## Higher Check In - 11.01 Basic probability and experiments

1. Clara is on square 96 in a game of Snakes and Ladders. She must land exactly on square 100 to win. She throws two fair six-sided dice. What is the probability that she **does not** win on this throw?

2. A biased spinner could land on either 1, 2, or 3. It is equally likely that the spinner lands on an odd or an even number. What is the probability that the spinner lands on 1 or 3?

3. A bag contains 10 black discs and 6 white discs. Two discs are picked at random, the result recorded and then the discs returned to the bag. How many times would you expect to pick two white discs if you repeated this experiment 200 times?

4. The probability of getting 'red' on a spinner is $\frac{2}{9}$. Anika spins the spinner a number of times and gets 'red' 74 times. Calculate the number of times Anika may have spun the spinner.

5. A circular spinner has four sections, A, B, C and D. The angle for A = 95°, B = 85°, C = 105° and D = 75°. The spinner is spun 600 times. Estimate the number of times the spinner lands on C.

6. Amir rolls two six-sided dice and records the sum of the two dice. He repeats this 300 times and his results are shown in the frequency graph below. Use the graph to explain why the dice may not be fair.
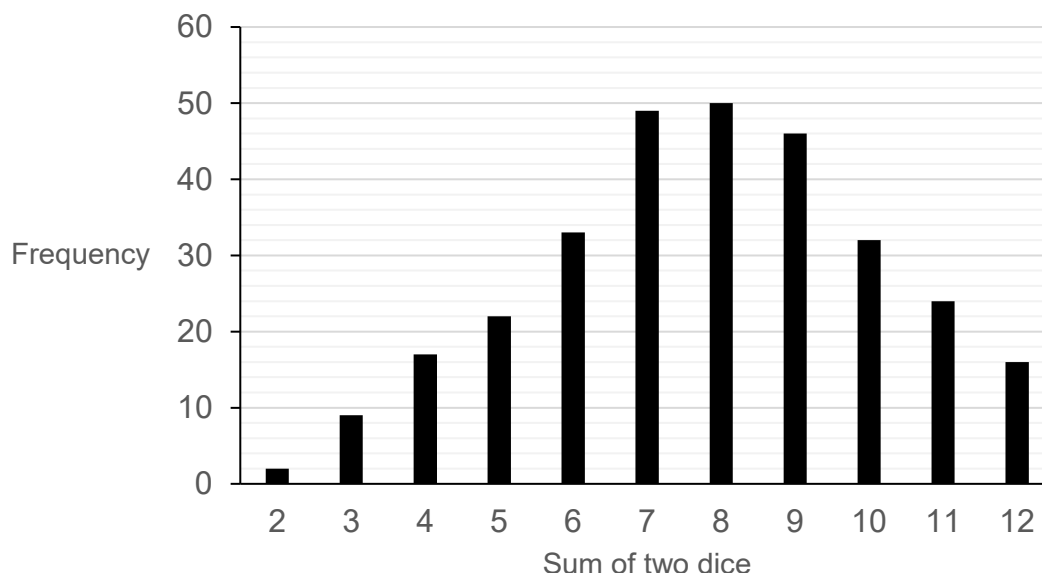

7. In a school there are 450 boys and 300 girls. A student from Year 9 is chosen at random. Explain why the probability that the student chosen is a girl may not be $\frac{2}{5}$

8. Each sector of a fair spinner is marked with a unique number. The lowest number is 1. The spinner is spun and a fair coin is tossed. The probability of spinning a 1 and getting a head is $\frac{1}{10}$. How many sides does the spinner have?

9. There are 700 students in a college. $\frac{9}{14}$ of the students are male. The ratio of male students who drive : do not drive is 2 : 3 and for the remaining students the ratio is 4 : 1. Complete this frequency tree.
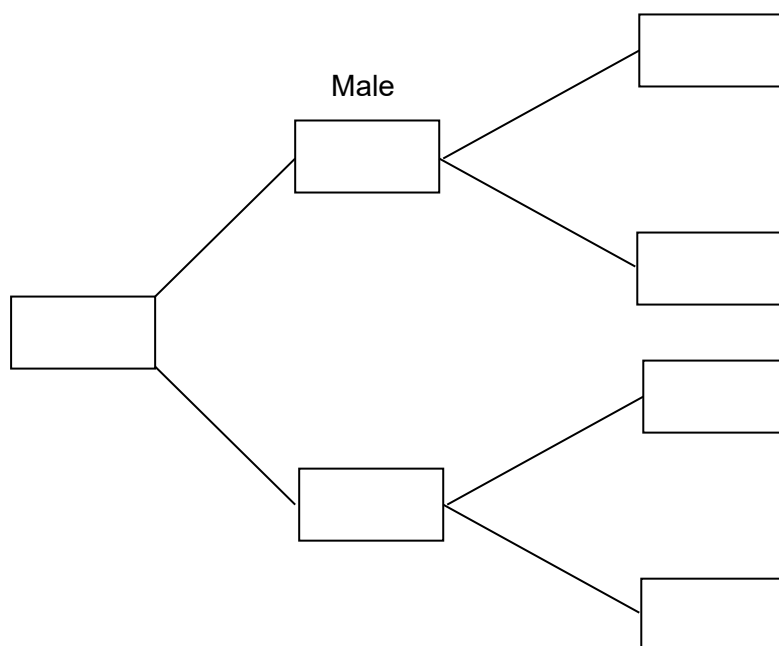
10. A circular spinner is divided into three sections only, green, red and white. The probability of getting 'green' from a spin is $\frac{2}{11}$. The probability of getting 'red' from a spin is twice the probability of getting 'green'. What angle around the centre is white?

Not to scale
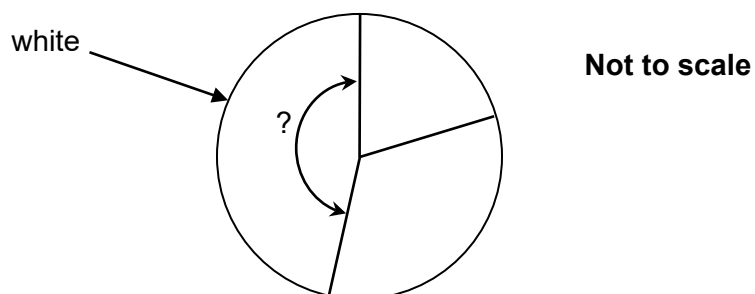
Extension

When rolling 1 fair 6-sided dice, there are 6 possible outcomes.
When rolling 2 fair 6-sided dice, there are 36 possible outcomes.

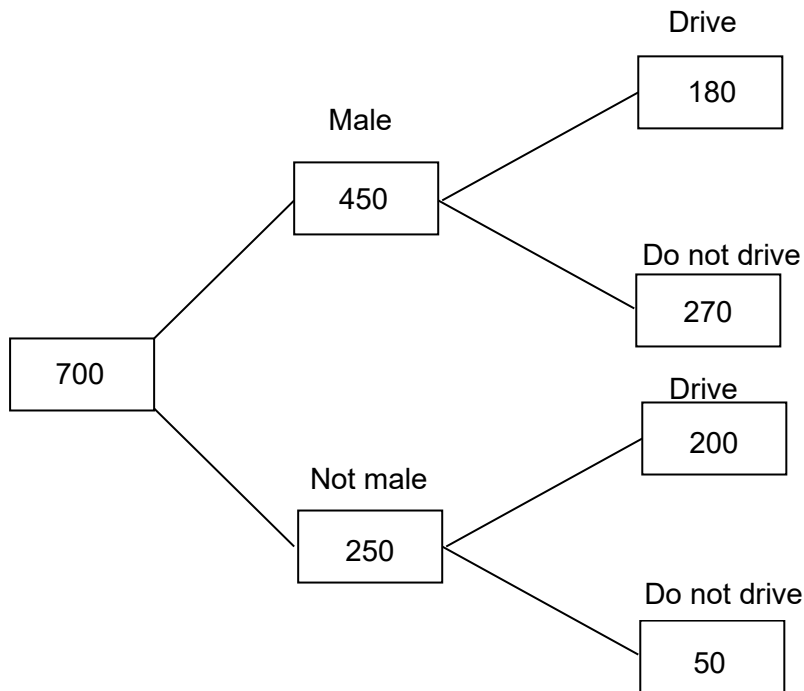How many possible outcomes are there when rolling 4 fair 6-sided dice?

Answers

1. There are 3 ways of making 4 (1 + 3, 3 + 1 and 2 + 2) out of 36 possible outcomes.
    Her probability of not winning on this throw is $1 - \dfrac{3}{36} = \dfrac{33}{36} = \dfrac{11}{12}$.

2. The probability of getting 1 or 3 is $\dfrac{1}{2}$.

3. Probability of 2 white discs $= \dfrac{6}{16} \times \dfrac{5}{15} = \dfrac{1}{8}$ so in 200 experiments: $200 \times \dfrac{1}{8} = 25$ times.

4. $74 \div \dfrac{2}{9} = 333$ times

5. $\dfrac{105}{360} \times 600 = 175$

6. If the dice were fair the graph would be symmetrical about 7 e.g. the relative frequency of scoring 2 would be approximately equal to the relative frequency of scoring 12, etc. This is not the case, so the dice are likely to be biased.

7. The ratio for the whole school for boys : girls is 3 : 2, but we cannot assume that the boys : girls ratio is the same for each year group. The probability of choosing a girl from Year 9 hence may not be $\dfrac{2}{5}$.

8. P(getting a head) $\times$ P(spinning a 1) $= \dfrac{1}{10}$

    $\dfrac{1}{2} \times$ P(spinning a 1) $= \dfrac{1}{10}$

    P(spinning a 1) $= \dfrac{1}{5}$, so the fair spinner has 5 sides.

9.

Drive: 180

Male: 450

Do not drive: 270

700

Drive: 200

Not male: 250

Do not drive: 50

10. $P(\text{white}) = 1 - \dfrac{2}{11} - 2 \times \dfrac{2}{11} = \dfrac{5}{11}$

$\dfrac{5}{11} \times 360 = 163.6^{o}$

Extension

$6^{4} = 1296$

GCSE (9−1)
MATHEMATICS

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AO1	3	Calculate expected outcome from a repeated experiment			
AO1	4	Calculate using expected frequency			
AO1	5	Find the number of expected outcomes on a biased spinner			
AO2	6	Interpret a frequency chart			
AO2	7	Explain why a probability may be incorrect			
AO2	8	Interpret result of two simple events using probability			
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