MATH STUDY CLASS
Sanniquellie Central High
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PROBABILITY

Mathematicians use probability to describe how likely or unlikely something is to happen. You can think of it like chance. Does one event have a greater chance (probability) of happening than another?

DEF: The **sample space** of an event is the group of all possible outcomes or results. For example, the sample space for rolling a six-sided die is $S = \{1,2,3,4,5,6\}$ because the die has six sides and each side has a different number.

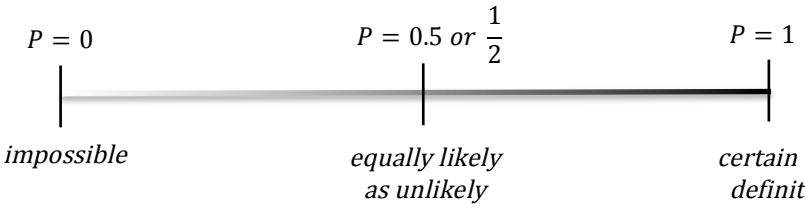
PROBABILITY

The probability of an event M happening in sample space S is given by the equation:

$$P(M) = \frac{number\ of\ ways\ to\ get\ the\ result\ M}{number\ of\ total\ possible\ results\ in\ the\ sample\ space}$$

$$= \frac{n(M)}{n(S)}$$

Probability is often expressed as a fraction or a decimal. This means it is a number between 0 and 1. A probability of 0 indicates that something is impossible. A probability of 1 indicates that something is certain or definite. The closer a probability is to 1 the more likely it is to happen. Think of it like a line.



EXAMPLE The whole numbers 1 to 10 are written on ten small pieces of paper. They are then folded and packed in a bag. One piece is removed at random. Find the probability that:

a) the number is 6

$$P(6) = \frac{number\ pieces\ of\ paper\ in\ the\ bag\ marked\ with\ 6}{total\ pieces\ of\ paper\ in\ the\ bag}$$

$$= \frac{1}{10}\ or\ 0.1$$

b) the number is *at least* 8

Remember that 'at least 8' means all numbers that are 8 or bigger. Looking at the whole numbers from 1 to 10 you can see 8, 9, and 10 are the numbers that are 8 or bigger. So there are three pieces of paper marked with a number that is at least 8.

$$P(at\ least\ 8) = \frac{number\ of\ pieces\ of\ paper\ marked\ with\ at\ least\ 8}{total\ pieces\ of\ paper\ in\ the\ bag}$$

$$= \frac{3}{10}\ or\ 0.3$$

c) the number is 12

The bag only contains the numbers from 1 to 10 so 12 is not even in the bag! It is impossible to select 12.

$$P(12) = \frac{number\ of\ pieces\ of\ paper\ marked\ with\ 12}{total\ pieces\ of\ paper\ in\ the\ bag}$$

$$= \frac{0}{10}$$

$$= 0$$

PRACTICE A bag contains 40 balls. There are 15 green balls and 9 yellow balls. The rest of the balls are red. A ball is chosen at random. Find the probability that it is:

a) green b) red c) yellow

Now, what if you wanted to find the probability of two independent events happening at the same time? For example, what if we combined our two problems so we had a bag with the numbers 1 to 10 and a second bag with 40 green, red, and yellow balls. What would be the probability of drawing a number that is at least 8 from the first bag and a green ball from the second bag?

RULE To find the probability of two independent events happening at the same time:

1. Calculate the probability of the first event happening.
2. Calculate the probability of the second event happening.
3. Multiply the probabilities together.

Two events are independent if the outcome of one does not affect the outcome of the other.