

Example 15**Self Tutor**

A box contains 3 red, 2 blue and 1 yellow marble. Find the probability of getting two different colours:

- a** if replacement occurs **b** if replacement does not occur.

To answer this question we use the tree diagram on page 278.

a P(two different colours)
 $= P(\text{RB or RY or BR or BY or YR or YB})$ {ticked ones ✓}

$$= \frac{3}{6} \times \frac{2}{6} + \frac{3}{6} \times \frac{1}{6} + \frac{2}{6} \times \frac{3}{6} + \frac{2}{6} \times \frac{1}{6} + \frac{1}{6} \times \frac{3}{6} + \frac{1}{6} \times \frac{2}{6}$$

$$= \frac{11}{18}$$

b P(two different colours)
 $= P(\text{RB or RY or BR or BY or YR or YB})$ {crossed ones ×}

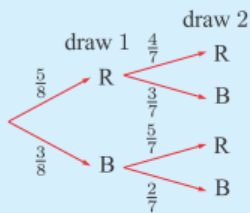
$$= \frac{3}{6} \times \frac{2}{5} + \frac{3}{6} \times \frac{1}{5} + \frac{2}{6} \times \frac{3}{5} + \frac{2}{6} \times \frac{1}{5} + \frac{1}{6} \times \frac{3}{5} + \frac{1}{6} \times \frac{2}{5}$$

$$= \frac{11}{15}$$

Notice that in **b**
 P(2 different colours)
 $= 1 - P(\text{2 the same})$
 $= 1 - P(\text{RR or BB})$
 $= 1 - (\frac{3}{6} \times \frac{2}{5} + \frac{2}{6} \times \frac{1}{5})$
 $= \frac{11}{15}$

**Example 16****Self Tutor**

A bag contains 5 red and 3 blue marbles. Two marbles are drawn simultaneously from the bag. Determine the probability that at least one is red.



P(at least one red)
 $= P(\text{RR or RB or BR})$
 $= \frac{5}{8} \times \frac{4}{7} + \frac{5}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{5}{7}$
 $= \frac{20+15+15}{56}$
 $= \frac{25}{28}$

Alternatively, P(at least one red)
 $= 1 - P(\text{no reds})$ {complementary events}
 $= 1 - P(\text{BB})$ and so on.

Drawing *simultaneously* is the same as sampling *without* replacement.

