

## Probabilities of events (exercise set 1)

### ► relevant probability formulas ◀

- combined events  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- mutually exclusive events  $P(A \cup B) = P(A) + P(B)$ , that is  $P(A \cap B) = 0$

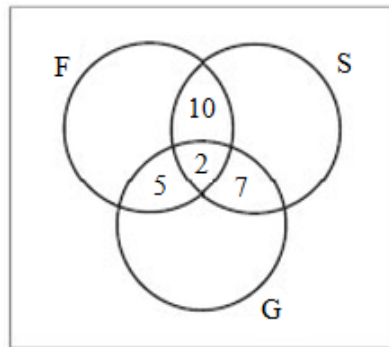
## Exercises

[ answers included ]

1. A fair die is rolled once. Write down the probability that the number shown on top is:
  - (a) an odd number
  - (b) a number greater than 2
  - (c) a number greater than or equal to 2
  - (d) a prime number
  - (e) a number greater than 2 **and** a prime number
  - (f) a number greater than 2 **or** a prime number
  - (g) a number greater than 2 or a prime number, but not both
  
2. A bag contains 6 white, 4 red and 2 black balls. A single ball is selected randomly. What is the probability that it is:
  - (a) red
  - (b) not black
  - (c) white or black
  - (d) white and black
  - (e) red or black
  - (f) red or not black
  
3. A bag contains 5 white and 3 red balls. A ball is removed at random and is not replaced into the bag. A second ball is removed randomly. What is the probability that:
  - (a) both balls are white
  - (b) both balls are red
  - (c) the two balls are different colors
  - (d) the two balls are the same color
  - (e) the first ball is red and the second ball is white
  
4. A bag contains 5 white and 3 red balls. A ball is selected at random and after its color is recorded it is replaced back into the bag and a ball is again selected randomly. What is the probability that:
  - (a) both selections are white
  - (b) both selections are red
  - (c) the two selections are different colors
  - (d) the two selections are the same color
  - (e) the first selection is red and the second selection is white
  
5. Three fair coins are tossed. What is the probability that:
  - (a) all three coins show heads;
  - (b) there is exactly two heads showing;
  - (c) there is only one head showing.

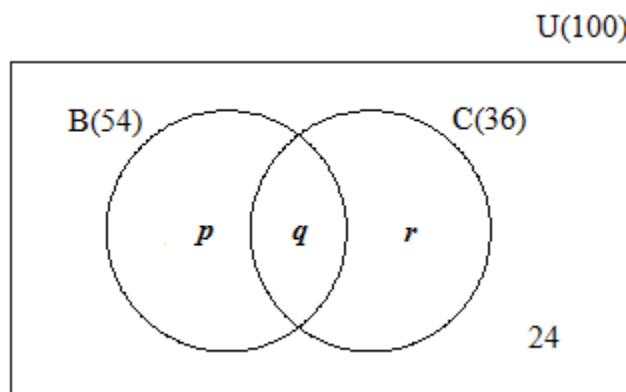
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6. The Venn diagram shows some of the information about 90 students in the last year of a secondary school. In this group of 90, 41 study French (F), 39 study Spanish (S) and 26 study German (G).



A student is chosen at random from the 90 students. Find the probability that the student:

- studies Spanish and French;
  - studies only French;
  - does not study any of these languages.
7. Assume that the probability that a woman giving birth to a boy or to a girl are equal, i.e. the probability of either event is  $\frac{1}{2}$ . Suppose a woman decides to have four children. What is the probability that:
- all four of the children are girls;
  - at least one of the children is a boy.
8. In a group of 100 girls, 54 study biology (B), 36 study chemistry (C) and 24 do not study either subject. This information is represented in the following Venn diagram.



- Calculate the values of  $p$ ,  $q$  and  $r$ .
- A student is selected at random from the group. Calculate the probability that she studies **both** biology and chemistry.
- A group of three students is selected at random from the group.
  - Calculate the probability that none of the three students studies biology.
  - Calculate the probability that at least one of the three students studies biology.

**Probabilities of events (exercise set 1)****Answers**

1. (a)  $\frac{1}{2}$  (b)  $\frac{2}{3}$  (c)  $\frac{5}{6}$  (d)  $\frac{1}{2}$  (e)  $\frac{1}{3}$  (f)  $\frac{5}{6}$  (g)  $\frac{1}{2}$

2. (a)  $\frac{1}{3}$  (b)  $\frac{5}{6}$  (c)  $\frac{2}{3}$  (d) 0 (e)  $\frac{1}{2}$  (f)  $\frac{5}{6}$

3. (a)  $\frac{5}{14}$  (b)  $\frac{3}{28}$  (c)  $\frac{15}{28}$  (d)  $\frac{13}{28}$  (e)  $\frac{15}{56}$

4. (a)  $\frac{25}{64}$  (b)  $\frac{9}{64}$  (c)  $\frac{15}{32}$  (d)  $\frac{17}{32}$  (e)  $\frac{15}{64}$

5. (a)  $\frac{1}{8}$  (b)  $\frac{3}{8}$  (c)  $\frac{3}{8}$

6. (a)  $\frac{2}{15}$  (b)  $\frac{4}{15}$  (c)  $\frac{1}{9}$

7. (a)  $\frac{1}{16}$  (b)  $\frac{5}{16}$

8. (a)  $p = 40, q = 14, r = 22$  (b)  $\frac{7}{50}$  (c) (i) 0.0939 (ii) 0.906