

Name: _____ Date: _____ Per: _____

Probability and Odds

THE PROBABILITY OF AN EVENT

When all outcomes are EQUALLY LIKELY, the probability that an event will occur is given by the formula below.

$$P = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}} = \frac{1}{6}$$

Example 1

A bag has 8 blue marbles, 3 yellow marbles, and 4 red marbles. Find the probability of drawing a marble that is:

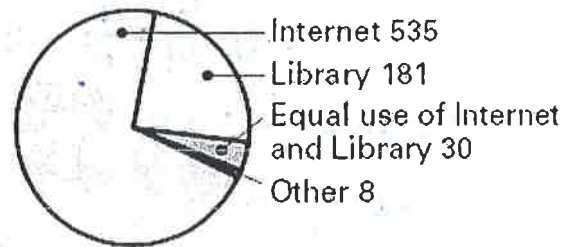
$8 + 3 + 4 = 15$

a) yellow $P(\text{YELLOW}) = \frac{3}{15} = \frac{1}{5}$ b) blue $P(\text{BLUE}) = \frac{8}{15}$

Example 2

The circle graph at the right shows the responses of 754 internet users aged 12 to 17 when asked to name their primary source of research for a school paper or project. Use the circle graph to find the following experimental probabilities of these students.

Primary Source of Research



a) What is the probability they use only the Internet as their main resource? $P(\text{INT.}) = \frac{535}{754}$

b) What is the probability they use the library and the Internet equally? $P(\text{I+L}) = \frac{30}{754} = \frac{15}{377}$

Example 3

A ten-sided cube has faces lettered A through J.

a) Find the probability of rolling a "C" $P(C) = \frac{1}{10}$

Experimental Probability uses the actual outcomes from repeatedly doing an activity.

When a cube is rolled 100 times, the following results were obtained:

A	B	C	D	E	F	G	H	I	J
9	5	14	7	8	9	15	10	11	12

Use these results to find the experimental probability of rolling:

b) $P(C) =$ the probability of rolling a "C" = $\frac{14}{100} = \frac{7}{50}$

c) $P(\text{not C}) =$ the probability of rolling any letter except for C =

$$\frac{100}{-14} = \frac{86}{100} = \frac{43}{50} \quad 1 - \frac{7}{50} = \frac{50}{50} - \frac{7}{50} = \frac{43}{50}$$

TOTAL # OUTCOMES = FAV. + UNFAV. SO:

UNFAV = TOTAL - FAV.

THE ODDS OF AN EVENT

When all outcomes are equally likely, the odds that an event will occur are given by the formula below.

$$\text{Odds} = \frac{\text{Number of FAVORABLE outcomes}}{\text{Number of UNFAVORABLE outcomes}}$$

Odds are always read as the ratio of one quantity to another. For example, $\frac{4}{3}$ is read as "four to three," not as "four thirds."

4:3



Example 4

You randomly choose an integer from 1 through 9.

a) What are the odds that the integer is even?

Favorable outcomes: 4 Unfavorable outcomes: 5

The odds that the integer is even are: 4:5

b) What is the probability the integer is even? $\frac{4}{9}$

c) What are the odds that the integer is composite? 4:5

d) What is the probability the integer is composite? $\frac{4}{9}$

Example 5

Twenty-four students went out to lunch. The waiter recorded how many students ordered each lunch in the table below. If the waiter randomly selects a student from this group, what are the odds that the student ordered the following?

a) Hot Dog $P(HD) = \frac{4}{24} = \frac{1}{6}$ 1:5 $\frac{4}{24-4} = \frac{4}{20} = \frac{1}{5}$ 1:5

b) Pizza or Hamburger $\frac{15}{9} = \frac{5}{3}$ 5:3

c) Anything except a Taco $\frac{21}{3} = \frac{7}{1}$ 7:1

Pizza	9
Taco	3
Hot Dog	4
Hamburger	6
Tuna melt	2

15

Finding Odds from Probability

$$\text{Odds} = \frac{\text{Probability event will occur}}{1 - (\text{Probability event will occur})}$$

The phrase "1 - (Probability event will occur)" is the probability that the event will not occur.

Example 6

When people drive at least 100 miles, the probability that they use their own personal use vehicle is $\frac{77}{100}$ (Other choices include business vehicles or public transit like taxi's, busses, or shuttles.) Find the odds in favor of a person using their own personal car.

EASIER WAY

$$\frac{\frac{77}{100}}{1 - \frac{77}{100}} = \frac{\frac{77}{100}}{\frac{23}{100}} = \frac{77}{23} = \frac{77}{23} \quad \left| \frac{77}{100} \quad 100 - 77 = 23 \text{ UNFAV.} \right. \quad \left. \frac{77}{23} \right.$$

Example 7

A fishing pond is stocked with two types of fish: largemouth bass and catfish. If the probability of catching a bass is 0.2, find the following:

a) $P(\text{catfish}) = 1 - 0.2 = 0.8$ b) Odds of catching a bass = 1:4 c) Odds of catching a bass = 4:1

$P(\text{CAT}) = 1 - 0.2 = \frac{20}{100} = \frac{2}{10} = \frac{1}{5}$ FAV. TOTAL UNFAV = 5 - 1 = 4

CATFISH