Expressing Probabilities

Probability

- the mathematical likelihood of something happening
- A ratio that compares the number of possible **successful** outcomes to the **total** number of possible outcomes.

$$\text{Probability of an event} = \frac{\text{Number of desired outcomes}}{\text{Total possible outcomes}}$$

Number of outcomes = P(event) x Total number of events
(as a decimal)

Four Ways to Express Probability

1) words
2) percentages
3) fractions
4) decimals

Example 1

A fisheries officer needs to measure the length of three different kinds of fish - pike, trout, and whitefish. The lake has been stocked with 250 fish.

total 250 fish

- 25 fish are pike
- 75 fish are trout
- 100 fish are whitefish

50 other

The officer catches the first fish to be measured.
What is the probability that the fish is:

a) A pike (express as a fraction)

$$P(\text{pike}) = \frac{25}{250}$$

$$= \frac{1}{10}$$ ← don't need to reduce

b) A trout (express as a decimal) $P(\text{trout}) = \frac{75}{250} = 0.3$ ← start with fraction

or calc $75 \div 250$

c) A whitefish (express as a percent) $P(\text{whitefish}) = \frac{100}{250} = 0.4$

0.4×100

40%

d) Any one of these three kinds of fish (express using words)

$P(\text{p, t or w}) = \frac{200}{250} = \frac{4}{5}$

The probability of that fish being a pike, trout or whitefish is 4 out of 5.

Example 2

Determine the probability of drawing a diamond from a well-shuffled deck of cards. State your answer as:

a) a fraction $\frac{13}{52}$ $\frac{1}{4}$

b) a ratio 13 : 52

1 : 4

c) a decimal 0.25

d) a percent 25%

e) using words

The probability of drawing a diamond is 1 out of 4.

Example 3

If you made 20 draws in Example 2 (returning each card), how many diamonds would you theoretically expect to draw?

Number of outcomes = P(event) x # of events

= 0.25 x 20

= 5 diamonds

theoretical

25%

in our trial

4 diamonds

experimental

20%

52 cards
4 suits
13 cards in each suit

Example 4

The probabilities for having a certain hair colour in Canada are given in the following chart.

Colour	Ratio	Fraction	Decimal (x100)	Percent
Brown	7:10	$\frac{7}{10}$	0.7	70%
Blonde	1:7	$\frac{1}{7}$	0.14	14%
Black	1:10	$\frac{1}{10}$	0.1	10%
Red	1:17	$\frac{1}{17}$	0.06	6%

a) Complete the chart.

b) In a class of 30 students, approximately 70% of them should have brown hair. This would be equivalent to 21 students (30 x 70%). Based on the number of students in our class, how many students should have brown hair?

students

10 x 0.70 = 7 students ← theoretical

in class 9 have brown hair ← experimental

c) How many students should have blonde hair?

10 x 0.14 = 1.4 ≈ 1 student ← theoretical

in class 1 have blonde hair ← exp

d) How many students should have black hair?

10 x 0.1 = 1 student ← theoretical

in class 0 have black hair ← exp

e) How many students should have red hair?

10 x 0.06 = 0.6 ≈ 1 student

in class 0 have red hair