

Consider the independent events:

Spinning a coin $\{H, T\}$ and Rolling a die $\{1, 2, 3, 4, 5, 6\}$

Possible equally likely outcomes:

$H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6$

Equally likely so each has probability $= \frac{1}{12}$

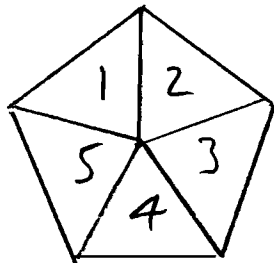
e.g. $P(H, 3) = \frac{1}{12}$

However, $P(H) = \frac{1}{2}$ and $P(3) = \frac{1}{6}$

$$\text{and } \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$$

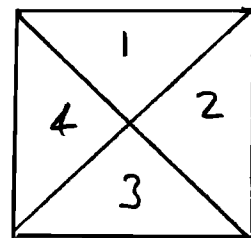
So to find the probability of two independent events occurring we simply multiply their individual probabilities

Now consider two fair spinners, one with 5 sides and one with 4



$$P(\text{odd}) = \frac{3}{5}$$

$$P(\text{even}) = \frac{2}{5}$$



$$P(\text{odd}) = \frac{2}{4} = \frac{1}{2}$$

$$P(\text{even}) = \frac{2}{4} = \frac{1}{2}$$

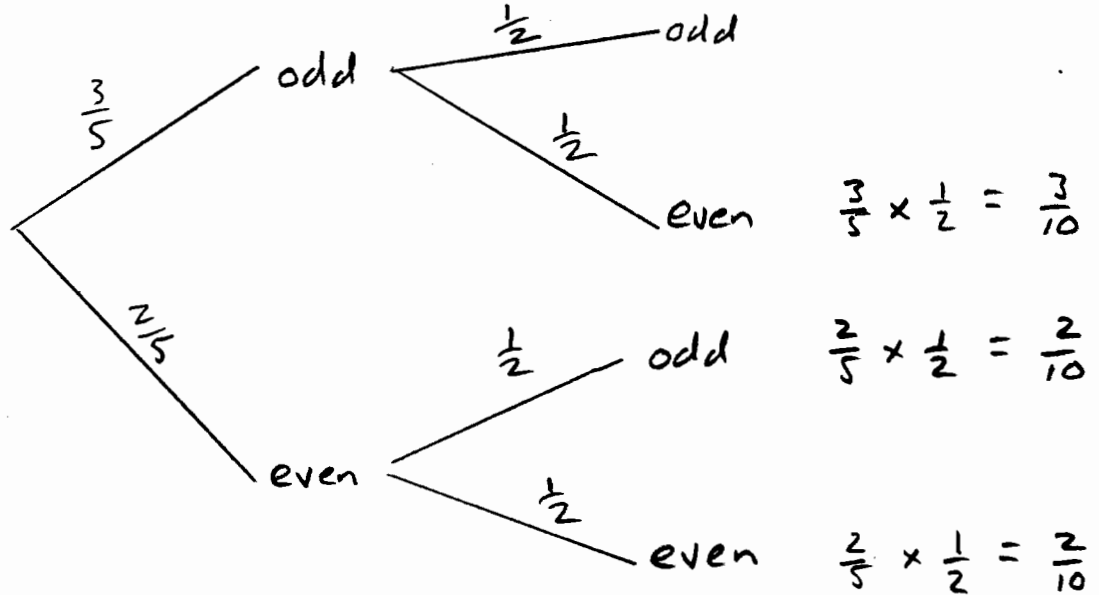
PROBABILITY TREES

TRANSCRIPT

Ex 1

5 sides
{1, 2, 3, 4, 5}

4 sides
{1, 2, 3, 4}



i) Find prob (both even) = $\frac{2}{10}$ or $\frac{1}{5}$

ii) Find prob (one odd and one even)

= $P(\text{odd, even}) + P(\text{even, odd})$

= $\frac{3}{10} + \frac{2}{10}$

= $\frac{5}{10}$ or $\frac{1}{2}$

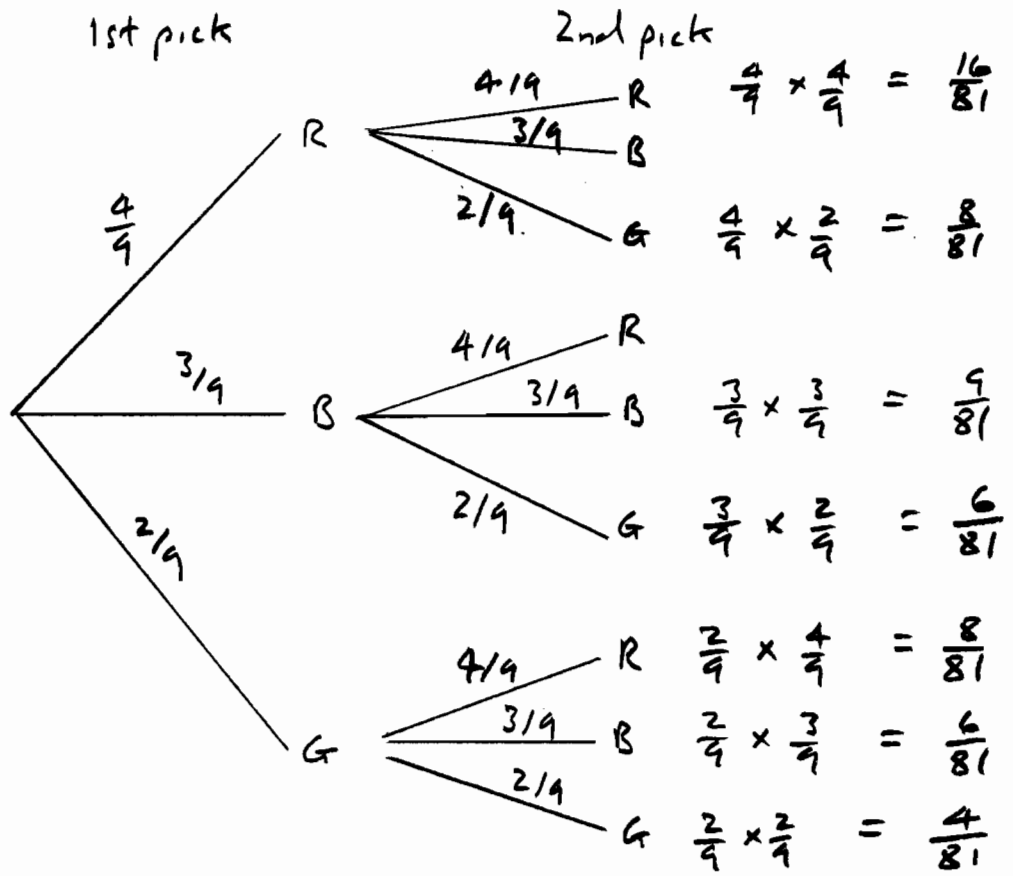
PROBABILITY TREES

TRANSCRIPT

Ex2

A bag contains 4 red balls, 3 blue balls and 2 green balls. A ball is chosen at random and its colour noted. It is then replaced in the bag and a second ball is chosen and its colour noted. Represent this situation with a probability tree and calculate:

- i) Prob(both same colour)
- ii) Prob(at least 1 green is chosen)



i) $P(\text{same colour}) = P(RR) + P(BB) + P(GG)$
 $= \frac{16}{81} + \frac{9}{81} + \frac{4}{81} = \frac{29}{81}$

ii) $P(\text{At least 1 green}) = P(GG) + P(GB) + P(GR)$
 $+ P(RG) + P(BG)$
 $= \frac{4}{81} + \frac{6}{81} + \frac{8}{81} + \frac{8}{81} + \frac{6}{81} = \frac{32}{81}$

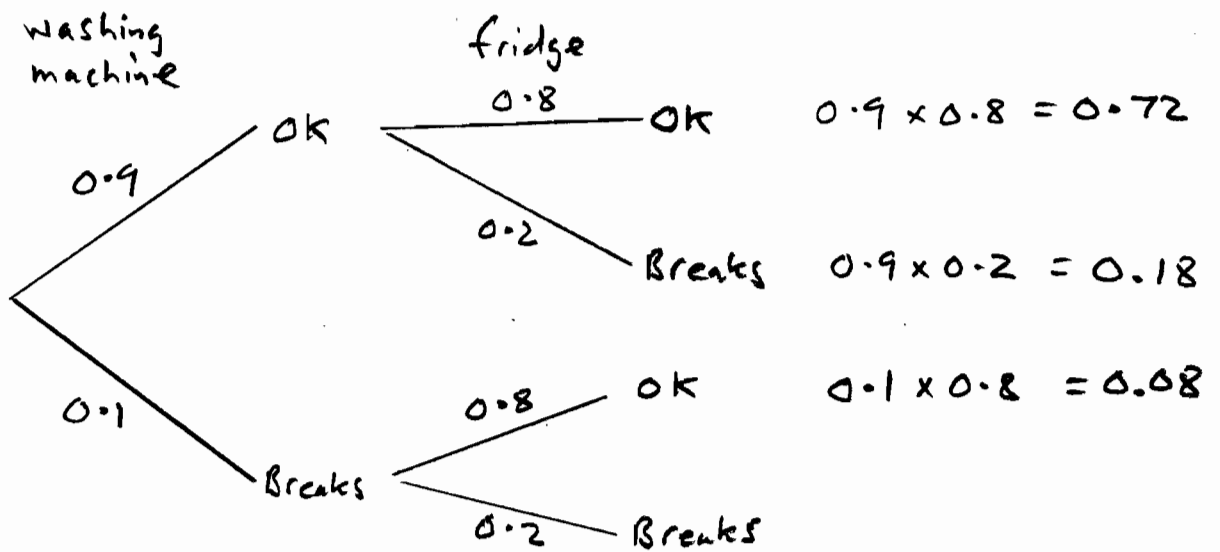
PROBABILITY TREES

TRANSCRIPT

Ex3

The probability a washing machine breaks down in the first year is 0.1 and the probability a fridge breaks down is 0.2. Show this information on a probability tree and calculate:

- i) Prob (Neither break down in first year)
- ii) Prob (Exactly one breaks down in first year)



i) $P(\text{Neither Breaks}) = P(\text{OK, OK}) = 0.72$

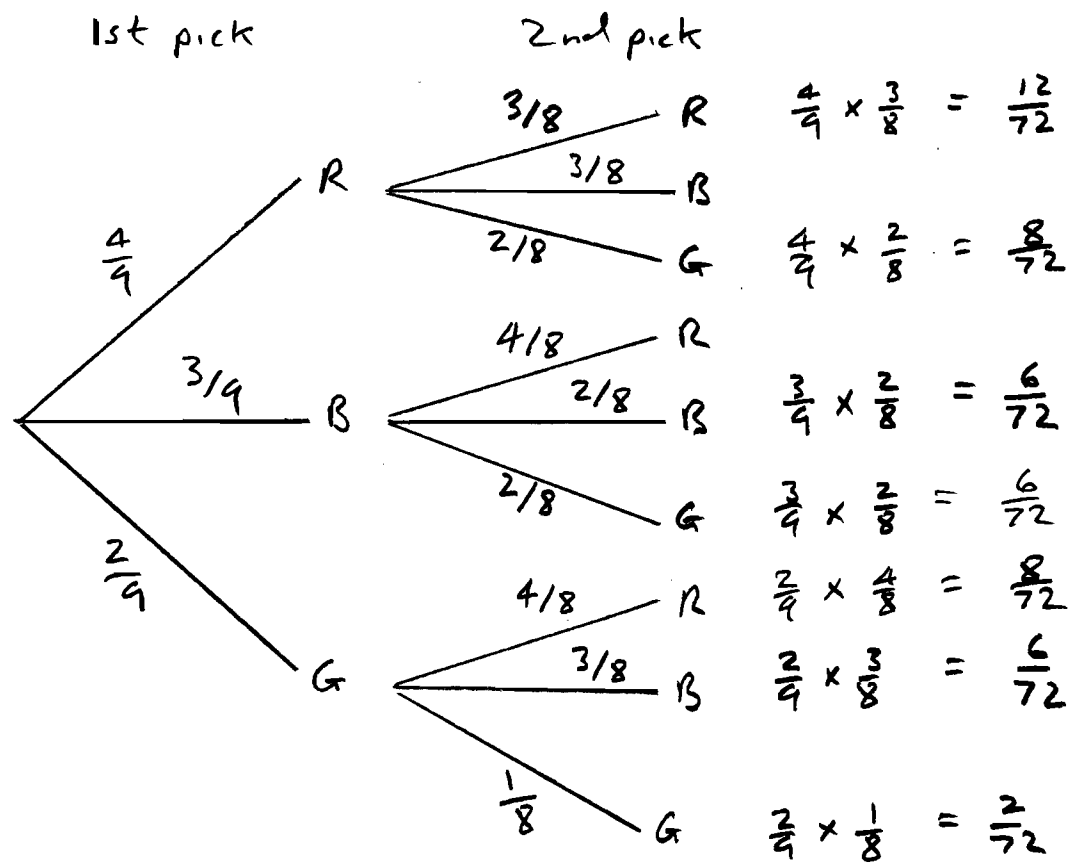
ii) $P(\text{Exactly one Breaks}) = P(\text{OK, Breaks}) + P(\text{Breaks, OK})$
 $= 0.18 + 0.08$
 $= 0.26$

Ex4 Conditional Probability

A bag has 4 red, 3 blue and 2 green balls. A ball is chosen at random, its colour noted BUT IT IS NOT REPLACED.

A second ball is chosen and its colour noted. Represent this situation with a probability tree and calculate:

- i) Prob (both same colour)
- ii) Prob (at least one green is chosen)



i) $P(\text{Same colour}) = P(RR) + P(BB) + P(GG)$
 $= \frac{12}{72} + \frac{6}{72} + \frac{2}{72} = \frac{20}{72}$ or $\frac{5}{18}$

ii) $P(\text{at least 1 green}) = P(GG) + P(GR) + P(GB) + P(RG) + P(BG)$
 $= \frac{2}{72} + \frac{8}{72} + \frac{6}{72} + \frac{8}{72} + \frac{6}{72} = \frac{30}{72}$ or $\frac{5}{12}$