

Complements

The complement of an event is all of the outcomes of that event that would not be considered 'successes' or 'desirable'. The following examples explore this idea in more depth.

Example 6

A bag contains five red marbles, eight green marbles and three blue marbles.

- a) If you select one marble at random from the bag, what is the probability that it is red?

$$P(\text{Red}) = \frac{5}{16}$$

- b) Describe the complement of "selecting a red marble".

not selecting Red

- c) Determine the probability of the complement of "selecting a red marble".

$$P(\text{not red}) = \frac{11}{16}$$

- d) Add your probabilities from a) and c). What do you notice?

$$\frac{5}{16} + \frac{11}{16} = \frac{16}{16} \Rightarrow 100\%$$

Example 7

If you roll a twelve-sided die once, "rolling an even number" and "rolling an odd number" are complementary events.

2 4 6 8 10 12 1 3 5 7 9 11
 1 2 3 4 5 6 7 8 9 10 11 12 - even

List another three pairs of complementary events for rolling a twelve-sided die.

- | <u>Event</u> | <u>Complement</u> |
|------------------------------------|---|
| • rolling a 4 | • Not rolling a 4: 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12 |
| • rolling a multiple of 2 (even) # | • Not rolling a multiple of 2 or rolling an odd (1, 3, 5, 7, 9, 11) |
| • rolling a number greater than 7 | • rolling a number less than 7 |