Angie Davison

7 - 26 - 10 Bonus quiz 12:40 (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 7 R and 3 G balls.
   Box 2 contains 2 R and 3 G balls.
   A choice of box is made.
   P(box 1 is chosen) = 0.6
   P(box 2 is chosen) = 0.4

$\boxed{7R\ 3G}$ 1 $\boxed{2R\ 3G}$ 2

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

Use the rules of probability to obtain the following:

a. P(R **| IF** Box 1) (from the assumptions) $7/10$

b. P(Box 1 **and** R)

$.6 \times 7/10 = .42$

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

$.42 + (.4 \times 2/5) = .58$

d. $P(\text{Box 1} \mid_{\text{IF}} R) = \dfrac{P(\text{Box 1 and R})}{P(R)}$ $\quad \dfrac{.42}{.58} = .72$

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

Increase b/c box 1 has more red, thus a higher probability of red. Yes, it is sensible.

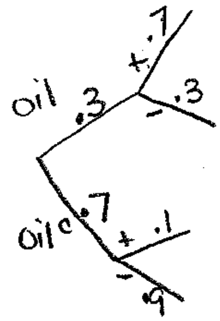
2. Suppose the following probabilities apply to the given events
   OIL (means oil is present at a prospective site)
   + (means a test comes back positive for oil)
   - (means a test comes back negative for oil)

$P(\text{OIL}) = 0.3$ (the probability of oil prior to testing)
$P(+ \mid_{\text{IF}} \text{OIL}) = 0.7$ (if oil is present a positive test is likely)
$P(- \mid_{\text{IF}} \text{OIL}^C) = 0.9$ (if oil not present a negative test is likely)

a. $P(\text{OIL} +) =$ $.3 \times .7 = .21$ (multiplication rule)

b. $P(+) = P(\text{OIL} +) + P(\text{OIL}^C +)$

$.21 + (.7 \times .1) = .28$



c. $P(\text{OIL} \mid_{\text{IF}} +) = \dfrac{P(\text{OIL} +)}{P(+)}$ $\dfrac{.21}{.28} = .75$

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

x	0	2	6
p(x)	0.6	0.2	0.2

a. E X

$(0 \times .6) + (2 \times .2) + (6 \times .2) = 1.6$

b. $E X^2$

$(0^2 \times .6) + (2^2 \times .2) + (6^2 \times .2) = 8$

c. Variance X

$E(X^2) - (EX)^2$

$8 - 1.6^2 = 5.44$

d. Standard deviation σ_X

$\sqrt{5.44} = 2.33$

e. E(total of 1600 independent plays of investment X)

$1600 \times 1.6 = 2560$

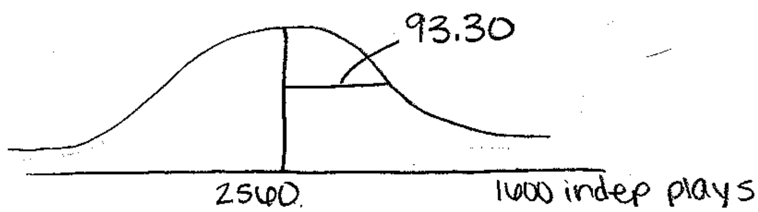
f. Variance(total of 1600 independent plays of investment X)

$5.44 \times 1600 = 8704$

g. Standard deviation of total of 1600 independent plays of investment X.

$\sqrt{8704} = 93.30$

h. Sketch the approximate normal distribution of the total of 1600 independent plays, labeling the mean and standard deviation of this normal as recognizable elements of your sketch.



i. Standard score of a total of 1772 for 1600 independent plays of investment X.

$$z = \frac{1772 - \text{E(total of 1600)}}{\text{standard deviation of total of 1600}} \qquad \frac{1772-2560}{93.3} = -8.44$$

j. Use (i) and z-table to approximate
P(total of 1600 independent plays < 1772).

The probability is ~ 0. 1772 is not even in the 1st percentile.