

Chapter (6)

Continuous Probability Distributions

Examples

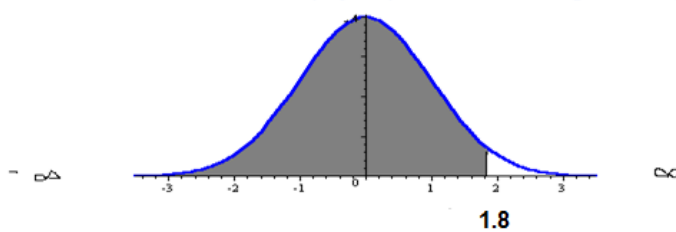
Normal probability distribution

How to find the area under the normal curve?

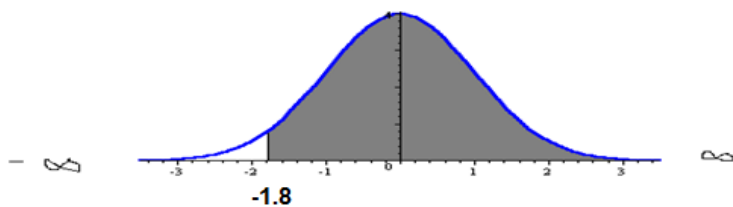
If $\mu = 50$ & $\sigma = 6$

Find

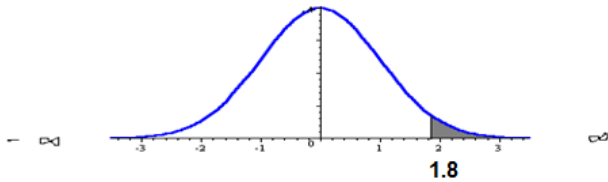
$$(1) P(X < 60.8) = P\left(Z < \frac{60.8 - 50}{6}\right)$$
$$= P\left(Z < \frac{10.8}{6}\right) = P(Z < 1.8) = P(-\infty < Z < 1.8) = 0.9641$$



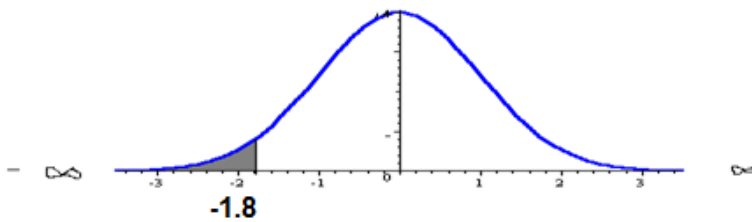
$$(2) P(X > 39.2) = P\left(Z > \frac{39.2 - 50}{6}\right)$$
$$= P\left(Z > \frac{-10.8}{6}\right) = P(Z > -1.8) = 1 - P(-\infty < Z < -1.8) = 1 - 0.0359 = 0.9641$$



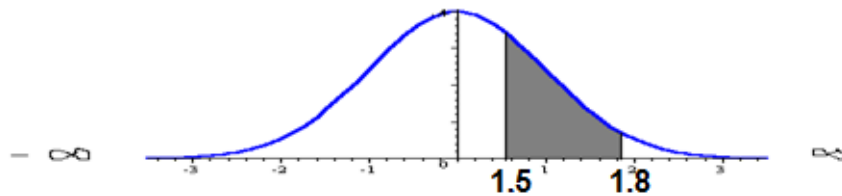
$$\begin{aligned}
 (3) P(X > 60.8) &= P\left(Z > \frac{60.8 - 50}{6}\right) \\
 &= P\left(Z > \frac{10.8}{6}\right) = p(Z > 1.8) = 1 - P(-\infty < Z < 1.8) \\
 &= 1 - 0.9641 = 0.0359
 \end{aligned}$$



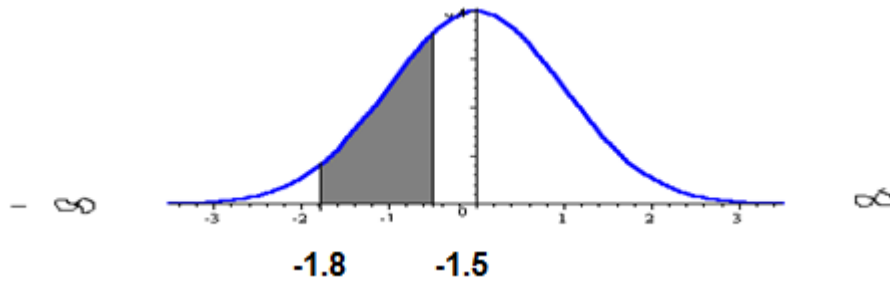
$$\begin{aligned}
 (4) P(X < 39.2) &= P\left(Z < \frac{39.2 - 50}{6}\right) \\
 &= P\left(Z < \frac{-10.8}{6}\right) = p(Z < -1.8) = P(-\infty < Z < -1.8) = 0.0359
 \end{aligned}$$



$$\begin{aligned}
 (5) P(59 < X < 60.8) &= P\left(\frac{59 - 50}{6} < Z < \frac{60.8 - 50}{6}\right) \\
 &= P\left(\frac{9}{6} < Z < \frac{10.8}{6}\right) = p(1.5 < Z < 1.8) = P(-\infty < Z < 1.8) - P(-\infty < Z < 1.5) \\
 &= \Phi(1.8) - \Phi(1.5) = 0.9641 - 0.9332 = 0.0309
 \end{aligned}$$



$$\begin{aligned}
(6) P(39.2 < X < 41) &= P\left(\frac{39.2-50}{6} < Z < \frac{41-50}{6}\right) \\
&= P\left(\frac{-10.8}{6} < Z < \frac{-9}{6}\right) = P(-1.8 < Z < -1.5) \\
&= P(-\infty < Z < -1.5) - P(-\infty < Z < -1.8) \\
&= 0.0668 - 0.0359 = 0.0309
\end{aligned}$$



$$\begin{aligned}
(7) P(41 < X < 60.8) &= P\left(\frac{41-50}{6} < Z < \frac{60.8-50}{6}\right) \\
&= P\left(\frac{-9}{6} < Z < \frac{10.8}{6}\right) = P(-1.5 < Z < 1.8) = P(-\infty < Z < 1.8) - P(-\infty < Z < -1.5) \\
&= 0.9641 - 0.0668 = 0.8973
\end{aligned}$$

