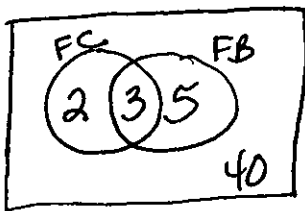


Name Key

Show all your work on this paper. Solutions without correct supporting work will not be accepted.

1. A check of 50 calculators just off the assembly line reveals that 5 have faulty cases, 8 have faulty batteries, and 3 have both of these defects. What is the probability that a randomly selected calculator from the collection will have a faulty case or a faulty battery? (6 points)



$$P(FC \text{ or } FB) = \frac{10}{50} = \frac{1}{5}$$

2. An insurance company is going to sell one-year life insurance policies with a face value of \$100,000 to 25-year-old women for \$1100. The company's mortality tables show that these women will live for one year with a probability of 0.99. Consider the company's earning from such policies to be values of a random variable. Find the company's expected earnings per policy. (8 points)

$$E(X) = 1100(.99) - 100,000(.01)$$

$$= \boxed{\$89}$$

3. Among 20 automotive CD players, 4 are known to have a defect. A sample of 3 of these players is selected, without replacement and without regard to order, to be checked for a defect. What is the probability that all 3 will have a defect or all 3 will not have a defect? (8 pts)

$$\frac{4C_3 + 16C_3}{20C_3} = \frac{49}{95}$$

$$\approx .4947$$

4. One card is drawn from a deck of 52 cards. What is the probability that the card is (4 pts each)

a. A king, given that the card was a heart? $P(K|H) = \frac{1}{13}$

b. A diamond, given that the card drawn is a diamond or a heart? $P(D|D \cup H) = \frac{1}{2}$

c. A diamond, given that the card drawn is a diamond and a jack? $P(D|D \cap J) = 1$

- d. What are the odds that the card is a king?

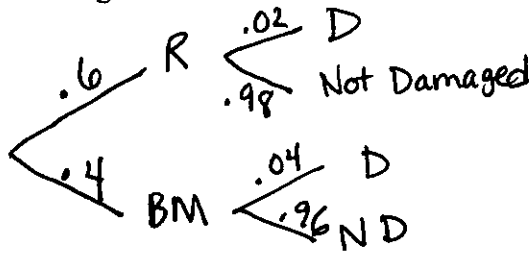
$$P(K) = \frac{4}{52} = \frac{1}{13}$$

$$P(\text{Not a } K) = \frac{12}{13}$$

$$\text{Odds} = \frac{\frac{1}{13}}{\frac{12}{13}} = \frac{1}{12} \quad \boxed{1:12}$$

5. A contractor buys bags of cement from two suppliers – Rodrigues's Lumber and Builder's Mart – and stores them in a warehouse. She buys 60% from Rodrigues's and 40% from Builder's Mart and, upon delivery, discovers that 2% of the bags from Rodrigues's are damaged and 4% of the bags from Builder's Mart are damaged. (5 pts each)

a. Draw a tree diagram for these data.



b. For a randomly selected bag, what is the probability that it came from Rodrigues's and was damaged?

$$P(R \text{ and } D) = .6(.02) = \boxed{.012}$$

c. For a randomly selected bag, what is the probability that it came from Rodrigues's, given that it was damaged?

$$P(R|D) = \frac{P(R \cap D)}{P(D)} = \frac{.012}{.6(.02) + .4(.04)} \approx \boxed{.42857}$$

6. Tests show that about 4% of the people who take a particular drug are subject to side effects. (5 pts each)

$$n=20, p=.04, q=.96$$

a. Of 20 people taking the drug, what is the probability that no more than 2 will experience the side effects?

0 side effects + 1 side effects + 2 side effects

$${}_{20}C_0 (.04)^0 (.96)^{20} + {}_{20}C_1 (.04)^1 (.96)^{19} + {}_{20}C_2 (.04)^2 (.96)^{18} \approx \boxed{.956}$$

b. If 20,000 people take the drug how many people would you expect to experience the side effects?

$$.04(20,000) = \boxed{800 \text{ people}}$$

7. A sample of 70 calculator batteries were tested for length of life. The results were as shown in the table:

Length of Life (months)	Frequency
6 to 8	12
8 to 10	16
10 to 12	18
12 to 14	13
14 to 16	11

a. Estimate the mean. (5 pts)

$$\bar{x} = \frac{7(12) + 9(16) + 11(18) + 13(13) + 15(11)}{70}$$

$$\bar{x} \approx \boxed{10.857 \text{ months}}$$

b. Estimate the standard deviation. (8 pts)

$$s \approx \boxed{2.64}$$

$x - \bar{x}$	$(x - \bar{x})^2$	Freq	
7-10.857	14.876	* 12	= 178.517388
9-10.857	3.448	* 16	= 55.175184
11-10.857	.0204	* 18	= .368082
13-10.857	4.592	* 13	= 59.701837
15-10.857	17.164449	* 11	= 188.808939

$$\frac{482.57143}{69} \approx 6.9937888 = \text{variance}$$

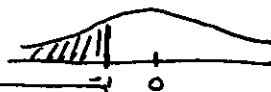
OK if worked on calculator instead of by hand.

$$s = \sqrt{\text{var}} \approx 2.64$$

8. The weights of bags of Kay's Potato Chips were found to be a normally distributed random variable with a mean of 6 oz and a standard deviation of $\frac{1}{2}$ oz. (4 pts each) $\mu = 6, \sigma = .5$

a. What percentage of the bags weighs less than $5\frac{1}{2}$ oz?

$$z = \frac{5.5 - 6}{.5} = -1$$



15.87%

b. What is the probability that a randomly selected bag weighs between $5\frac{3}{4}$ oz and $6\frac{1}{4}$ oz?

$$z_1 = \frac{5.75 - 6}{.5} = -1$$

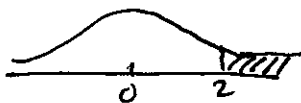


$$z_2 = \frac{6.25 - 6}{.5} = 1$$

$$P(-1 < z < 1) = .6915 - .3085 = .383$$

c. If a store has 500 bags of Kay's chips in stock, about how many will weigh more than 7 oz?

$$z = \frac{7 - 6}{.5} = 2$$



$$500(.0228) = 11.4 \text{ bags}$$

$$P(z > 2) = 1 - .9772 = .0228$$

or 11 bags

9. The daily salaries of the Lhila Corporation employees are \$90, \$80, \$110, \$97, and \$70. These salaries have a mean of \$91 and a standard deviation of \$13.2. How many of the salaries lie within one standard deviation of the mean? (4 pts)

$$\mu = 91, \sigma = 13.2$$

How many lie between 77.8 and 104.2?

3

10. Assume that SAT verbal scores for a freshman class at a university are normally distributed with a mean of 520 and a standard deviation of 75. The top 10% of the students are placed in the honors program for English. What is the lowest score for admittance into the honors program? (8 pts)

$$\mu = 520, \sigma = 75$$



What z-value will give us 90% of the area to the left?

$$z = 1.28$$

(using chart)

$$z = \frac{x - \mu}{\sigma}$$

$$1.28 = \frac{x - 520}{75}$$

$$x - 520 = 75(1.28) = 96$$

$$x = 616$$

lowest SAT score for the honors program