Statistics

① ⓑ   14, 18, 30, 31, 15, 18, 27

reorder: 14, 15, 18, 18, 27, 30, 31

<u>mid range:</u> $\dfrac{14+31}{2} = 22.5$

<u>average:</u> $\dfrac{14+15+18+18+27+30+31}{7} = 24.857$

<u>median:</u> $\dfrac{0+1}{2} = 4^{th} place \Rightarrow 18$

<u>mode:</u> ⑱

ⓐ 1, 8, 1, 5, 8, 6, 3, 3, 3, 7

reorder: 1, 1, 3, 3, 3, 5, 6, 7, 8, 8

<u>mid range:</u> $\dfrac{1+8}{2} = 4.5$

<u>average:</u> $\dfrac{1+1+3+3+3+5+6+7+8+8}{10} = 4.5$

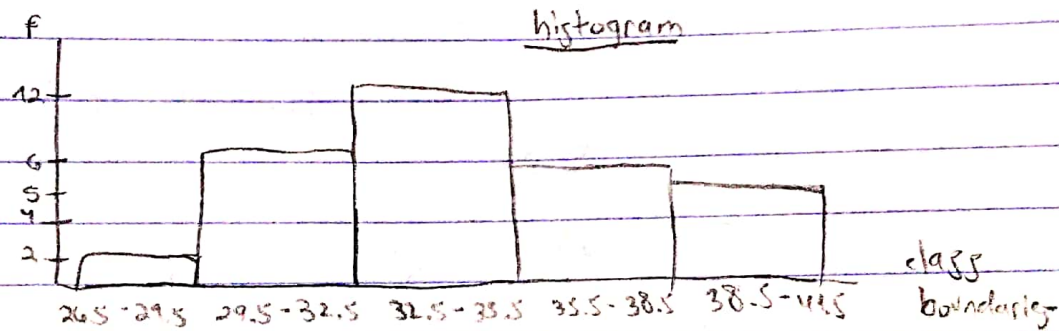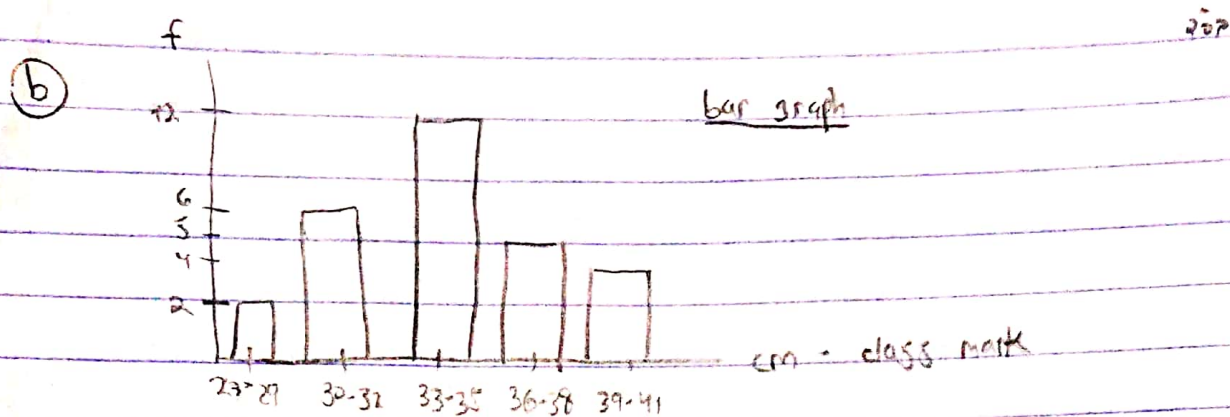<u>Median:</u> $\dfrac{n}{2} = 5$ $\dfrac{n}{2}+1 = 6$ 5th place = 3 $\dfrac{3+5}{2} = 4$

                                                6th place = 5

$\dfrac{3+5}{2} = 4$

<u>mode:</u> ③

③

cumulative frequency	# of days	Max. temperature (c)	CL	class boundaries CB	frequency f(x)	$\dfrac{f(x)}{n}$	relative cumulative frequency F(x)
2	2	27-29	27-29	26.5-29.5	2	$\dfrac{2}{29}=0.068$	$\dfrac{2}{29}=0.068$
8	6	30-32	30-32	29.5-32.5	6	$\dfrac{6}{29}=0.206$	$\dfrac{8}{29}=0.275$
20	12	33-35	33-35	32.5-35.5	12	$\dfrac{12}{29}=0.413$	$\dfrac{20}{29}=0.689$
25	5	36-38	36-38	35.5-38.5	5	$\dfrac{5}{29}=0.172$	$\dfrac{25}{29}=0.862$
29	4	39-41	39-41	38.5-41.5	4	$\dfrac{4}{29}=0.137$	$\dfrac{29}{29}=1$

⓫

f

bar graph

12

6
5
4

2

cm - class mark

27-29   30-32   33-35   36-58   39-41

---

f

histogram

12

6
5
4

2

class boundaries

26.5-29.5   29.5-32.5   32.5-35.5   35.5-38.5   38.5-41.5

© mid range: $\frac{26.5 + 41.5}{2} = 34$

class mark
28
31
34
37
40

average: $\frac{2\cdot28 + 6\cdot31 + 12\cdot34 + 8\cdot37 + 4\cdot40}{29} = 34.3103$

median: $\frac{\frac{1}{2} - F(X_{m-1})}{F(X_m)} \cdot (L_1 - L_0) + L_0 \Rightarrow \frac{\frac{29}{2} - 8}{12} \cdot (35.5 - 32.8) + 32.5 = 30.042$

mode: 34 is the variable with the highest frequency

Scanned with CamScanner

(6)

(a) True

Class averages for class 1 and class 2:

$$\text{average } (c_1) = \frac{\sum\limits_{i=0}^{n} (x_{1,i} \cdot f_{1,i})}{\sum\limits_{i=0}^{n} (f_{1,i})} \qquad \text{average}(c_2) = \frac{\sum\limits_{i=0}^{n} (x_{2,i} \cdot f_{2,i})}{\sum\limits_{i=0}^{n} (f_{2,i})}$$

averaging both class averages together:

$$\text{average } (c_1, c_2) = \frac{\dfrac{\sum\limits_{i=0}^{n} (x_{1,i} \cdot f_{1,i})}{\sum\limits_{i=0}^{n} (f_{1,i})} + \dfrac{\sum\limits_{i=0}^{n} (x_{2,i} \cdot f_{2,i})}{\sum\limits_{i=0}^{n} (f_{2,i})}}{2}$$

since the size of both classes are the same $\sum\limits_{i=0}^{n} (f_{1,i}) = \sum\limits_{i=0}^{n} (f_{2,i})$

$$\text{average } (c_1, c_2) = \frac{\sum\limits_{i=0}^{n} (x_{1,i} \cdot f_{1,i}) + \sum\limits_{i=0}^{n} (x_{2,i} \cdot f_{2,i})}{2 \cdot \sum\limits_{i=0}^{n} (f_{1,i})}$$

The sum of all the class grades is $\sum\limits_{i=0}^{n} (x_{1,i} \cdot f_{1,i}) + \sum\limits_{i=0}^{n} (x_{2,i} \cdot f_{2,i})$

The total number of students is $\sum\limits_{i=0}^{n} (f_{1,i}) + \sum\limits_{i=0}^{n} (f_{2,i}) = 2 \cdot \sum\limits_{i=0}^{n} (f_{1,i})$

Therefore, averaging the 2 equal-size class averages gives an equivalent result

(b) False

counter example:

class 1 grades: 60, 70, 80 (median: 70)

class 2 grades: 80, 80, 90 (median: 80)

average of medians: 75

median of combined classes: 80

(c) false   counter example:

class 1 grades: 60, 70, 70, 80 (mode: 70)

class 2 grades: 80, 90, 90, 100 (mode: 90)

combined mode: {70, 80, 90}

@ true

case 1: $n_1 \leq g_1 \leq n_2 \leq g_2$

$n_1 = 60, g_1 = 70, n_2 = 80, g_2 = 90$

$m_1 = 65, m_2 = 85$

combined mid range : 75

case 2: $n_1 \leq n_2 \leq g_1 \leq g_2$

$n_1 = 60, g_1 = 80, n_2 = 70, g_2 = 90$

$m_1 = 70, m_2 = 90$

combined mid-range: 75

case 3: $n_1 \leq n_2 \leq g_2 \leq g_1$

$n_1 = 60, g_1 = 90, n_2 = 70, g_2 = 80$

$m_1 = 78, m_2 = 75$

combined mid-range: 75