STA-6166

Sec 5.3

Binomial Distn:

There are a fixed # of items or observations n

The items or observations are all independent

The outcomes of each item (or observation) can be classified as either a success (S) or a failure (F). You can choose which outcome is S and which one is F.

$p = P(S)$ for each observation and is the same for each observation.

X = # of observations which are successes (S) out of n

Distn. of X is Binomial (n, p) or for short $B(n; p)$

The possible values of X are $(0, 1, 2, 3, \ldots, n)$

The probability for each x. If k is any one of these values (like $k=3$), then $P(X=k)$ can be found by the formula

$$P(X=k) = \frac{n!}{k!(n-k)!} p^k (1-p)^{n-k} \quad \text{(see p. 327)}$$

These are also available in Table C
Pages T-6 to T-10 in the back of the book
for proper choice of n and then p.

The mean of a Binomian (n, p) i.e. $\mu_x = np$
The standard deviation $\sigma_x = \sqrt{np(1-p)}$ } see P318

5.48 P317

Each throw is made or missed (two possibilities)

$P(\text{Throw is made}) = 0.80$

$P(\text{Throw is missed}) = 0.20$

n = # of shots = 10

X = # of throws that are missed

Here Success S = Throw is missed

Failure F = " " made

$p = P(S) = 0.20$

X is $B(10, 0.20)$

$P(X \geq 3) = 1 - P(X \leq 2)$

From Table C (P.T-9) Choose $n=10$, $p = .20$

$P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$

$= 0.1074 + 0.2684 + .3020 = 0.6778$

$P(X \geq 3) = 1 - P(X \leq 2) = 1 - 0.6778 = 0.3222$

#5.50 Here X = # of throws that are made

Success S = when throw is made

$p = P(S) = .80$

$n = 85$

X is $B(85, .80)$

$\Rightarrow \mu_X = np = 85 * .80 = 68$

$\sigma_X = \sqrt{np(1-p)} = \sqrt{85 * .80 * .20} = 3.688$

#5.40 P309

X = DNA of female rowers (Training session duration)

Distn. of X is Normal with $\mu = 58$ min, $\sigma = 11$ min

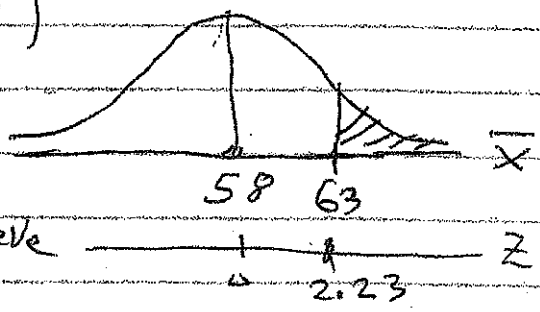
a) $n = 24$ sample mean is $\bar{X}$

Sampling distn. of $\bar{X}$ is Normal with

$$\mu_{\bar{X}} = \mu = 58, \quad \sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} = \frac{11}{\sqrt{24}} = \frac{11}{4.899} = 2.246$$

$$P(\bar{X} > 63) = P\left(\frac{\bar{X} - 58}{2.246} > \frac{63 - 58}{2.246}\right)$$

$$P(Z > 2.23)$$



= area right of 2.23 of Z curve

= 1 − area left of 2.23 of Z curve

= 1 − .9871 = .0129

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b) Y = Normal iron states female rower (duration)

Distn of Y is Normal with $\mu = 69$, $\sigma = 18$

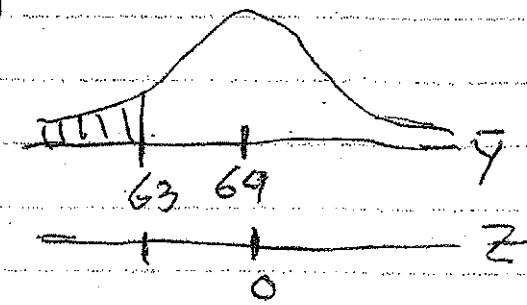
$n = 24$, sample mean is $\bar{Y}$

sampling distn. of $\bar{Y}$ is Normal with

$$\mu_{\bar{Y}} = \mu = 69, \quad \sigma_{\bar{Y}} = \frac{\sigma}{\sqrt{n}} = \frac{18}{\sqrt{24}} = \frac{18}{4.899} = 3.674$$

$$P(\bar{Y} < 63) = P\left(\frac{\bar{Y} - 69}{3.674} < \frac{63 - 69}{3.674}\right)$$

$$= P(Z < -1.63)$$



= area left of −1.63 of Z-curve

= .0516

c) Omit. It deals with two variables $\bar{X} > \bar{Y}$ (see answer key)