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Economics 300-01
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Answers to Test #1

(1) many possible answers involving nonrandom selection

(2) a. **60 oz**.

b. **69 oz**.

c. **66 oz**.

d. 21.21, or **21 oz.**

(3) Pr(passing at least one) = Pr(pass math) + Pr(pass Italian) - Pr(pass both)

= Pr(pass math) + Pr(pass Italian) - Pr(pass math)*Pr(pass Italian) [independence assumption]

= .75 + .85 - .75*.85 = 1.60 - .6375 = .9625, or **96%**

You can also calculate this as Pr(passing at least one) = 1 - Pr(passing neither)

= 1 - Pr(fail math)*Pr(fail Italian) = 1 - .25*.15 = 1 - .02 = .9625, or 96%

(4) a. $\mu_X = n\pi = 8(.2) =$ **1.6**; $\sigma_X = \sqrt{n\pi(1-\pi)} = \sqrt{8(.2)(.8)} =$ **1.13**

b. $\mu_Y = 10\mu_X + 20 = 10*1.6 + 20 =$ **36**; $\sigma_Y = 10\sigma_X = 10(1.13) =$ **11.3**

c. since $Y = 10X + 20$, $X = (50 - 20)/10 = 3$; from Table IIIc, $\Pr(X \geq 3) =$ **.203**

(5) a. (7/8)^25 = .035498, or **3.55%**

b. (1/8)^2 = .015625, or **1.56%**

c. Pr(winning at least twice) = 1 – Pr(not winning) – Pr(winning once)

= 1 - .035498 – 25*(1/8)*(7/8)^24 = 1 - .035498 - .1267778 = .8377, or **83.77%**

(6) Consider the first four games from the position of team A. In order for this to happen, they either win all four, or team B wins all four, which is equivalent to team A losing all four.

There are 16 possible sequences of wins and losses for team A for a four-game series:

WWWW
WWWL
WWLW
.
.
.
LLLW
LLLL

If the teams are equally matched, all sequences are equally likely,

so Pr(four-game sweep) = 2/16 = 1/8 = .125, or **12.5%**

(7) This is an application of Bayes' Theorem:

```
                              l--------   .95 "honest"  ------> = .912
             .96 honest ----
                              l--------   .05 "liar"    ------->  = .048

                              l--------   .97 "liar"    ------->  = .0388
             .04 liar ----
                              l--------   .03 "honest"  -------> = .0012
                                                            100% of possible states of the world
```

a. Pr("honest") = .912 + .0012 = 0.9132, or **91.32%**

b. Pr(liar l "liar") = $\frac{.0388}{.0868}$ = 0.4470, or **44.7%**

(8) These can all be solved using the binomial probability tables with n = 12 and π = .60

a. s = 8 using the individual table, so Pr(8 hits) = 0.213, or **21.3%**

b. s = 0 using the individual table, so Pr(0 hits) = 0.00, or **0%**

c. s = 2 using the cumulative table, so Pr(at least two hits) = 1.000, or **100%**

(9) These are both solved using the standard normal probability table

a. Pr(X < 24) = Pr(Z < $\frac{24-30}{10}$) = Pr(Z < -.60) = Pr(Z > .60) = .274, or **27.4%**

b. from Table IV, .03 = Pr(Z > 1.88) = Pr(X > 10*(1.88) + 30) = Pr(X > 48.8)

so 48.8 months (or **4 years** with downward rounding)

(10) a. E(salad size) = 0.5*10 + 0.5*20 = **15 ounces**

Var(salad size) = $2 \cdot 0.5 \cdot 5^2$ = 25 ounces^2, so Std. Dev. = **5 ounces**

b. You just have to show one case in which multiplying the two marginal probabilities together does not equal the joint probability, e.g.:

Pr(12 oz latte)*Pr(10 oz salad) = .4*.5 = .20 ≠ Pr(12 oz latte and 10 oz salad) = .25

Alternatively you can show that the conditional probability does not equal the unconditional probability for some outcome, e.g. Pr(12 oz lattel10 oz salad) ≠ Pr(12 oz latte)

c. Given dependence as shown in (b) and the pattern that there is more weight on the main diagonal than the off-diagonal, you can see that latte size and salad size are positively correlated.

E(salad size l 12 ounce latte) = (5/8)*10 + (3/8)*20 = **13.75 ounces**
E(salad size l 16 ounce latte) = (5/12)*10 + (7/12)*20 = **15.83 ounces**