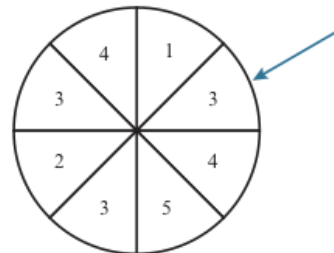# Probability

Super easy questions:

4 A numbered wheel is divided into eight sectors of equal size, as shown. The wheel is spun until it stops with the arrow pointing at one of the numbers.

Axel decides to spin the wheel 400 times.

a Find the number of times the arrow is not expected to point at a 4.

b How many more times must Axel spin the wheel so that the expected number of times that the arrow points at a 4 is at least 160?

5 A bag contains black and white counters, and the probability of selecting a black counter is $\frac{1}{6}$.

a What is the smallest possible number of white counters in the bag?

b Without replacement, three counters are taken from the bag and they are all black. What is the smallest possible number of white counters in the bag?

1 Using a tree diagram, find the probability that exactly one head is obtained when two fair coins are tossed.

2 Two ordinary fair dice are rolled. Using a possibility diagram, find the probability of obtaining:

a two 6s   **b** two even numbers   **c** two numbers whose product is 6.

- A little more calculation:

7 A set of data values is 8, 13, 17, 18, 24, 32, 34 and 38. Find the probability that a randomly selected value is more than one standard deviation from the mean.

8 One student is randomly selected from a school that has 837 boys. The probability that a girl is selected is $\frac{4}{7}$. Find the probability that a particular boy is selected.

In a group of 60 students, 27 are male (M) and 20 study History (H). The Venn diagram shows the numbers of students in these and other categories. One student is selected at random from the group. Show that the events 'a male is selected' and 'a student who studies History is selected' are independent.
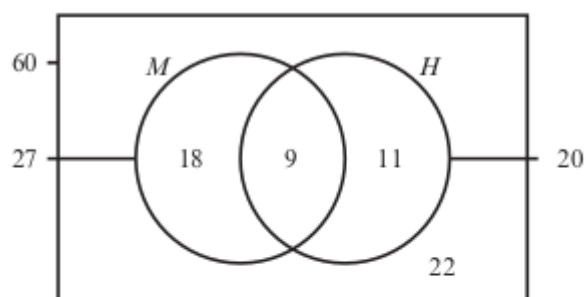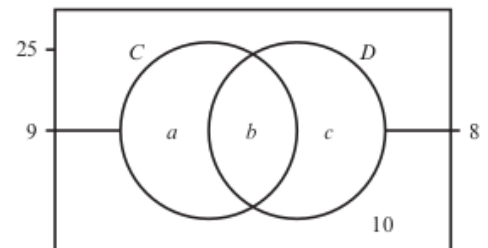

Answer

Does $P(M) \times P(H) = P(M \cap H)$? ····· If the multiplication law holds for the events M and H, then they are independent.

1 Y and Z are independent events. $P(Y) = 0.7$ and $P(Z) = 0.9$. Find $P(Y \cap Z)$.

2 Two independent events are M and N. Given that $P(M) = 0.75$ and $P(M \cap N) = 0.21$, find $P(N)$.

3 Independent events S and T are such that $P(S) = 0.4$ and $P(T') = 0.2$. Find:

a $P(S \cap T)$ **b** $P(S' \cap T)$.

4 A, B and C are independent events, and it is given that $P(A \cap B) = 0.35$, $P(B \cap C) = 0.56$ and $P(A \cap C) = 0.4$.

a Express $P(A)$ in terms of:

   i $P(B)$ **ii** $P(C)$.

b Use your answers to part **a** to find:

   i $P(B)$ **ii** $P(A')$ **iii** $P(B' \cap C')$.

6 In a group of 25 boys, nine are members of the chess club (C), eight are members of the debating club (D) and 10 are members of neither of these clubs. This information is shown in the Venn diagram.

a Find the values of a, b and c.

b Find the probability that a randomly selected boy is:

   i a member of the chess club or the debating club

   ii a member of exactly one of these clubs.

6 Each child in a group of 80 was asked whether they regularly read (R) or regularly watch a movie (M). The results are given in the Venn diagram opposite. One child is selected at random from the group. Event R is 'a child who regularly reads is selected' and event M is 'a child who regularly watches a movie is selected'.
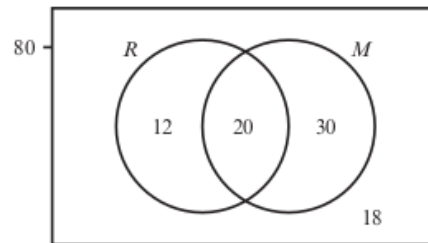
Determine, with justification, whether events R and M are independent.

7 Two fair 4-sided dice, both with faces marked 1, 2, 3 and 4, are rolled.

Event A is 'the sum of the numbers obtained is a prime number'.

Event B is 'the product of the numbers obtained is an even number'.

a Find, in simplest form, the value of $P(A)$, of $P(B)$ and of $P(A \cap B)$.

b Determine, with justification, whether events A and B are independent.

c Give a reason why events A and B are not mutually exclusive.

8 Two ordinary fair dice are rolled.

Event X is 'the product of the two numbers obtained is odd'.

Event Y is 'the sum of the two numbers obtained is a multiple of 3'.

a Determine, giving reasons for your answer, whether X and Y are independent.

b Are events X and Y mutually exclusive? Justify your answer.

9 A fair 8-sided die has faces marked 1, 2, 3, 4, 5, 6, 7 and 8. The score when the die is rolled is the number on the face that the die lands on. The die is rolled twice.

Event V is 'one of the scores is exactly 4 less than the other score'.

Event W is 'the product of the scores is less than 13'.

Determine whether events V and W are independent, justifying your answer.