

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.

$$P(\text{twins}) = 1/125 + 1/300 = 17/1500$$

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.

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

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.

In addition, identical twins are of the same gender, so we don't need to add the probability that the twin is a male.

$$P(\text{identical twin} | \text{twin}) = (1/300) / (17/1500) = 5/17 = 0.29411$$

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

We'll also use the formula:

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

$P(\text{bowl 1 was picked} | \text{the cookie was a chocolate one}) = P(\text{the cookie was a chocolate one} | \text{bowl 1 was picked}) * P(\text{bowl 1 was picked}) / P(\text{the cookie was a chocolate one}) =$

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

2.

We'll use this formula:

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

The numerator of this formula is 1/2, if the yellow candy was from the 1994 bag.

The denominator will be the probability of getting a yellow m&m, which is:

$$\frac{1}{2} * \frac{20}{100} + \frac{1}{2} * \frac{14}{100} = 0.17$$

$$P = (20/100 * 0.5) / 0.17 = 10 / 17$$

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.

Above 12:

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 know that the mean is 26000 and the standard deviation is 2000.

We'll use this equation, to find the area:

If X is a normally distributed random variable with mean μ and standard deviation σ , then

$$P(a < X < b) = P\left(\frac{a - \mu}{\sigma} < Z < \frac{b - \mu}{\sigma}\right)$$

$a = 26,000$

$b = 30,000$

the mean is : 26,000

standard deviation is: 2,000

$$P(a < X < b) = P((26,000 - 26,000) / 2000 < Z < (30,000 - 26,000) / 2,000) = P(Z < 2)$$

I used the standard normal distribution table to get the value of the area $P(Z < 2)$.

$$P(26 < X < 30) = P(Z < 2) = 0.4772$$

5. 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

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:

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