Prb-3

The customer accounts at a certain departmental store have an average balance of Rs. 480 and S.d. of Rs. 160. Assuming that the account balances are normally distributed

i) What proportion of the account is over Rs. 600?

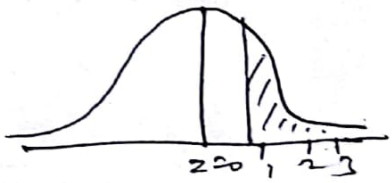
ii) What proportion of the account is between Rs. 400 and Rs. 600?

Soln:- Let X be a random variable of account balances which is normally distributed.

$$Z = \frac{X-\mu}{\sigma} = \frac{X-480}{160} \qquad \mu = 480, \quad \sigma = 160$$

When $X=600$, $Z = \frac{600-480}{160} = 0.75$

i) $P(X>600) = P(Z>0.75)$



$= 0.5 - P(0<Z<0.75)$

$= 0.5 - 0.2734 = 0.2266$

% of accounts over 600 $= 0.2266 \times 100 = 22.66\%$

ii) When $X=400$, $Z = \frac{400-480}{160} = -0.5$

When $X=600$, $Z = \frac{600-480}{160} = 0.75$

$P(400<X<600) = P(-0.5<Z<0.75)$

$= P(Z<0.75) - P(Z<-0.5)$

$= 0.7734 - 0.3085$

$= 0.4649$ //

% of accounts having an average bet. Rs. 400 & Rs. 600 $= 100 \times 0.4649 = 46.49\%$ //

Problem 4.

The customer accounts of a certain departmental store have an average balance of Rs. 120 and a S.d of Rs. 40. Assuming that the account balances are normally distributed, find

i) what proportion of accounts is over Rs. 150?

ii) what proportion of accounts is between Rs. 100 and Rs. 150?

iii) what proportion of accounts is between Rs. 60 and Rs. 90?

Soln:- Given that $\mu = 120$, $\sigma = 40$

$$z = \frac{x-\mu}{\sigma} = \frac{x-120}{40}$$

When $x = 150$, $z = \frac{150-120}{40} = 0.75$

i) $P(X > 150) = P(z > 0.75)$

$= 1 - P(z < 0.75)$

$= 1 - (0.5 + 0.2734)$

$= 0.5 - 0.2734 = 0.2266.$

22.66% of accounts will have balance over Rs. 150.

ii) When $x = 100$, $z = \frac{100-120}{40} = -0.5$

$P(100 < X < 150) = P(-0.5 < z < 0.75)$

$= P(-0.5 < z < 0)$ 

$+ P(0 < z < 0.75)$

$= 0.1915 + 0.2734 = 0.4649$

66.49% of accounts will have balance bet Rs. 100 and Rs. 150

iii) $P(60 < X < 90) = P(-1.5 < z < -0.75)$

$= P(-1.5 < z < 0) - P(-0.75 < z < 0)$

$= 0.4332 - 0.2734 = 0.1598$

15.98% of the accounts will have balance btt. Rs. 60 & Rs. 90

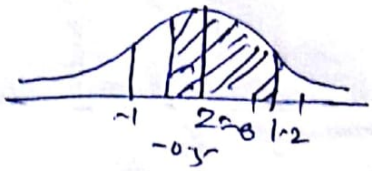
① Given a random variable X having a normal distribution with $\mu = 50$ and $\sigma = 10$, find the probability that X assumes a value bet. 45 and 62.

Given $\mu = 50$, $\sigma = 10$

The z values corresponding to $x_1 = 45$ and $x_2 = 62$ are $z_1 = \frac{45-50}{10} = -0.5$ $\quad z_2 = \frac{62-50}{10} = 1.2$

$P(45 < x < 62) = P(-0.5 < z < 1.2)$

The area of the shaded region is

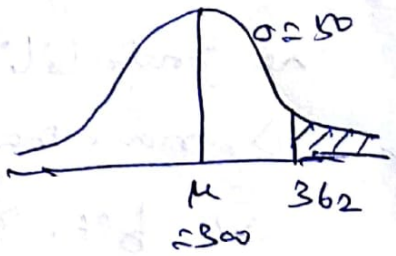


$P(-0.5 < z < 1.2) = P(z < 1.2) - P(z < -0.5)$

$= 0.8849 - 0.3085 = 0.5764$

② Given that x has a normal distribution with $\mu = 300$ and $\sigma = 50$, find the probability that X assumes a value greater than 362.

Given $\mu = 300$, $\sigma = 50$.



when $x = 362$ $\quad z = \frac{x-300}{50}$

$z = \frac{362-300}{50} = 1.24$

$P(x > 362) = P(z > 1.24) = 1 - P(z \leq 1.24)$

$= 1 - 0.8925 = 0.1075$

③ An electrical firm manufactures light bulbs that have a life, before burn-out that is normally distributed with mean equal to 800 hours and a s.d of 40 hrs. Find the prob. that a bulb burns between 778 and 834 hours.