Shelly Brown
Section 202
26 Jul 10

7 - 26 - 10 Bonus quiz 8am (applicable to midterm exam Wednesday 7-28-10).

The 1 hr 50 min midterm exam Wednesday, 7-28-10 will be closed book, no notes or extra papers or electronics in use or in view (except a calculator). A normal table will be provided.

Rules of Probability.

1. Box 1 contains 8 R and 1 G balls.
   Box 2 contains 3 R and 2 G balls.
   A choice of box is made.
   P(box 1 is chosen) = 0.2
   P(box 2 is chosen) = 0.8

A ball is then selected with equal probability from the chosen box.

Use the rules of probability to obtain the following:

a. P(G $|_{IF}$ Box 1) (from the assumptions) $1/9$

b. P(Box 1 **and** G) = $(0.2)(1/9) = \boxed{0.02\bar{2}}$ (multiplication rule)

c. P(G) = P(Box 1 **and** G) + P(Box 2 **and** G)

$$(0.2)(1/9) + (0.8)(2/5) = \boxed{0.34\bar{2}}$$

d. P(Box 1 $|_{IF}$ G) = $\frac{\text{P(Box 1 and G)}}{\text{P(G)}}$ $\frac{(0.2)(1/9)}{(0.2)(1/9)+(0.8)(2/5)} = \boxed{0.0649}$

e. Has the probability of Box 1 having been selected increased or decreased upon learning that a green ball has been selected from the chosen box? Does this result seem sensible? Why?

It has decreased. It seems sensible because there are less Green balls in box 1 to begin with. Box 2 has one more Green ball then Box 1 therefore making it less likely to draw a green ball from box 1.

2. Suppose the following probabilities apply to the given events
   OIL (means oil is present at a prospective site)
   + (means a test comes back positive for oil)
   - (means a test comes back negative for oil)

   P(OIL) = 0.1 (the probability of oil prior to testing)
   $P(+ |_{IF}$ OIL) = 0.8 (if oil is present a positive test is likely)
   $P(- |_{IF}$ OIL^C) = 0.7 (if oil not present a negative test is likely)

a. P(OIL +) = $(0.1)(0.8) = \boxed{0.08}$ (multiplication rule)

b. P(+) = P(OIL +) + P(OIL^C +)

$$(0.1)(0.8) + (0.9)(0.3) = 0.08 + 0.27 = \boxed{0.35}$$

c. $P(\text{OIL } |_{IF} +) = \dfrac{P(\text{OIL }+)}{P(+)} = \dfrac{(0.1)(0.8)}{(0.1)(0.8)+(0.9)(0.3)} = \dfrac{0.08}{0.08+0.27} = \boxed{0.229}$

3. An investment produces random return X with the following probability distribution:

x	0	2	4
p(x)	0.6	0.3	0.1

a. E X

$$EX = (0)(0.6) + (2)(0.3) + (4)(0.1) = \boxed{1.0}$$

b. E X^2

$$EX^2 = (0)^2(0.6) + (2)^2(0.3) + (4)^2(0.1) = 1.2 + 1.6 = \boxed{2.8}$$

c. Variance X

$$\text{Variance } X = EX^2 - (EX)^2 = 2.8 - 1.0 = \boxed{1.8}$$

d. Standard deviation σ_X

$\sigma = \sqrt{1.8} = \boxed{1.34}$

e. E(total of ~~400~~ 900 independent plays of investment X)

$(900)(1.0) = \boxed{900}$

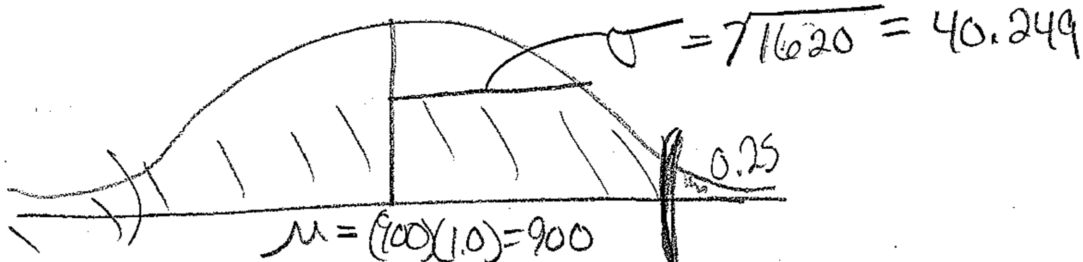
f. Variance(total of 900 independent plays of investment X)

$(900)(1.8) = \boxed{1620}$

g. Standard deviation of total of 900 independent plays of investment X.

$\sigma = \sqrt{1620} = \boxed{40.249}$

h. Sketch the approximate normal distribution of the total of 900 independent plays, labeling the mean and standard deviation of this normal as recognizable elements of your sketch.



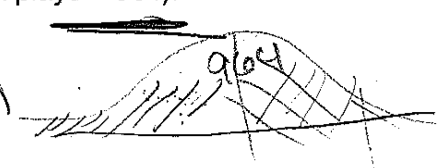
i. Standard score of a total of 964 for 900 independent plays of investment X.

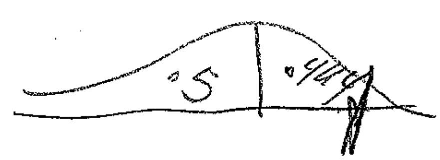
$$z = \frac{964 - \text{E(total of 900)}}{\text{standard deviation of total of 900}} = \frac{964 - 900}{\sqrt{1620} = 40.249} = \boxed{1.59}$$

j. Use (i) and z-table to approximate
P(total of 900 independent plays < 964).

900 < 964

table = 0.4441





$0.4441 + 0.5 = 0.9441$
$= \boxed{94\%}$