U3A Maths

1-APR-2022 Term 1 / Week 9

Relative Frequency

- The heights of 200 male soccer players (in inches) are given as Grouped Freq. Table below:

Group (class)	Freq (f)	Relative Frequency
60 - 62	6	0.03
>62 - 64	10	0.05
>64 - 66	30	0.15
>66 - 68	80	0.40
>68 - 70	34	0.17
>70 - 72	24	0.12
>72 - 74	14	0.07
>74 - 76	2	0.01
No. of values: $n = \Sigma f$	= 200	Sum = 1.00

-2-

- The data can be considered as "continuous", since the heights are measured using a graduated scale.

- For a given frequency value (f), we can calculate the "Relative Frequency" as a ratio of the frequency (f) to the total number of data values ('Σf' or 'n')

ie, Rel. Freq = $(f/\Sigma f)$

- We have

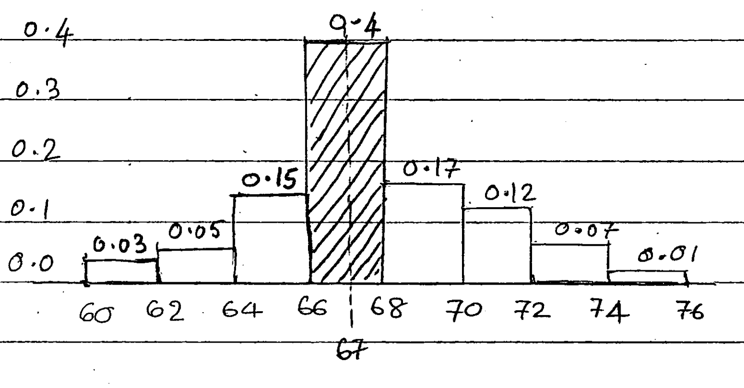
$$n = \Sigma f = 200$$

for the given data set in the Frequency Table.

-3-

- Let us now plot the relative frequency as a bar chart as shown below:

Relative Freq Bar Chart



- The "beauty" of relative freq is that, it provides the "probability" of a data value occuring in that group.

-4-

- For example, we can say that, the "probability" of a soccer player's height between >66 to 68 inches is 0.4 or 40%.

$$P[66:68] = 0.4$$

- Extending the same logic, we can say that the probability of a soccer player's height between >66 to 70 inches is:

$$P[66:70] = P(66:68) + P(68:70)$$
$$= 0.4 + 0.17$$
$$= 0.57$$
or 57%

- Let us 'define' that the relative frequency or the probability of the group (class) corresponds to the area of the corresponding bar in the bar chart.

- In other words, the "hatched area" in the bar chart shown (on Page 3) for the group ">66 to 68" corresponds to the probability, that is 0·40

- It is important to recognise that, even though the bar chart was drawn using the relative frequency as the height (on the y-axis);

- However, y-axis is no longer relevant for "probability" calculations.

- Hence, the area of the "bar" is more relevant and not the height!

- The above "definition" gives rise to some interesting possibilities!

- For example, we can now calculate the probability of a given soccer player's height between >66 to 67 inches as approximately half the area of the bar!

$$P\,[66:67] = 0{\cdot}4\,/\,2$$
$$= \underline{0{\cdot}2} \text{ or } \underline{20\%}$$

- Of course, the above calculation assumes that the data values are uniformly distributed between 66 and 68. This may not be true in practice!

- In practice, it has been found that commonly occuring probability distribution is as shown below: