P.31 #17

243
①
9-28

23
26
29
30
52
34
37
45
57
80
102
147
210
355
782
1209

$n = 16$

Q_2: $i = (16+1)\frac{50}{100} = 8.5$

$\frac{45+57}{2} = 51 = Q_2$

Q_1: $i = (16+1)\frac{25}{100} = 4.25$

$30 + .25(32-30) = 30.5$

4^{th} 5^{th} 4^{th}

Q_3: $i = (16+1)\frac{75}{100} = 12.75$

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②

$147 + .75(210-147) = 194.25$

12^{th} 13^{th} 12^{th}

$IQR = Q_3 - Q_1 = 194.25 - 30.5$

$= 163.75$

45^{th} percentile: $i = (16+1)\frac{45}{100} = 7.65$

$37 + .65(45-37) = 42.2$

7^{th} 8^{th} 7^{th}

(3)

* 23. $\bar{x} = 199.875$

$Q_2 = 51$

Mode = none

Skewness to the right caused $\bar{x}$ to be larger than Q_2.

Example

9	89
10	2466
11	457889
12	2457
13	12
14	4
15	1

$n = 20$

Modes = 106, 118

$\bar{x} = 118.6$

Q_2: $i = (20+1)\frac{50}{100}$

$= 10.5$

10^{th}: 118
11^{th}: 118
$> 118 = Q_2$

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(4)

Q_1: $(20+1)(.25) = 5.25$

5^{th}: 106
6^{th}: 106

$106 + .25(106 - 106) = 106$ (Q_1)

Q_3: $(20+1)(.75) = 15.75$

15^{th}: 125
16^{th}: 127

$125 + .75(127 - 125)$
$= 126.5$

$IQR = Q_3 - Q_1 = 126.5 - 106 = 20.5$

Measures of Variability

Data set 1		Data set 2
60	$\bar{x}=80$	79
80	$Q_2=80$	80
100		81
$R=40$		$R=2$

Range = R = largest − smallest

x	$x-\bar{x}$	$(x-\bar{x})^2$
60	−20	400
80	0	0
100	20	400
	↑ deviations	↑ squared deviations

$$\sum (x-\bar{x})^2 = 400+0+400 = 800$$

The sample variance $= s^2 = \dfrac{\sum (x-\bar{x})^2}{n-1}$

$$= \frac{800}{3-1} = 400$$

The sample standard deviation $= s = \sqrt{s^2}$

$$= \sqrt{400} = 20$$

City A	City B
$\bar{x} = 200{,}000$	$\bar{x} = 500{,}000$
$s = 10{,}000$	$s = 20{,}000$

Relative to the average prices, which city has more variability? City A

Coefficient of Variation = CV

$= \frac{s}{\bar{x}}$, expressed as a percentage.

City A: $CV = \frac{10{,}000}{200{,}000} = 5\%$

City B: $CV = \frac{20{,}000}{500{,}000} = 4\%$

Descriptive Statistics

Measures of location		Measures of variability	
Sample mean	$\bar{x}$	sample range	R
" median	Q_2	" variance	s^2
" mode		" std. dev.	s
percentiles		Coeff. of var.	CV
quartiles		interquartile range	IQR

Hw p.40 #31, 33