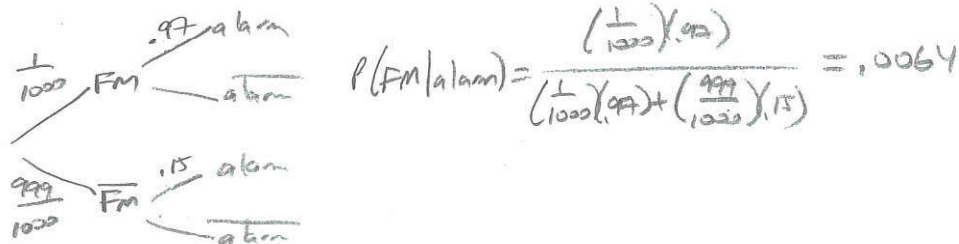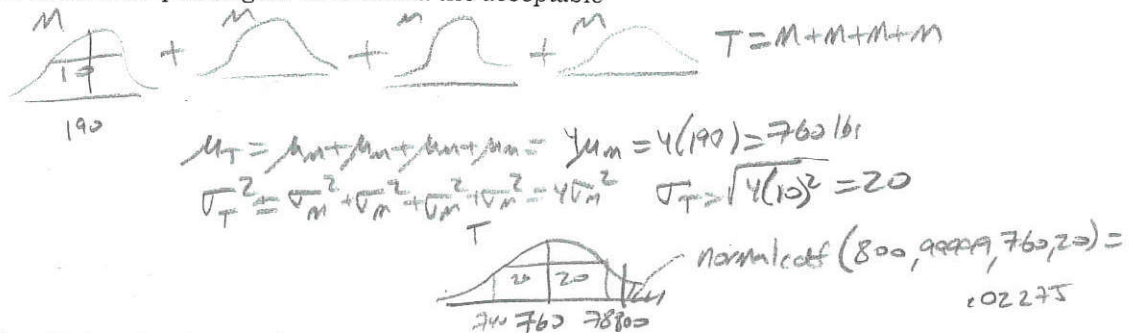# Probability Practice   name: solutions

3. All bags entering a research facility are screened. Ninety-seven percent of the bags that contain forbidden material trigger an alarm. Fifteen percent of the bags that do not contain forbidden material also trigger the alarm. If 1 out of every 1,000 bags entering the building contains forbidden material, what is the probability that a bag that triggers the alarm will actually contain forbidden material?

(A) 0.00097
(B) 0.00640
(C) 0.03000
(D) 0.14550
(E) 0.97000

$$P(FM|alarm) = \frac{\left(\frac{1}{1000}\right)(.97)}{\left(\frac{1}{1000}\right)(.97)+\left(\frac{999}{1000}\right)(.15)} = .0064$$

7. A summer resort rents rowboats to customers but does not allow more than four people to a boat. Each boat is designed to hold no more than 800 pounds. Suppose the distribution of adult males who rent boats, including their clothes and gear, is normal with a mean of 190 pounds and standard deviation of 10 pounds. If the weights of individual passengers are independent, what is the probability that a group of four adult male passengers will exceed the acceptable weight limit of 800 pounds?

(A) 0.023
(B) 0.046
(C) 0.159
(D) 0.317
(E) 0.977

$$T = M + M + M + M$$

$$\mu_T = \mu_M + \mu_M + \mu_M + \mu_M = 4\mu_M = 4(190) = 760 \text{ lbs}$$

$$\sigma_T^2 = \sigma_M^2 + \sigma_M^2 + \sigma_M^2 + \sigma_M^2 = 4\sigma_M^2 \qquad \sigma_T = \sqrt{4(10)^2} = 20$$
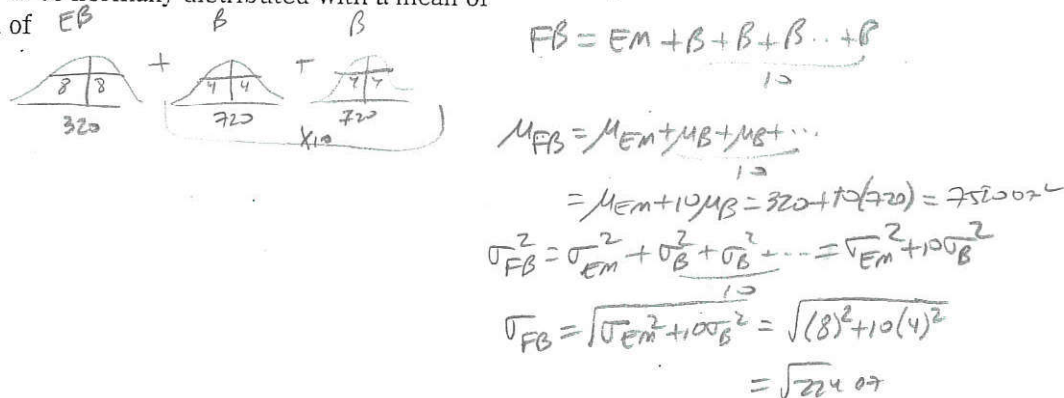
normalcdf $(800, 99999, 760, 20) = .02275$

10. In a certain game, a fair die is rolled and a player gains 20 points if the die shows a "6." If the die does not show a "6," the player loses 3 points. If the die were to be rolled 100 times, what would be the expected total gain or loss for the player?

(A) A gain of about 1,700 points
(B) A gain of about 583 points
(C) A gain of about 83 points
(D) A loss of about 250 points
(E) A loss of about 300 points

Binomial: $Y = "6"$ (p+) X   +20   −3

$p = \frac{1}{6}$ P $\frac{1}{6}$ $\frac{5}{6}$

$$EV = (20)\left(\frac{1}{6}\right) + (-3)\left(\frac{5}{6}\right) = .833$$

$\times 100$ trials $= 83.3$

11. The Attila Barbell Company makes bars for weight lifting. The weights of the bars are independent and are normally distributed with a mean of 720 ounces (45 pounds) and a standard deviation of 4 ounces. The bars are shipped 10 in a box to the retailers. The weights of the empty boxes are normally distributed with a mean of 320 ounces and a standard deviation of 8 ounces. The weights of the boxes filled with 10 bars are expected to be normally distributed with a mean of 7,520 ounces and a standard deviation of

(A) $\sqrt{12}$ ounces
(B) $\sqrt{80}$ ounces
(C) $\sqrt{224}$ ounces
(D) 48 ounces
(E) $\sqrt{1,664}$ ounces

$$FB = EM + B + B + B \cdots + B$$

$$\mu_{FB} = \mu_{EM} + \mu_B + \mu_B + \cdots = \mu_{EM} + 10\mu_B = 320 + 10(720) = 7520 \text{ oz}$$

$$\sigma_{FB}^2 = \sigma_{EM}^2 + \sigma_B^2 + \sigma_B^2 + \cdots = \sigma_{EM}^2 + 10\sigma_B^2$$

$$\sigma_{FB} = \sqrt{\sigma_{EM}^2 + 10\sigma_B^2} = \sqrt{(8)^2 + 10(4)^2} = \sqrt{224} \text{ oz}$$

12) Our school district is considering offering free SAT prep classes for students who did not do well on the PSAT. The distribution of equivalent SAT scores is normally distributed with a mean of 680 and a standard deviation of 35. Students who scored below 620 will be considered for the program. What percentage of those students scored above 600?

a) .0432

b) .7425

c) .0321

d) .2000

event

35   35

600   620 645   680   715

Cond. SS.
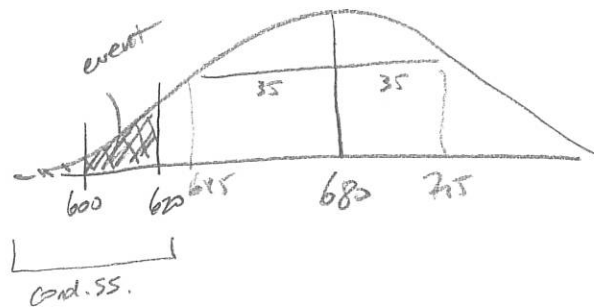
$$P(>600 \mid <620) = \frac{\text{normalcdf}(600, 620, 680, 35)}{\text{normalcdf}(-999, 620, 680, 35)}$$

$$= \frac{.0321}{.043638}$$

$$= .742 4619$$