

Take your time and make sure you follow all instructions. Where necessary, work must be shown in order to receive partial credit. Include input into the calculator in order to receive partial credit.

1. Which of the following probability assignments are possible for the distribution of colored gum balls in a large vending machine? If an assignment is not possible give a reason why it is not. [8 pts]

a)

Blue	Red	Orange	Green
0.05	0.7	0.2	0.05

 Possible

b)

Blue	Red	Orange	Green
0.2	0.2	0.2	0.2

 Not Possible $.2 + .2 + .2 + .2 \neq 1$

c)

Blue	Red	Orange	Green
0	0	0	1

 Possible

d)

Blue	Red	Orange	Green
0.4	0.4	0.4	-0.2

 Not Possible because of Negative Probability.

2. A real estate study shows that 62% of homes have garages, 20% have swimming pools, and 13% have both a garage and a pool.

- a) What is the probability a randomly selected home has a garage but no pool? [5 pts]

$$P(\text{Garage but No Pool}) = .62 - .13 = .49$$

- b) What is the probability a randomly selected home owns a pool or a garage? [5 pts]

$$\begin{aligned} P(\text{Pool or garage}) &= P(\text{Pool}) + P(\text{Garage}) - P(\text{Both}) \\ &= .2 + .62 - .13 \\ &= .59 \end{aligned}$$

- c) If a randomly selected home has a pool, what is the probability it has a garage? [5 pts]

$$\begin{aligned} P(\text{Garage} | \text{Pool}) &= \frac{P(\text{Both})}{P(\text{Pool})} \\ &= \frac{.13}{.2} = .65 \end{aligned}$$

3. An automobile manufacturer makes 35% of its vehicles the color white, 24% red, 11% black, and the rest blue.
- a) If a vehicle randomly drives out of the manufacturer's factory what is the probability that [4 pts each]
- i. The vehicle is blue?

$$P(\text{Blue}) = 1 - (.35 + .24 + .11) = .3$$

- ii. The vehicle is not red?

$$P(\text{Not Red}) = 1 - .24 = .76$$

- iii. The vehicle is either white or black?

$$P(\text{White or Black}) = .35 + .11 = .46$$

- b) If 4 vehicles are randomly driven out of the factory, what is the probability that [5 pts each]
- i. All the vehicles are white?

$$P(\text{All White}) = .35^4 = .015$$

- ii. The first is the only black vehicle?

$$P(\text{First only Black}) = .11 \times .89^3 = .078$$

- iii. At least one of the vehicles is blue?

$$\begin{aligned} P(\text{At least one Blue}) &= 1 - P(\text{None Blue}) \\ &= 1 - .7^4 \\ &= .7599 \end{aligned}$$

4. The following table gives the length (in minutes) of movies and the probability of each length.

Length (in min.)	Probability
75	0.15
90	0.18
95	0.26
110	0.31
120	? .1

$$1 - (.15 + .18 + .26 + .31) = 1$$

[15 pts]

$$75 \times .15 = 11.25$$

$$90 \times .18 = 16.20$$

$$95 \times .26 = 24.70$$

$$110 \times .31 = 34.10$$

$$120 \times .1 = \frac{12}{98.25}$$

- a) What is the expected amount length of a movie?

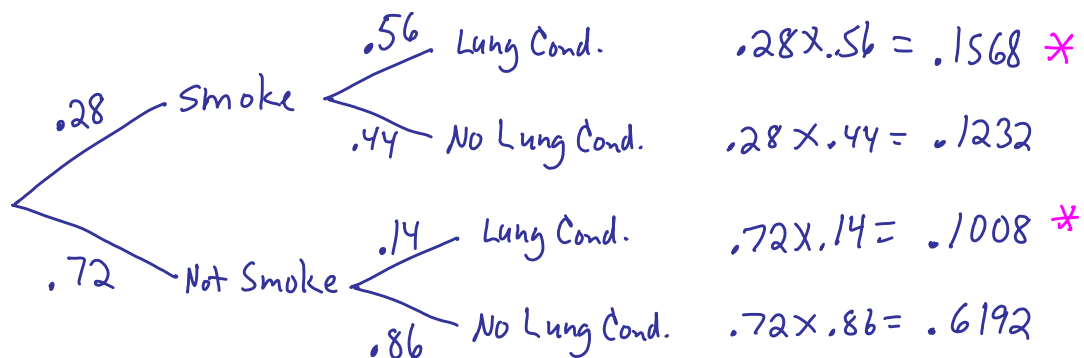
$$98.25$$

- b) If a distribution company charges \$3 per minute of a movie for the right to show a movie at theaters. On average how much will a theater be charged for each movie?

$$3(98.25) = \$294.75$$

5. Suppose that 28% of adults smoke. It is known that 56% of smokers and 14% of nonsmokers develop a certain lung condition by age 60. [16 pts]

- a) What is the probability a randomly selected 60 year old has this lung condition? (Tree diagram might be helpful)



$$P(\text{Lung Cond.}) = .1568 + .1008 = .2576$$

- b) What is the probability that a randomly selected 60 year old with the lung condition is a smoker?

$$P(\text{Smoker} | \text{Lung Cond.}) = \frac{.1568}{.2576} = .6087$$

6. The government says that 76% of the residents have health insurance. If 10 residents are randomly selected then determine the following.
(Show calculator inputs on (b)-(e) to receive partial credit)

- a) Find the mean and the standard deviation for the number with insurance out of 10? [6 pts]

$$\mu = np = 10 \cdot .76 = 7.6$$

$$\sigma = \sqrt{npq} = \sqrt{10 \cdot .76 \cdot .24} = 1.35$$

- b) What is the probability that exactly 7 of the residents have health insurance? [5 pts]

$$P(X=7) = \text{Binompdf}(10, .76, 7)$$

$$= .2429$$

- c) What is the probability that at least 3 of the residents have health insurance? [5 pts]

$$P(X \geq 3) = 1 - \text{Binomcdf}(10, .76, 2)$$

$$= .9997 \text{ or } 1$$

- d) What is the probability that less than half of the residents have health insurance? [5 pts]

$$P(X < 5) = \text{Binomcdf}(10, .76, 4)$$

$$= .0161$$