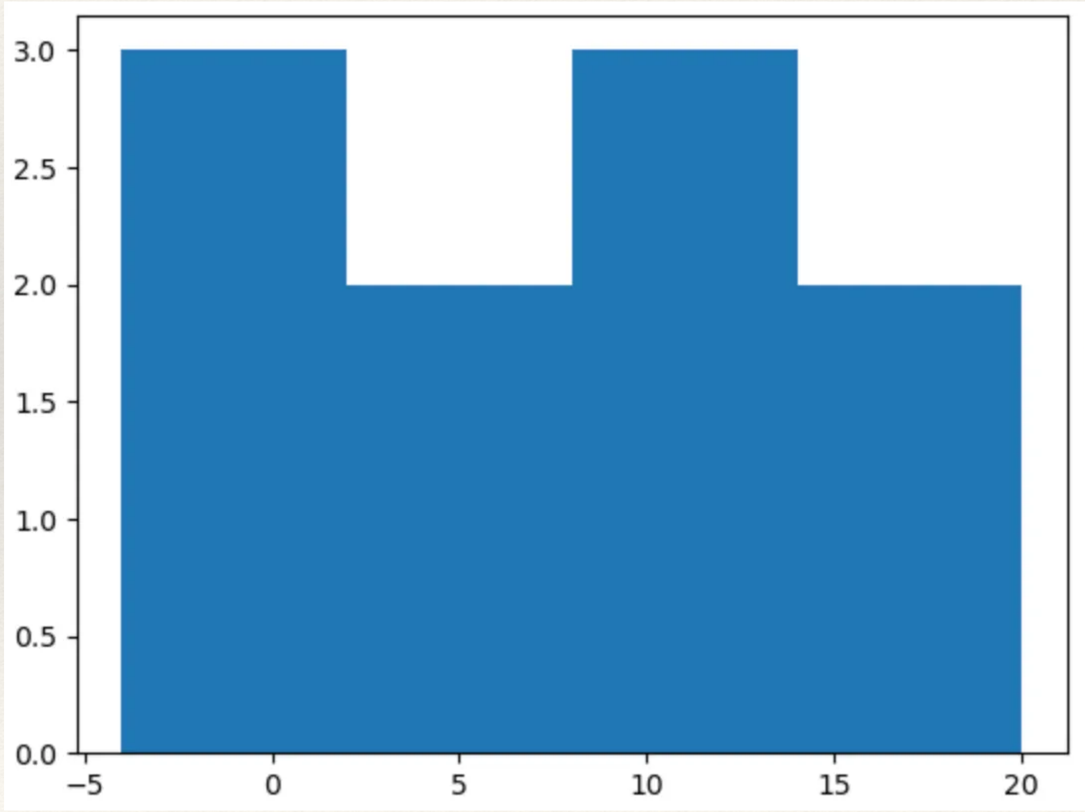
Stat Midterm

黃馨霈

1.(a)

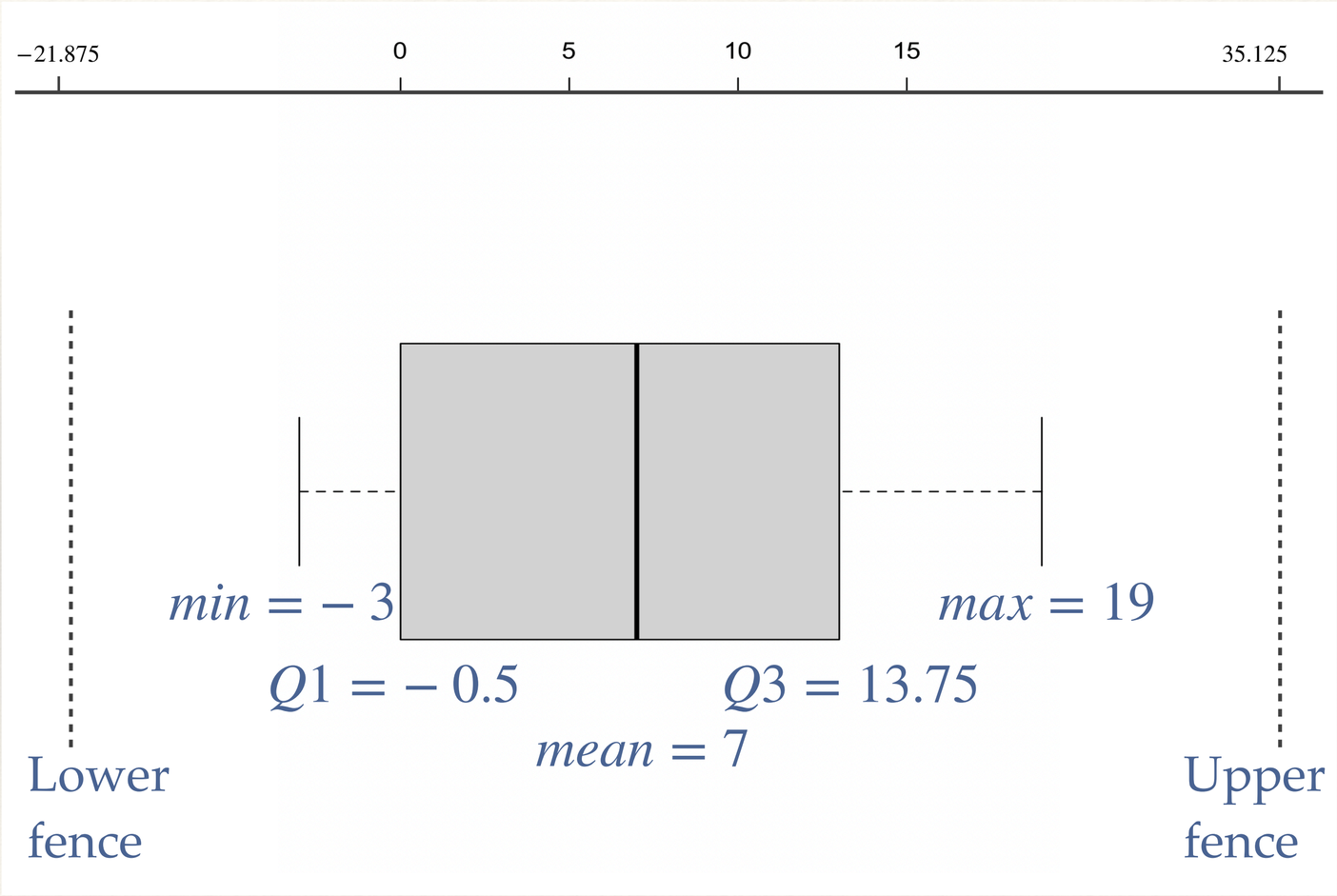
- bins = 4 → [20 − (−4)] ÷ 4 = 6 → 每6為一個區間

Interval	numbers	總個數
[-4, 2]	-3, -2, 0	3
[2, 8]	3, 5	2
[8, 14]	9, 11, 13	3
[14, 20]	16, 19	2

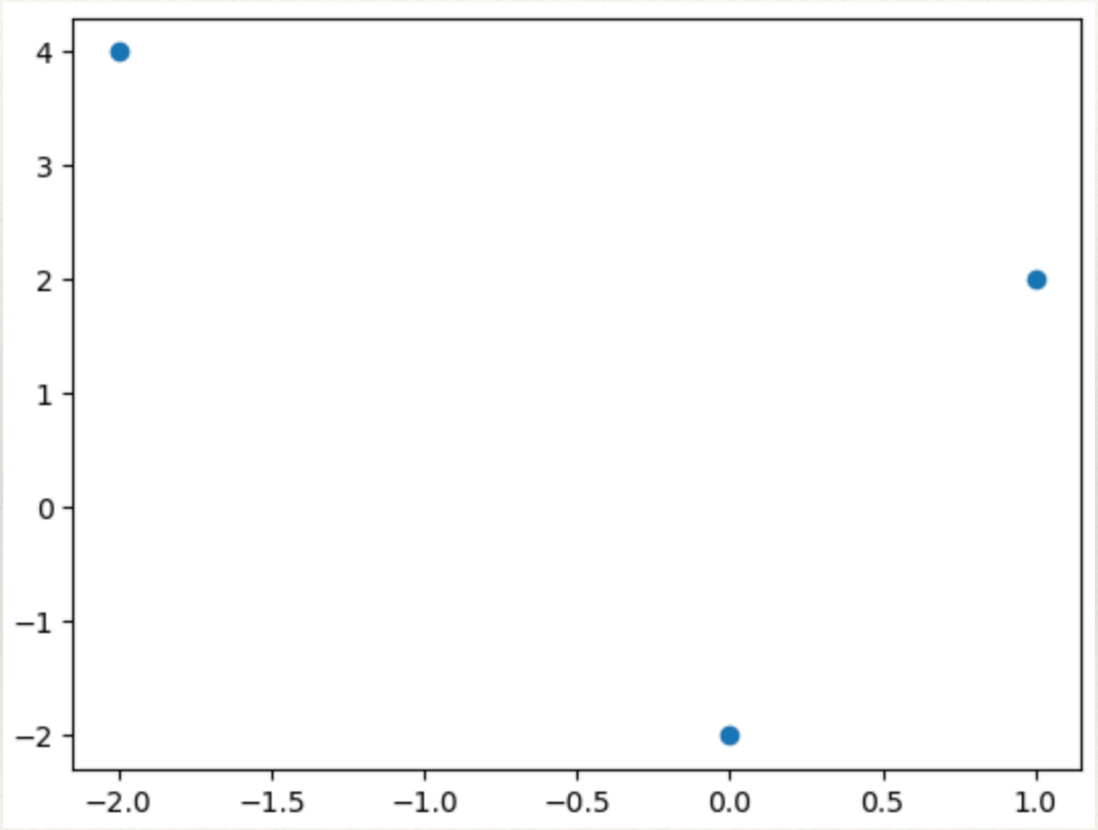


1.(b)

- 按小到大排列：−3, −2, 0, 3, 5, 9, 11, 13, 16, 19
- min = −3, max = 19
- Q1 position = $0.25 \times (10 + 1) = 2.75$,
- $Q1 = (-2) + 0.75 \times [0 - (-2)] = -0.5$
- mean position = $\frac{1}{2} \times (10 + 1) = 5.5$, mean = 7
- Q3 position = 8.25, Q3 = 13.75
- IQR = 13.75 - (-0.5) = 14.25
- lower fence = Q1 - 1.5IQR = -21.875
- upper fence = 35.125



2.(a)



2.(b)

Index	X	Y	XY	X^2	Y^2
1	1	2	2	1	4
2	0	-2	0	0	4
3	-2	4	-8	4	16
total	-1	4	-6	5	24

$$S_x^2 = \frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1} = \frac{7}{3}$$

$$S_y^2 = \frac{\Sigma y^2 - \frac{(\Sigma y)^2}{n}}{n-1} = \frac{28}{3}$$

$$S_{xy} = \frac{\Sigma xy - \frac{\Sigma x \Sigma y}{n}}{n-1} = \frac{-7}{3}$$

$$r = \frac{S_{xy}}{S_x \cdot S_y} = \frac{\frac{-7}{3}}{\sqrt{\frac{7}{3}} \cdot \sqrt{\frac{28}{3}}} = \frac{\frac{-7}{3}}{\frac{14}{3}} = -0.5$$

2.(c)

$$b = r \times \frac{S_y}{S_x} = -0.5 \times \frac{\sqrt{\frac{28}{3}}}{\sqrt{\frac{7}{3}}} = -1$$

$$a = \bar{y} - b \cdot \bar{x} = \frac{4}{3} - (-1) \cdot \frac{-1}{3} = 1$$

$$\hat{y} = 1 - x$$

2.(d)

$If\ x = -1,$

$\hat{y} = 1 - (-1) = 2$

3.(a)(b)

(a)

- r = red, b = brown, y = yellow, o = orange.
- S = { (r,b), (r,y), (r,o), (b,r), (b,y), (b,o), (y,r), (y,b), (y,o), (o,r), (o,b), (o,y) } , 共12種

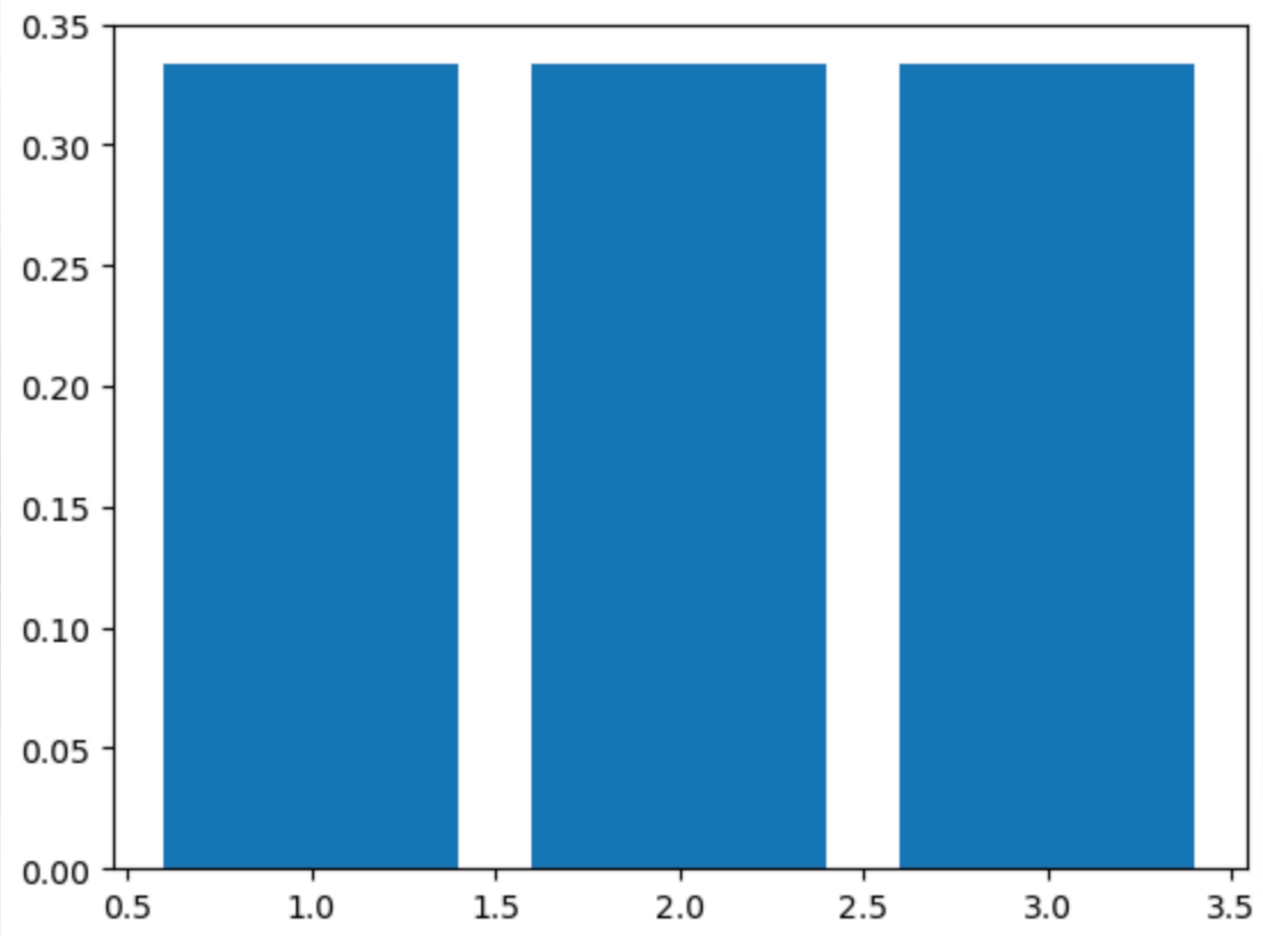
(b)

- probability = 1/12

4.(a)(b)(c)

(a) Simple events	probability	(b) X	(c) P(X)
(Y)	1/3	1	1/3
(Y,N)	$2/3 \cdot 1/2 = 1/3$	2	1/3
(Y,N,N)	$2/3 \cdot 1/2 \cdot 1 = 1/3$	3	1/3

4.(d)



5.(a)

$$P(3 < X < 8) = P(X \leq 7) - P(X \leq 3)$$

查表得 $P(X \leq 7) = 0,\ P(X \leq 3) = 0$

$$P(X \leq 7) - P(X \leq 3) = 0 - 0 = 0$$

5.(b)

$$P(X > 4) = 1 - P(X \leq 4)$$

查表得 $P(X \leq 4) = 0.051$

$$1 - P(X \leq 4) = 1 - 0.051 = 0.949$$

6.

$n = 100,\ p = 0.47$

$\mu = n \cdot p = 47$

$\sigma = \sqrt{npq} = \sqrt{100 \cdot 0.47 \cdot 0.53} = 4.99$

$$P(X > 36) \overset{C.C.}{=} P(X \geq 36 + 0.5) \overset{Z}{=} P(Z \geq \frac{36.5 - 47}{4.99})$$
$$\approx P(Z \geq -2.104) = 1 - P(Z < -2.104)$$

查表得$P(Z < -2.104) = 0.0162$

$1 - 0.0162 = 0.9838$

很多同學只查表到−2.1, 這次不扣分, 答案會是0.9821

7.(a)

$P(-C < Z < C) = 0.95$

$(1 - 0.95) \div 2 = 0.025$

查表得$P(X < -1.96) = 0.025$

$C = 1.96$

經驗法則寫$C = 2$也算對

7.(b)

$$P(1.35 < X < 1.5) \overset{Z}{\approx} P(\frac{1.35-1}{0.5} < Z < \frac{1.5-1}{0.5})$$
$$= P(0.7 < Z < 1) = P(Z < 1) - P(Z < 0.7)$$

查表得$P(Z < 1) = 0.8413,\ P(Z < 0.7) = 0.7580$

$0.8413 - 0.7580 = 0.0833$