

Answers to example questions

Sample data of 20 scores {31, 23, 34, 38, 27, 34, 36, 22, 23, 33, 29, 33, 34, 34, 36, 33, 36, 24, 30, 29}

- What is the mode? 34
- What is the median? 33
- What is the mean? 30.95
- What is the range? 16
- What score is the 22nd percentile using the interpolation method? 25.86
- What is Q1? 27.5
- What is Q3? 34
- What is the interquartile range? 6.5
- What is the semi-interquartile range? 3.25
- What is the variance? 23.94
- What is the standard deviation? 4.89

Normal Distribution

What is the mean and standard deviation? 70, 15

What proportion of respondents had scores that fell between 55 and 85? 68%

What proportion of respondents had scores that fell between 40 and 100? 96%

What proportion of respondents had scores that fell between 85 and 115? 16%

What proportion of respondents scored below 90? 91%

What proportion of respondents scored above 60? 75%

What proportion of respondents scored between 50 and 80? 66%

What proportion of respondents scored between 90 and 110? 9%

What score had 75% of the respondents below it? 80.12

What score had 20% of the respondents above it? 82.62

Probability

- A large basket of fruit contains 3 oranges, 2 apples and 5 bananas. If a piece of fruit is chosen at random, what is the probability of getting an orange or a banana?

$$P(O \text{ or } B) = 3/10 + 5/10 = 8/10 = 4/5$$

- A pair of dice are rolled. What is the probability of getting a sum of 2?

There is only 1 way to roll a 2 with two dice and 36 possible combinations, so it's 1/36

- In the United States, 43% of people wear a seat belt while driving. If two people are chosen at random, what is the probability that both of them wear a seat belt?

*P(1 and 2) = .185. This problem can be rephrased as "What's the probability that person 1 AND person 2 will be wearing their seatbelt?". So it's .43 for person 1 and .43 for person 2 and because of the and you multiply. .43 * .43 = .185*

- A city survey found that 47% of teenagers have a part time job. The same survey found that 78% plan to attend college. If a teenager is chosen at random, what is the probability that the teenager has a part time job and plans to attend college?

*P(J and C) = .366. It's an and question again. So it's .47 for part time job and .78 for part time job and because of the AND you multiply. .47 * .78 = .366*

- In a shipment of 100 televisions, 6 are defective. If a person buys two televisions from that shipment, what is the probability that both are defective?

*$P(1 \text{ and } 2) = 1/330$ or $.003$. This problem can be rephrased as “What’s the probability that TV 1 AND TV 2 will be defective?”. The probability of the first TV is $6/100$ and the second is $5/99$. Because of the AND we multiply. $6/100 * 5/99 = 30/9900 = 1/330 = .003$*

- Three cards are chosen at random from a deck without replacement. What is the probability of getting a jack, a ten and a nine in order?

$P(J \text{ and } 10 \text{ and } 9) = 8/16575 = .00048$. Because they are in order this makes it a little easier. The probability of a Jack is $4/52$, after the Jack is removed the probability of getting a 10 is then $4/51$ and then for the 9 it’s $4/50$. Multiply them and you get $64/132600 = 8/16575 = .00048$.

- Three cards are chosen at random from a deck without replacement. What is the probability of getting a jack, a ten and a nine in ANY order?

$P(J \text{ and } 10 \text{ and } 9 \text{ any order}) = 16.5525 = .0029$. This is similar to the one above but getting them in any order makes it a little trickier. The probability of getting a Jack, a 10 or a 9 in the first card is $12/52$ (because there are 4 of each of them), once the first card is selected it can’t be selected again, so the probability of the next card is then $8/51$ and then 4 out of 50. So, multiply and you get $384/132600 = 16/5525 = .0029$

Advanced Question

- Suppose you must choose between two products to sell in your shop. Your choice depends on what the economy is going to do. If the economy goes up, you will make a profit of \$100,000 on (product A) or \$60,000 on (product B). If the economy stays the same, you will earn a profit of \$50,000 on (product A) and \$40,000 on (product B). And if the economy goes down, you will lose \$20,000 on (product A) but can still earn \$10,000 on (product B).

You don't know for sure what the economy is going to do, but you might know the probabilities of these things happening. Suppose the probability of the economy going up is .4, the probability of it staying the same is .4, and the probability of it going down is .2.

Determine the expected profit for each product. Which product would you choose and WHY?

$$\text{Product A: } .4(100,000) + .4(50,000) + .2(-20,000) = 40,000 + 20,000 - 4,000 = 56,000$$

$$\text{Product B: } .4(60,000) + .4(40,000) + .2(10,000) = 24,000 + 16,000 + 2,000 = 42,000$$

The average business professional would choose (product A). However, a very conservative or cautious business professional would be willing to sacrifice some of the profit in order to avoid any risk of losing money. So, he or she would choose (product B).