## Venn diagrams


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22 (a) $\mathrm{n}(\mathscr{E})=10, \mathrm{n}(A)=7, \mathrm{n}(B)=6, \mathrm{n}(A \cup B)^{\prime}=1$.

(i) Complete the Venn diagram by writing the number of elements in each subset.
(ii) An element of $\mathscr{E}$ is chosen at random.

Find the probability that this element is an element of $A^{\prime} \cap B$.
(b) On the Venn diagram below, shade the region $C^{\prime} \cap D^{\prime}$.


6 The Venn diagram shows the number of students who study French $(F)$, Spanish $(S)$ and Arabic $(A)$.

(a) Find $\mathrm{n}(A \cup(F \cap S))$.
(b) On the Venn diagram, shade the region $F^{\prime} \cap S$.


The Venn diagram shows the number of people who like films $(F)$, music ( $M$ ) and reading $(R)$.
(a) Find
(i) $\mathrm{n}(M)$,
(ii) $\mathrm{n}(R \cup M)$.
(b) A person is chosen at random from the people who like films.

Write down the probability that this person also likes music.
$\qquad$
(c) On the Venn diagram, shade $M^{\prime} \cap(F \cup R)$.


The Venn diagram shows the numbers of elements in each region.
(a) Find $\mathrm{n}\left(A \cap B^{\prime}\right)$.
$\qquad$
(b) An element is chosen at random.

Find the probability that this element is in set $B$.
(c) An element is chosen at random from set $A$.

Find the probability that this element is also a member of set $B$.
$\qquad$
(d) On the Venn diagram, shade the region $(A \cup B)^{\prime}$.

$$
\mathscr{E}=\{x: 1 \leqslant x \leqslant 10, \text { where } x \text { is an integer }\}
$$

$A=$ \{square numbers $\}$
$B=\{1,2,3,4,5,6\}$
(a) Write all the elements of $\mathscr{E}$ in their correct place in the Venn diagram.

(b) List the elements of $(A \cup B)^{\prime}$.

Answer(b)
(c) Find $\mathrm{n}\left(A \cap B^{\prime}\right)$.

9 (a) $\mathscr{E}=\{25$ students in a class $\}$
$F=\{$ students who study French $\}$
$S=$ \{students who study Spanish $\}$
16 students study French and 18 students study Spanish.
2 students study neither of these.
(i) Complete the Venn diagram to show this information.

(ii) Find $\mathrm{n}\left(F^{\prime}\right)$.

Answer(a)(ii)
(iii) Find $\mathrm{n}(F \cap S)^{\prime}$.

> Answer(a)(iii)
(iv) One student is chosen at random.

Find the probability that this student studies both French and Spanish.
Answer(a)(iv)
(v) Two students are chosen at random without replacement.

Find the probability that they both study only Spanish.


The Venn diagram shows the number of red cars and the number of two-door cars in a car park. There is a total of 50 cars in the car park.
$R=\{$ red cars $\}$ and $T=\{$ two-door cars $\}$.
(a) A car is chosen at random.

Write down the probability that
(i) it is red and it is a two-door car,

> Answer(a)(i)
(ii) it is not red and it is a two-door car.
Answer(a)(ii)
(b) A two-door car is chosen at random.

Write down the probability that it is not red.

> Answer(b)
(c) Two cars are chosen at random.

Find the probability that they are both red.
(d) On the Venn diagram, shade the region $R \cup T^{\prime}$.

$\mathscr{E}=\{240$ passengers who arrive on a flight in Cyprus $\}$
$H=$ \{passengers who are on holiday $\}$
$C=\{$ passengers who hire a car $\}$
(a) Write down the number of passengers who
(i) are on holiday,

Answer(a)(i)
(ii) hire a car but are not on holiday.

Answer(a)(ii)
(b) Find the value of $\mathrm{n}\left(H \cup C^{\prime}\right)$.

Answer(b)
(c) One of the 240 passengers is chosen at random.

Write down the probability that this passenger
(i) hires a car,

Answer(c)(i)
(ii) is on holiday and hires a car.

(a) Use the information in the Venn diagram to complete the following.
(i) $P \cap Q=\{$ $\qquad$ .)
(ii) $P^{\prime} \cup Q=\{$ $\qquad$ ..)
(iii) $\mathrm{n}(P \cup Q)^{\prime}=$ $\qquad$
(b) A letter is chosen at random from the set $Q$.

Find the probability that it is also in the set $P$.
(c) On the Venn diagram shade the region $P^{\prime} \cap Q$.
(d) Use a set notation symbol to complete the statement.

$$
\begin{equation*}
\{\mathrm{f}, \mathrm{~g}, \mathrm{~h}\} \quad \ldots . . . . . P \tag{1}
\end{equation*}
$$

[^0]20 (a) $\mathscr{E}=\left\{7,9.3, \pi, \frac{5}{9}, 2 \sqrt{8}\right\}$
$A=\{$ integers $\}$
$B=\{$ irrational numbers $\}$
Write all the elements of $\mathscr{E}$ in their correct place on the Venn diagram.

(b) Shade the region in each of the Venn diagrams below.

$C^{\prime} \cup D$

$E \cap F^{\prime} \cap G$

16 (a) In this part, you may use this Venn diagram to help you answer the questions.


In a class of 30 students, 25 study French $(F), 18$ study Spanish $(S)$.
One student does not study French or Spanish.
(i) Find the number of students who study French and Spanish.
Answer(a)(i)
(ii) One of the 30 students is chosen at random.

Find the probability that this student studies French but not Spanish.

Answer(a)(ii)
(iii) A student who does not study Spanish is chosen at random.

Find the probability that this student studies French.

> Answer(a)(iii)
(b)


On this Venn diagram, shade the region $R \cap(P \cup Q)^{\prime}$.

430 students were asked if they had a bicycle $(B)$, a mobile phone $(M)$ and a computer $(C)$. The results are shown in the Venn diagram.

(a) Work out the value of $x$.

$$
\begin{equation*}
\text { Answer(a) } x= \tag{1}
\end{equation*}
$$

(b) Use set notation to describe the shaded region in the Venn diagram.
Answer(b)
(c) Find $\mathrm{n}\left(C \cap(M \cup B)^{\prime}\right)$.
Answer(c)
(d) A student is chosen at random.
(i) Write down the probability that the student is a member of the set $M^{\prime}$.
Answer(d)(i)
(ii) Write down the probability that the student has a bicycle.
Answer(d)(ii)
(e) Two students are chosen at random from the students who have computers.

Find the probability that each of these students has a mobile phone but no bicycle.


The Venn diagram shows the number of elements in sets $A, B$ and $C$.
(a) $\mathrm{n}(A \cup B \cup C)=74$

Find $x$.

$$
\operatorname{Answer}(a) x=
$$

(b) $\mathrm{n}(\mathscr{E})=100$

Find $y$.

$$
\text { Answer(b) } y=
$$

(c) Find the value of $\mathrm{n}\left((A \cup B)^{\prime} \cap C\right)$.


In the Venn diagram, $\mathscr{E}=\{$ children in a nursery $\}$
$B=\{$ children who received a book for their birthday $\}$
$T=\{$ children who received a toy for their birthday $\}$
$P=\{$ children who received a puzzle for their birthday $\}$
$x$ children received a book and a toy and a puzzle.
6 children received a toy and a puzzle.
(a) 4 children received a book and a toy.

5 children received a book and a puzzle.
7 children received a puzzle but not a book and not a toy.
Complete the Venn diagram above.
(b) There are 40 children in the nursery.

Using the Venn diagram, write down and solve an equation in $x$.
Answer(b)
(c) Work out
(i) the probability that a child, chosen at random, received a book but not a toy and not a puzzle,
Answer(c)(i)
(ii) the number of children who received a book and a puzzle but not a toy,
Answer(c)(ii)
(iii) $\mathrm{n}(B)$,
Answer(c)(iii)
(iv) $\mathrm{n}(B \cup P)$,
Answer(c)(iv)
(v) $\mathrm{n}(B \cup T \cup P)$ '.

Answer(c)(v)
(d)


Shade the region $B \cap(T \cup P)^{\prime}$.


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