Question

No. 1: The table below gives the distribution of heights of 1000 yam tubers at Mile 12 market of Ketu, Lagos.
Height (x) 156-160 161-163 164-166 167-169 170-175
Total No. of yams (f) 160 140 360 210 130

Using Assumed mean method, correct to two decimal places compute mean yam height;
Compute the Variance and Standard deviation;
Obtain the coefficient of variation.

Solution

Assumed mean method

$$\overline{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

$\overline{x} - Mean\ of\ the\ given\ data\ to\ be\ calculated$

$a - Assumed\ mean\ which\ is\ the\ mid\ value$

$\sum f_i - Sum\ of\ the\ frequencies$

$\sum f_i d_i - Sum\ of\ the\ product\ of\ frequencies\ and\ deviation, d_i = x_i - a$

$x_i = \dfrac{lowerlimit + upperlimit}{2}$

Height (x)	Total No. of yams, f	Class Mark x_i	$d_i = x_i - a$
$156 - 160$	160	158	-7
$161 - 163$	140	162	-3
$164 - 166$	360	165	0
$167 - 169$	210	168	3
$170 - 175$	130	172.5	7.5
	$\sum f_i = 1000$		$\sum f_i d_i = 65$

$$\overline{d} = \frac{\sum f_i d_i}{\sum f_i} = \frac{65}{1000} = 0.065$$
$$\overline{x} = a + \overline{d}$$
$$\overline{x} = 165 + 0.065 = 165.065 \approx 165.07$$

$\sum f_i(x_i - \overline{x})^2 = 160(158 - 165.065)^2 + 140(162 - 165.065)^2 +$

$+360(165 - 165.065)^2 + 210(168 - 165.065)^2 + 130(172.5 - 165.065)^2 =$
$= 18298.275$

$$s^2 = \frac{\sum f_i(x_i - \bar{x})^2}{\sum f_i - 1} = \frac{18298.275}{1000 - 1} \approx 18.32$$
$$s = \sqrt{s^2} \approx 4.28$$
$$coefficient\ of\ variation = \frac{s}{\bar{x}} \cdot 100\% \approx 2.59\%$$

Question

No. 2: A bowl contains 6 Black and 4 Yellow balls. Two balls are drawn without replacement. Find the probability that (a) the selection is Yellow; (b) both are of the same colour; (c) both are of different colour.

Solution

$N = 6 + 4 = 10$

(a)

$$P(YY) = \frac{4}{10}\left(\frac{3}{9}\right) = \frac{2}{15}$$

(b)

$$P(same\ colour) = P(YY) + P(BB) = \frac{2}{15} + \frac{6}{10}\left(\frac{5}{9}\right) = \frac{7}{15}$$

(c)

$$P(different\ colour) = P(YB) + P(BY) = \frac{4}{10}\left(\frac{6}{9}\right) + \frac{6}{10}\left(\frac{4}{9}\right) = \frac{8}{15}$$

Check

$$P(same\ colour) + P(different\ colour) = \frac{7}{15} + \frac{8}{15} = 1$$

Question

No. 3: A random variable X is given as shown below. Find $Var(X)$

x_i	-2	0	2	4
$p(x_i)$	$1/3$	$1/6$	$1/6$	$1/3$

Solution

$$\bar{x} = \sum_{i=1}^{n} x_i p(x_i) = -2\left(\frac{1}{3}\right) + 0\left(\frac{1}{6}\right) + 2\left(\frac{1}{6}\right) + 4\left(\frac{1}{3}\right) = 1$$

$$Var(X) = \sum_{i=1}^{n} p(x_i)(x_i - \bar{x})^2 = \frac{1}{3}(-2 - 1)^2 + \frac{1}{3}(0 - 1)^2 + \frac{1}{3}(2 - 1)^2 +$$

$$+ \frac{1}{3}(4-1)^2 = \frac{20}{3}$$