

3.2: Fundamentals of Probability

Event: a collection of results or outcomes of a procedure.

Example: When tossing a coin, an event would be "Tails"

Sample space: all possible simple events

Example: When tossing a coin, the sample space would be $\{H, T\}$
(there are only two possible outcomes)

Toss a coin 3 times

a) Give an example of an event.

HTT

2^3

b) What is the sample space?

HHH	TTT
HHT	THT
HTH	HTH
HTT	TTH

P – denotes a probability.

A , B , and C – denote specific events.

$P(A)$ – denotes the probability of
event A occurring.

Determine the probability when tossing a coin 3 times:

$$P(\text{all tails}) = \frac{1}{8} = .125$$

$$P(\text{exactly two tails}) = \frac{3}{8} = .375$$

Experimental vs Theoretical Probability

- A coin is tossed 200 times, of which 95 results were “tails”.

- $P(\text{tails}) =$

- $P(\text{tails}) = 95/200$ (Experimental; I tossed the coin)

- What is the actual probability of tossing “Tails”?

$$\frac{100}{200} = \frac{1}{2}$$

- Roll a die: If the die is fair, what's the probability of rolling a "4"?

- $P(4) = \frac{1}{6} = .167$

Probability values

- ❖ The probability of an impossible event is 0.
- ❖ Example: If you roll a die, the probability of rolling a 7 is impossible. $P(7) = 0$
- ❖ The probability of an event that is certain to occur is 1.
- ❖ Example: If you roll a die, the probability of rolling a number is certain. $P(\text{number}) = 1$
- ❖ $0 \leq P(A) \leq 1$ for any event A .

Which values could not be probabilities?

-5

0.44444444

1.2

8/9

1/3

.326

sqrt(10)

7/3

$$P(\bar{A}) = 1 - P(A)$$

The complement of event A , denoted by \bar{A} , consists of all outcomes in which the event A does **not occur.**

$$P(A) = .72$$

$$P(\bar{A}) = 1 - .72 = .28$$

If $P(A) = .546$ then

$$P(\bar{A}) = .454$$

There are 15 girls and 20 boys in a class.
Find the probability of selecting

a girl? $P(G) = \frac{15}{35} = .429$

a boy? $P(B) = \frac{20}{35} = .571$

not a boy? $P(\bar{B}) = 1 - P(B) = 1 - .571$
 $= .429$

There are 5 red marbles, 7 green marbles, and 8 yellow marbles.

Find the probability of selecting a marble that is

Red $P(R) = \frac{5}{20} = .25$

Not yellow $P(\bar{Y}) = \frac{12}{20} = .6$

Orange $P(O) = 0$

Rounding rule for probabilities

3 Significant digits

- $.1666666667 = .167$

- $0.00321 = 0.00321$

- $.5987 = .599$

.0000582468

.0000582

$$\frac{17}{100,000} = 1.7 \text{ E}-4$$
$$1.7 \times 10^{-4} = 0.00017$$

$$\frac{6}{45,587} = 1.31616 \text{ E}-4$$
$$0.000132$$

Unusual probability values have a probability value less than 0.05

(Less than 5%)

p. 128
1-8 All
11-19 odd