Class Exercise 11

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Measures of central tendency

Q1. The number of goals scored by a football team in a season is shown in the table below:

n = total frequency
f = cumulative frequency before class median.
f_m = frequency of class median
i = class width
L_m = lower boundary of class median.

Number of Goals	Frequency	Cumulative Frequency	Total no. of goals (A)(B)
0	7	7	0
1	14	21	14
2	13	34	26
3	8	42	24
4	3	45	12
5	4	49	20
6	1	50	6
		$\Sigma f = 50$	= 102 (total number)

What is:

a) The mode for the number of goals scored? 1 (14 frequency) ← most frequent.

b) The median number of goals scored? ~~25.5~~ 2.5 = 2

c) The mean number of goals scored (to the nearest whole number)? $\frac{102}{50}$ = 2 goals

$\frac{56}{7}$ = 7

(b) median = $L_m + \left(\frac{n}{2} - F\right) i$ / f_m

$\frac{n}{2} = \frac{50}{2} = 25$

F = 21

f_m = 13

L_m = 1.5

i =

median: 6, 4, 5, 0, 3, 2, 1 ← order of goals by frequency (7 numbers)

middle

5 to = $\frac{5}{2}$ = 2.5

~~total frequency~~ $\frac{(50+1)}{2} = 25.5$ ~~median~~

median ~~median~~

Q2. Below is a frequency table of data based on survey where 89 women were asked what their shoe size was.

Calculate the mean, median, and mode of the data.

Shoe Size	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
Frequency	5	12	18	19	11	4	8	5	5	0	2

Mean = $4+4.5+5+5.5+6+6.5+7+7.5+8+8.5+9 = \frac{71.5}{11}$

Mean = 6.5 $= 6.5$

Median = 8.5, 9, 6.5, 4, 7.5, 8, 7, 6, 4.5, 5, 5.5 (11 numbers)
Median is The 6th number
Median = 8

Mode = 5.5 (most frequent size)

Q3. Consider the set of data below.

7 babies are weighed and weigh the following amounts:

2.5 kg, 3.1 kg, 3.4 kg, 3.5 kg, 3.5 kg, 4 kg, 4.1 kg

Find the interquartile range of the weights of the babies. (You need to find the lower quartile and the upper quartile.)

Babies weight:

1. 2.5 kg
2. 3.1 kg
3. 3.4 kg
4. 3.5 kg
5. 3.5 kg
6. 4 kg
7. 4.1 kg

Baby weight	f	cf
2.5 kg	1	1
3.1 kg	1	2
3.4 kg	1	3
3.5 kg	2	5
4 kg	1	6
4.1 kg	1	7

Lower Quartile

Class Q1 = 2

$3.1 + \left(\frac{1.75 - 1}{1}\right)$

$\frac{7}{4} = 1.75$ define $m = 2$ therefore:

Lower Quartile = 2nd from lower end = 3.1

Upper Quartile = 2nd from upper end = 4

$IQR = Q3 - Q1$

$= 4 - 3.1$

$= 0.4$

Q4. Consider the set of data below, shown in a grouped frequency distribution. (Hint: work it out yourself with the formulae as discussed once you studies the slides' example)

Median = $L_m + \left(\frac{n}{2} - F\right) i$ / f_m

$L_m + \left(\frac{50}{2} - F\right) i$ / f_m

25-

20-5

3rd class

$i = 10$

Time to travel to work	Frequency	Cumulative frequency
1 – 10	8	8
11 – 20	14	22
21 – 30	12	34
31 – 40	9	43
41 – 50	7	50

before class median

frequency of class median.

Determine the estimated mean, median and mode and interquartile range.

$n = (8+14+12+9+7 = 50)$

Median = 25th & 26th

CF column = 21 – 30

n/2 F

Median $= L_m + \left(\frac{25-22}{12}\right) 10$ (class width)

(Lower boundary)

$= L_m + \left(\frac{3}{12}\right) 10$

$= L_m (0.25) 10$

Median $= L_m + 2.5$

$= 20.5 + 2.5$

Median = 23?

Mode = 11-20

L_{mo} = lower boundary.

$10+11/2 = 10.5$

Mean = $L_{mo} = 10.5$

$\Delta_1 = (14-8) = 6$ $\Delta_2 = (14-12) = 2$

i (width) = 10.

Mode $= 10.5 + \left(\frac{6}{6+2}\right) 10$

MODE = 18.

f = Cumulative frequency before class median

f_m = frequency of class median

Mode $= L_{mo} + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2}\right) i$

lower boundary

Δ_1 different frequency class and frequency class before class mode

Δ_2 after

Even or odd ...

Interquartile Range.

Class Q1 $\frac{50}{4} = 12.5$

Q1 is 2nd class 12.5 falls in (11-20)

$Q_1 = 10.5 + \left(\frac{12.5 - 8}{14}\right) 10$

lower boundary

(cf cumulative frequency before class median)

14 (f_{Q1}) frequency

$10.5 + \left(\frac{4.5}{14}\right) 10$

$10.5 + 3.21428$

$Q_1 = 13.7142857$

lower

Q3 is 2nd class from bottom (4th) (31-40) & before class median

$30.5 + \left(\frac{3(50)}{4} - 34\right) / 9$ (frequency 31-40)

$30.5 + \left(\frac{150}{4}\right) = 37.5$

$30.5 + \left(\frac{37.5 - 34}{9}\right) 10$

0.3888

$= 34.388$ upper

IQR = Q3 − Q1

34.3889 − 13.7143

IQR = 20.67

Time to travel	f	x	fx
1-10	8	5.5	44
11-20	14	15.5	217
21-30	12	25.5	306
31-40	9	35.5	319.5
41-50	7	45.5	318.5

frequency mid point class

f 50 (add 1+10) the 11+20 = 1205

MEAN

$\bar{x} = \frac{\Sigma fx}{n} = \frac{1205}{50} = 24.1$

$x \leq h < 150$

less than or equal to h

Q5. The table below gives data on the heights, in cm, of 51 children.

Mid point 145 155 165 175

Class Interval	$140 \leq h < 150$	$150 \leq h < 160$	$160 \leq h < 170$	$170 \leq h < 180$
Frequency	6	16	21	8

(a) Estimate the mean height.

(b) Find the median class.

(c) Find the modal class.

Total

a. Mean height

Class Interval					
Mid points	145	155	165	175	51
Frequency	6	16	21	8	
Mid point × Frequency	870	2480	3465	1400	= 8215

(Total (midpoint × Frequency) / (total Frequency)) 8215 / 51

mean = 161 cm

(b) Median class = 26th ($160 \leq h < 170$) class

(c) modal class = 21 frequency from $160 \leq h < 170$ class.