

Name : V.Neelima

Gmail : n180101@rguktn.ac.in

HandWritten Digit Recognition (Week 2 Task)

Practice Problems

Q.1: Find the mean of 5,10,15,20,25.

$$\begin{aligned}\text{Mean} &= (5+10+15+20+25)/5 \\ &= 75/5 = 15\end{aligned}$$

Q.2: Find the mean of the given data set: 10,20,30,40,50,60,70,80,90.

$$\begin{aligned}\text{Mean} &= (10+20+30+40+50+60+70+80+90)/9 \\ &= 450/9 = 50\end{aligned}$$

Q.3: Find the mean of the first 10 even numbers.

$$\begin{aligned}\text{Mean} &= (2+4+6+8+10+12+14+16+18+20)/10 \\ &= 110/10 = 11\end{aligned}$$

Q.4: Find the mean of the first 10 odd numbers.

$$\begin{aligned}\text{Mean} &= (1+3+5+7+9+11+13+15+17+19)/10 \\ &= 100/10 = 10\end{aligned}$$

Practice Problems

1. The mode of the following marks (out of 10) obtained by 20 students:

4, 6, 5, 9, 3, 2, 7, 7, 6, 5, 4, 9, 10, 10, 3, 4, 7, 6, 9, 9

$$\text{Mode} = 9(\text{Most frequent item})$$

2. Find the mode for the following data set.

41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60

Mode = 52(Most Frequent item)

3. Find the mode of the given distribution.

Class Interval	10-25	25-40	40-55	55-70	70-85	85-100
Frequency	12	9	17	16	20	16

The maximum class frequency is 20 and the class interval corresponding to this frequency is 70-85 . Thus, the modal class is 70 -85 .

Lower limit of the modal class (l) = 70

Size of the class interval (h) = 15

Frequency of the modal class (f_1) = 20

Frequency of the class preceding the modal class (f_0) = 16

Frequency of the class succeeding the modal class (f_2)= 16

$$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h =$$

$$Mode = 70 + ((20-16)/(2*20-16-16))*15 \\ = 155/2$$

Practice Problems

1.The marks in a subject for 12 students are as follows. Find the range for the given data
31, 37, 35, 38, 42, 23, 17, 18, 35, 25, 35, 29.

Maximum Value=42

Minimum Value = 17

Range=Max-Min

$$= 42 - 17 = 25$$

2. Given below are heights of 15 students of a class measured in cm:

128, 144, 146, 143, 136, 142, 138, 129, 140, 152, 144, 140, 150, 142, 154

Find the range of the given data.

Maximum Value = 154

Minimum Value = 128

Range = Max - Min

$$= 154 - 128 = 27$$

3. Calculate the range for the following data below.

Class Interval	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	2	3	8	15	12	7	3

Upper Class Boundary of highest interval = 100

Lower Class Boundary of lowest interval = 30

Range = upper - lower

$$= 100 - 30 = 70$$

Practice problems on standard Deviation

1. Calculate the standard deviation of the following values:

5, 10, 25, 30, 50.

Mean = $(5 + 10 + 25 + 30 + 50) / 5$

$$= 120 / 5 = 24$$

X	X-u	(X-u)*2
5	-19	361

10	-14	196
25	1	1
30	6	36
50	26	676
Total		1270

$$SD = \sqrt{(1270/5)} = 15.9$$

2. Find the mean and standard deviation for the following data.

x	60	61	62	63	64	65	66	67	68
f	2	1	12	29	25	12	10	4	5

x	Frequency	Deviation(x-64)(d)	Square of deviation	f*d	f*d ²
60	2	-4	16	-8	32
61	1	-3	9	-3	9
62	12	-2	4	-24	48
63	29	-1	1	-29	29
64	25	0	0	0	0
65	12	1	1	12	12
66	10	2	4	20	40
67	4	3	9	12	36
68	5	4	16	20	80
	sum=100		sum=60	sum=0	sum=286

$$SD = \sqrt{((286/100) - (0/100)^2)}$$

$$= 1.69$$

3.The diameters of circles (in mm) drawn in a design are given below:

Diameters	33-36	37-40	41-44	45-48	49-52
No of Circles	15	17	21	22	25

Calculate the standard deviation and mean diameter of the circles.

[Hint: First make the data continuous by making the classes as 32.5-36.5, 36.5-40.5, 40.5-44.5, 44.5 – 48.5, 48.5 – 52.5 and then proceed.]

Daimeters	32.5-36.5	36.5-40.5	40.5-44.5	44.5-48.5	48.5-52.5
No of circles	15	17	21	22	25

xi	34.5	38.5	42.5	46.5	50.5
----	------	------	------	------	------

$$y_i = (x_i - A) / h$$

$$A = 42.5$$

$$h = 4.0$$

xi	yi	fi	yi*fi	yi*2	(yi*2)*fi
34.5	-2	15	-30	4	60
38.5	-1	17	-17	1	17
42.5	0	21	0	0	0
46.5	1	22	22	1	22
50.5	2	25	50	4	100
		Sum=100	sum=25		sum=199

$$\bar{Y} = 25/100 = 0.25$$

$$\bar{X} = h (\bar{Y}) + A = (4 * (1/4)) + 42.5 = 43.5$$

$((SD)^2)$ with respect to $y = (199/100) - (1/16) = 1.9275$

(SD) with respect to $y = \sqrt{1.9275} = 1.388$

(SD) with respect to $x = h(SD)y = 4 * 1.388 = 5.552$

Practice Problems

Solve the following problems using Bayes Theorem.

1. A bag contains 5 red and 5 black balls. A ball is drawn at random, its color is noted, and again the ball is returned to the bag. Also, 2 additional balls of the color drawn are put in the bag. After that, the ball is drawn at random from the bag. What is the probability that the second ball drawn from the bag is red?

Ans : - The bag contains 5 red and 5 black balls.

$$n(R)=5, n(B)=5 \text{ and } n(S)=10$$

Let a red ball be drawn in the first attempt

$$\therefore P(\text{drawing a red ball}) = n(R)/n(S) = 5/10 = 1/2$$

If two red balls are added to the bag, then the bag contains 7 red and 5 black balls

$$n(R)=7, n(B)=5 \text{ and } n(S)=12$$

$$P(\text{drawing a red ball}) = n(R)/n(S) = 7/10$$

Let a black ball be drawn in the first attempt

$$n(R)=5, n(B)=5 \text{ and } n(S)=10$$

$$P(\text{drawing a black ball in the first attempt}) = n(B)/n(S) = 1/2$$

If two black balls are added to the bag, then the bag contains 5 red and 7 black balls.

$$n(R)=5, n(B)=7 \text{ and } n(S)=12$$

$$\therefore P(\text{drawing a red ball}) = n(R)/n(S) = 5/12$$

Therefore, probability of drawing second balls as red is

$$12 \times 712 + 12 \times 512 = 12(712+512) = 12 \times 1 = 12$$

2. Of the students in the college, 60% of the students reside in the hostel and 40% of the students are day scholars. Previous year results report that 30% of all students who stay in the hostel scored A Grade and 20% of day scholars scored A grade. At the end of the year, one student is chosen at random and found that he/she has an A grade. What is the probability that the student is a hosteler?

Let $P(H)$, $P(D)$ and $P(A)$ be the probabilities of student selected in hostler, student selected in scholar, and grad "A" student.

The probability that the student selected is a hostler, if he has an 'A' grade that is $P(H/A)$,

$$P(H/A) = \frac{P(H)P(A/H)}{P(H)P(A/H) + P(D)P(A/D)}$$

The probability of chosen student is hostler.

$$P(H) = 60\% = 0.6$$

The probability that student gets 'A' grade, given that he is hostler,

$$P(A/H) = 30\% = 0.3$$

Probability of chosen student is scholar,

$$P(D) = 40\% = 0.4$$

The probability that student gets 'A' grade, if day scholar,

$$P(A/D) = 20\% = 0.2$$

Put these values in equation (1),

$$P(H/A) = \frac{(0.6 \times 0.3)}{(0.6 \times 0.3) + (0.4 \times 0.2)} = \frac{0.18}{0.18 + 0.08} = \frac{0.18}{0.26} = \frac{18}{26} = \frac{9}{13}$$

Thus, the required probability is $\frac{9}{13}$.

3. From the pack of 52 cards, one card is lost. From the remaining cards of a pack, two cards are drawn and both are found to be diamond cards. What is the probability that the lost card is a diamond?

Ans : -

E1 be the event that the drawn card is a diamond

E2 be the event that the drawn card is not a diamond and “A” be the event that the card is lost

$$P(E1) = 13/52 = 1/4$$

$$P(E2) = 39/52 = 3/4$$

After losing one diamond card, there are 12 diamond cards remaining out of 51 cards.

Two diamond cards can be drawn out of 12 diamond cards in ${}^{12}C_2$ ways.

Similarly, two diamond cards can be drawn out of total 51 cards in ${}^{51}C_2$ ways.

Thus, the probability of getting two cards, when one diamond card is lost, is $P(A/E1)$

$$\begin{aligned} P(A/E1) &= {}^{12}C_2 / {}^{51}C_2 \\ &= (12 \times 11) / (51 \times 50) \end{aligned}$$

Now, probability of getting two cards, when card is lost which is not diamond, is $P(A/E2)$

$$\begin{aligned} P(A/E2) &= {}^{13}C_2 / {}^{51}C_2 \\ &= (13 \times 12) / (51 \times 50) \end{aligned}$$

$$\begin{aligned} P(E1/A) &= (P(E1) * (P(A/E1))) / (P(E1) * (P(A/E1))) + (P(E2) * (P(A/E2))) \\ &= 11 / 11 + 39 \\ &= 11 / 50 \end{aligned}$$

