Notes:- There is table of the values of z called (the normal dist. table). we can find any area under the normal Curve in one or two sides about the mean and for these cases:-

Then:-

① $P(z \geq 0) = P(z \leq 0) = 0.5$

② $P(0 \leq z \leq t) = \phi(t)$ and $P(-t \leq z \leq 0) = \phi(-t)$

③ $P(z \geq +t) = P(z \geq 0) - \phi(t)$

$P(z \geq -t) = \phi(-t) + P(z \geq 0)$.

where $\phi(+t) = \phi(-t)$; t any value.

④ $P(a \leq X \leq b) = P\left(\frac{a-\mu}{\sigma} \leq \frac{X-\mu}{\sigma} \leq \frac{b-\mu}{\sigma}\right)$

$= P(\bar{a} \leq z \leq \bar{b}) = \phi(\bar{b}) - \phi(\bar{a})$

where $a < b$ and:-

$P(-a \leq X \leq b) = \phi(\bar{a}) + \phi(\bar{b})$.

Examples:- Find the area under the normal dis. Curve in each of the cases.

① $P(0 \leq z \leq 1.2) = \phi(1.2) = 0.3849$

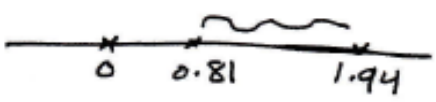
② $P(-0.68 \leq z \leq 0) = \phi(0.68) = 0.2517$

③ $P(-0.46 \leq z \leq 2.21) = \phi(0.46) + \phi(2.21)$

$= 0.1772 + 0.4864$

$= 0.6636.$

④ $P(0.81 \leq Z \leq 1.94) = \Phi(1.94) - \Phi(0.81)$

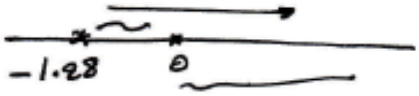


$= 0.9738 - 0.7910 = 0.1828$

⑤ $P(Z \geq 0.6) = P(Z \geq 0) - \Phi(0.6)$

$= 0.5 - 0.2257 = 0.2743$

⑥ $P(Z \geq -1.28) = \Phi(-1.28) + P(Z \geq 0)$



$= 0.3997 + 0.5 = 0.8997$

⑦ $P(0 \leq Z \leq Z_0) = 0.9901$ Find Z_0 ?

Sol/ نبحث في جدول التوزيع الطبيعي المعياري عن 0.9901 فنجد أنه يقابل $Z = 2.33$

⑧ If $X \sim N(3, 16)$; Find $P(4 \leq X \leq 8)$ and $P(0 \leq X \leq 5)$.

Sol/ $P(4 \leq X \leq 8) = P\left(\frac{4-3}{4} \leq \frac{X-3}{4} \leq \frac{8-3}{4}\right)$

$= P\left(\frac{1}{4} \leq Z \leq \frac{5}{4}\right) \Rightarrow = P(0.25 \leq Z \leq 1.25)$

$= \Phi(1.25) - \Phi(0.25)$

$= 0.8944 - 0.5987$

$= 0.2957$

$P(0 \leq X \leq 5) = P\left(\frac{0-3}{4} \leq Z \leq \frac{5-3}{4}\right)$

$= P(-0.75 \leq Z \leq 0.5)$

$= \Phi(0.5) + \Phi(0.75)$

$= 0.6915 + 0.2734$

$= 0.4649$

(9) If $X \sim N(16,1)$. Find $P(X \geq 17)$

Sol/ $P(X \geq 17) = P\left(\frac{X-\mu}{\sigma} \geq \frac{17-16}{1}\right)$

$= P(Z \geq 1) = P(Z \geq 0) - \phi(1)$

$= 0.5 - 0.3413 = 0.1587$

(10) If $X \sim N(70, 100)$. Find $P(60 \leq X \leq 95)$?

Sol/ $P(60 \leq X \leq 95) = P\left(\frac{60-70}{10} \leq Z \leq \frac{95-70}{10}\right)$

$= P(-1 \leq Z \leq 2.5)$

$= \phi(-1) + \phi(2.5)$

$= 0.3413 + 0.4938$

$= 0.8351$

(11) The life time of a battry is normally distributed with mean 42 hours and standard deviation of 1.2 hours. Find the prob. that a randomly selected battry with life equale or Longer than 40 hours.

($\because P = 1 - q$)

Sol/

$P(X \geq 40) = 1 - P(X < 40)$

$= 1 - P\left(\frac{X-\mu}{\sigma} < \frac{40-\mu}{\sigma}\right)$

$= 1 - P\left(\frac{X-42}{1.2} < \frac{40-42}{1.2}\right)$

$= 1 - P(Z \leq 1.67)$

$= 1 - 0.4525$

$= 0.5475$