

MATH 5e: Class Work 21

Topics: Equations, Introduction to Probability

Probability:

In general, the probability of obtaining one outcome from a certain collection of A possible outcomes, is given by

$$P(A) = \frac{\text{Number of outcomes giving } A}{\text{total number of possible outcomes}}$$

Addition rule:

Probability of outcome A to happen or outcome B to happen is sum of the individual probabilities

$$P(A \text{ or } B) = P(A) + P(B)$$

Complement rule:

The sum of probability of all outcomes is 1. Then the probability of getting an outcome different from A is

$$P(\text{not } A) = 1 - P(A)$$

Product rule

When we have independent trials, the probability is a product of the probability for each trial.

Then, if the probability for each trial is p, the probability after n trials is:

$$P(n \text{ -trials}) = p \times p \times p \dots \dots = p^n$$

Probability given as a percent:

So far, we expressed the probability as a fraction. We can write the fractions as decimals and work with them. But if the probability is given as a percent value, please convert the % to **1/100**.

Example: $p = 1/5 = 2/10 = 0.2$

$$p = 20\% = 20 \times \mathbf{1/100} = 20/100 = 0.2$$

Review HW problems.

Problems

1. We roll two 6-sided dice together. How many different outcomes (combinations of numbers) are there when rolling the two dice? Write them down.

- What is the probability of rolling a 5 and a 6
- What is the probability that the sum of the two numbers is 4
- Will the answer change if we have one die and roll it twice?



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2. A fair coin has an equal probability of landing on head (H) or tail (T). This probability is $P(H) = P(T) = \frac{1}{2}$. First, let's write all possible outcomes after flipping 3 coins once.

- What is the probability of getting 3 H in a row, $P(HHH) = ?$
- What is the probability of getting P(HTH)?
- What is the probability of flipping one coin 3 times and getting P(HTH)? Is there a difference from b)? Define the Product rule and see attached file.



Head



Tail

3. Use the product rule for compound events. If a fair coin is flipped 10 times, calculate the following:

- The probability to get 10 heads in a row
- the probability to get at least one T

4. The probability of winning a specific game is 5%, or $P(A) = 5\%$.
What is the probability of winning 2 times in a row, $P(AA) = ?$

4. Take a coin and flip it 10 times. Write down in your notes the sequence of H and T you get. How many heads did you get?

5. **Choosing with repetition.** How many possible sequences of H and T are there when we flip a coin 4 times? Can we count the number faster? After, review the link in Google Classroom

6. How many 3-letter combinations can be formed using the 26 English alphabet letters?

7. You have 6 colors O Y G B P R. What are all possible ways to paint 4 empty squares with the six colors if

- You can repeat colors
- You cannot repeat a color

