Probability

1.a. the probability of a birth of twins is: the probability of a birth of identical twin + the probability of a birth of unidentical twin, as they are the only options of twins.

P(twins) = 1/125 + 1/300 = 17/1500

we'll use the formula below to calculate the probability of Elvis's twin brother being an identical one, given the fact that he is a twin.

$$\boxed{P(A \mid B) = \frac{P(A \cap B)}{P(B)}}$$

The numerator of this formula is 1/300, given that every identical twin is a twin so the cut between them is all the identical twins.

P(identical wtin| twin) = (1/300) / (17/1500) = 5/17 = 0.29411

1.b. we'll use the same formula.

We'll also use the formula:

$$P(A \cap B) = P(A \mid B)P(B) = P(B \mid A)P(A)$$

P(bowl 1 was picked | the cookie was a chocolate one) = P(the cookie was a chocolate one | bowl 1 was picked) * P(bowl 1 was picked) / P(the cookie was a chocolate one) =

= (3/4) * 0.5 / (5/8) = 0.6

RANDOM VARIABLES:

1. Divisible by 3: 3,6,9,12. 4/12.
   Not divisible by 3: 1 – 4/12 = 8/12

   The expected value of Roi is:
   E = (8/12) * (- 3) + (4/12) * 6 = 0

2. 5*5 = 25. There are 25 scenarios of different numbers.
   <u>Above 12:</u>
   10 : 3,4,5
   9: 4,5
   8 : 5

   Above 12 = 6 /25.

12:
10 : 2
9 : 3
8 : 4
7 : 5

12: 4 / 25

Below 12: 1 – 4/25 – 6/25 = 15/25 = 3/5

Alex’s expected value is:
E = 6/25 * 5 + 4/25 * 0 + 15/25 * (-6) = -2.4

3. 40% of 8 is 3.2.
The mean = 3.2

We’ll use this formula to calculate the standard deviation:

$$\sigma = \sqrt{\frac{\sum (x - \text{mean})^2}{n}}$$

x is a set of numbers
mean is the average of the set of numbers
n is the size of the set
σ is the standard deviation

The numerator is 65.759999 or 65.76.
There are 9 options for men selected each month, from 0 men to 8, so n = 9.

The standard deviation is 2.703.

4. We’ll calculate the area beneath the line from the point we need. The area below the line after x > 3 is the probability of P(x > 3).

The area is: (0.4 * 2) /2 = 0.4

P(x > 3) = 0.4.

6. 60% of employees with kids are 300 employees, and 3/5 of the employees.
   The number of employees without kids are 2/5 of the employees.

   We'll use this formula:

   Binomial Distribution Formula

   $$P(x) = \binom{n}{x} p^x q^{n-x} = \frac{n!}{(n-x)!\,x!} p^x q^{n-x}$$

   where
   n = the number of trials (or the number being sampled)
   x = the number of successes desired
   p = probability of getting a success in one trial
   $q = 1 - p$ = the probability of getting a failure in one trial

   Using this formula we get:

   P = 0.3456

7. We'll take from the bar graph what we need.

   The expected value of X is:

   X = 0.1 * (-10) + 0.35*(-5) + 0.1* 0 + 0.35 * 5 + 0.1 * 10 = 0