

GCSE Maths: Sets and Venn diagrams (Foundation): answers

GCSE Maths - Probability - Foundation - Lesson 23.7

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch23-probability/foundation/sets-and-venn-diagrams/

Exercise 23I Sets and Venn diagrams Non-calculator

1 $\xi = \{1, 2, 3, \dots, 12\}$, $A = \{\text{odd numbers}\}$ and $B = \{\text{prime numbers}\}$. List the elements of...

(a) A

Answer: $\{1, 3, 5, 7, 9, 11\}$

(b) B

Answer: $\{2, 3, 5, 7, 11\}$

(c) $A \cap B$

Answer: $\{3, 5, 7, 11\}$

(d) $A \cup B$

Answer: $\{1, 2, 3, 5, 7, 9, 11\}$

(e) A'

Answer: $\{2, 4, 6, 8, 10, 12\}$

(f) $(A \cup B)'$

Answer: $\{4, 6, 8, 10, 12\}$

2 Complete each statement with $\in$ or $\notin$. $A = \{2, 3, 5, 7, 11\}$.

(a) $3 \dots A$

Answer: $\in$

(b) $4 \dots A$

Answer: $\notin$

(c) $11 \dots A$

Answer: $\in$

(d) $9 \dots A$

Answer: $\notin$

3 $A = \{1, 2, 3, 4, 5, 6\}$ and $B = \{4, 5, 6, 7, 8\}$, and $\xi = \{1, 2, \dots, 9\}$. Work out...

(a) $n(A)$

Answer: 6

(b) $n(A \cap B)$

Answer: 3

(c) $n(A \cup B)$

Answer: 8

(d) $n((A \cup B)')$

Answer: 1

4 For each question, draw a Venn diagram with two circles, A and B, and write the number in each region.

- (a) 30 students. 18 play football (A), 12 play swimming (B) and 5 do both.

Answer: only A: 13, both: 5, only B: 7, neither: 5

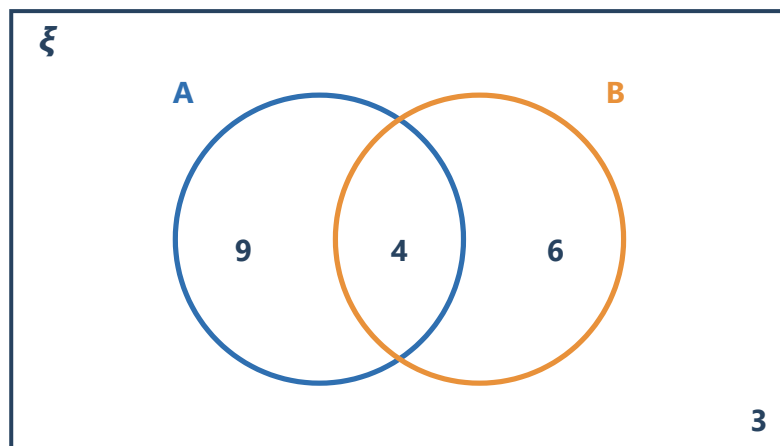
- (b) 40 people. 25 own a cat (A), 17 own a dog (B) and 6 own both.

Answer: only A: 19, both: 6, only B: 11, neither: 4

- (c) 50 students. 28 study French (A), 25 study Spanish (B) and 10 study both.

Answer: only A: 18, both: 10, only B: 15, neither: 7

5 Use the Venn diagram to find...



(a) A

Answer: 13

(b) $A \cap B$

Answer: 4

(c) $A \cup B$

Answer: 19

(d) A'

Answer: 9

(e) $A \cap B'$

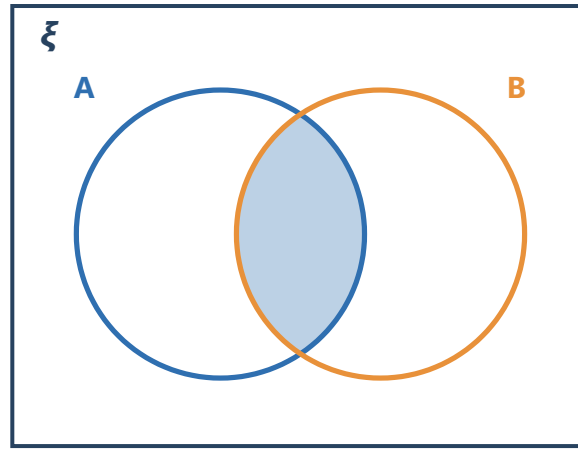
Answer: 9

(f) $(A \cup B)'$

Answer: 3

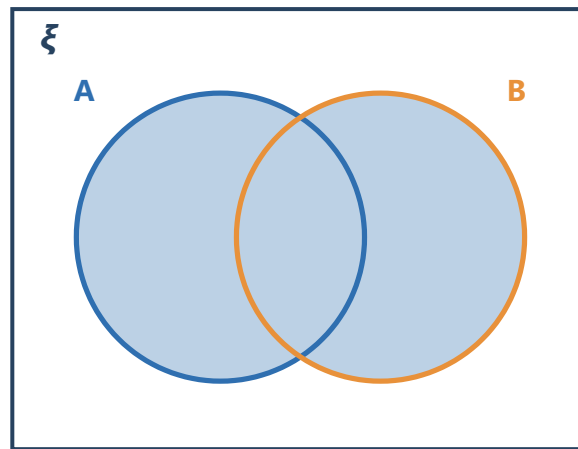
6 Describe the shaded region using set notation.

(a)



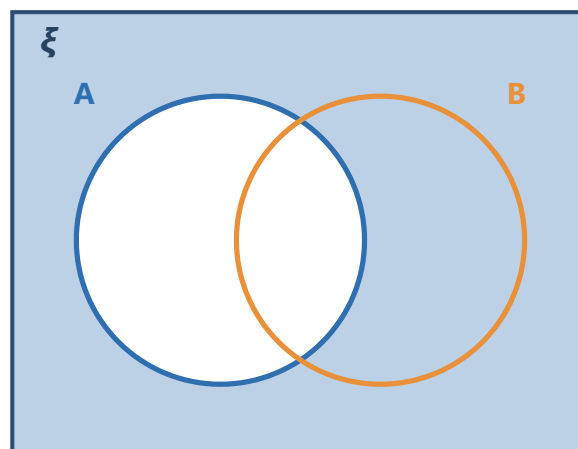
Answer: $A \cap B$

(b)



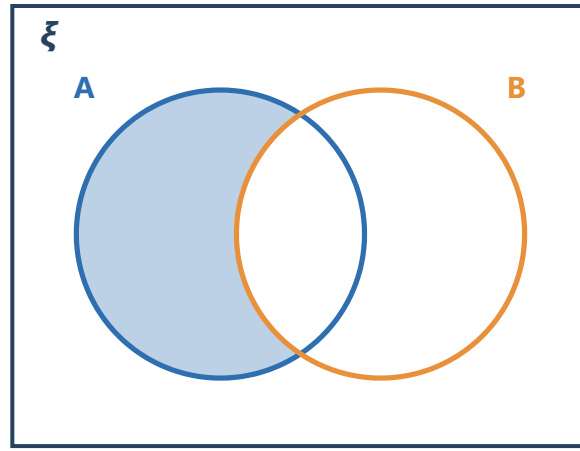
Answer: $A \cup B$

(c)



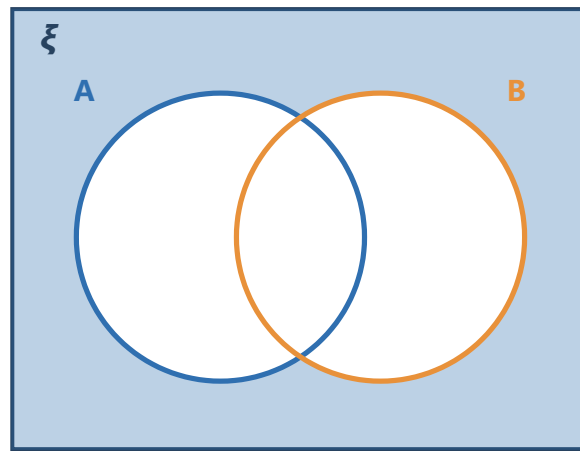
Answer: A'

(d)



Answer: $A \cap B'$

(e)



Answer: $(A \cup B)'$

7 Draw a two-circle Venn diagram for each statement and say what $A \cap B$ means.

Answer: The numbers that are in both sets

8 A and B are two sets. Explain what $A \cap B = \emptyset$ tells you about A and B. Give an example.

Answer: They have no elements in common

9 In a class of 28 students, 15 have brothers (B) and 12 have sisters (S). 7 have both. Work out how many students have neither a brother nor a sister.

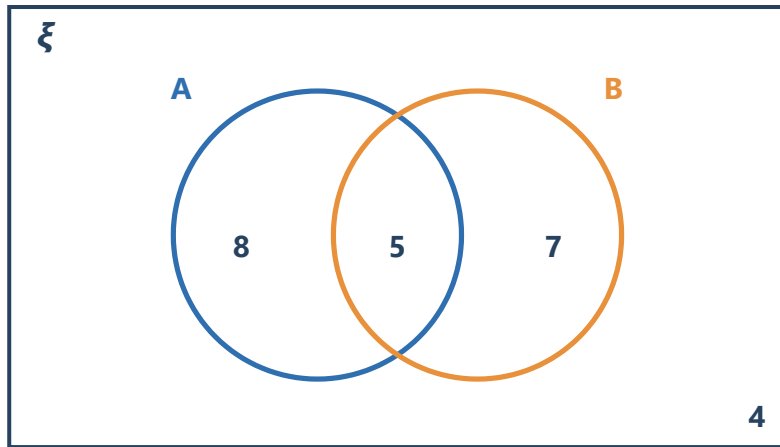
Answer: 8

10 A and B are sets with $n(A) = 14$, $n(B) = 9$ and $n(A \cap B) = 4$. Show that $n(A \cup B) = 19$.

Answer: $14 + 9 - 4 = 19$

Exercise 23J Probability from Venn diagrams Non-calculator

1 The Venn diagram shows 24 students. A student is chosen at random. Find the probability that the student is in...



(a) A

Answer: $\frac{13}{24}$

(b) B

Answer: $\frac{1}{2}$

(c) $A \cap B$

Answer: $\frac{5}{24}$

(d) $A \cup B$

Answer: $\frac{5}{6}$

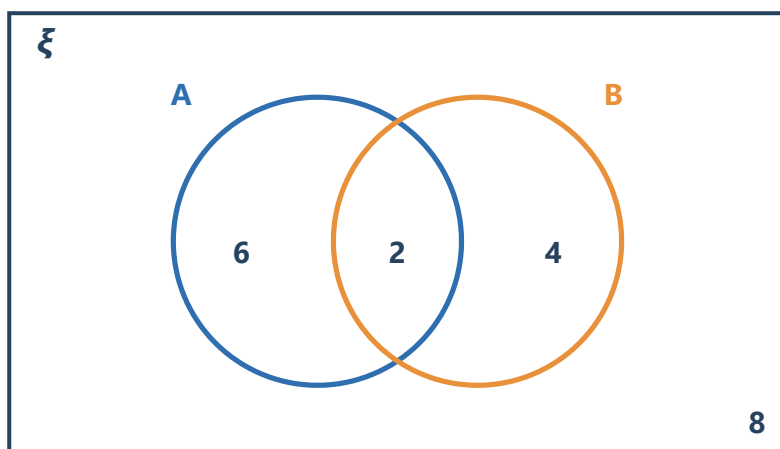
(e) A'

Answer: $\frac{11}{24}$

(f) $A \cap B'$

Answer: $\frac{1}{3}$

- 2 The Venn diagram shows the numbers of people in a group who like tea (A) and coffee (B). One person is chosen at random. Find the probability that the person likes tea.



Answer: $\frac{2}{5}$

- 3 30 students were asked about sport. 18 play football (F), 12 swim (S) and 5 do both. A student is chosen at random. Find the probability that the student...

(a) plays football but does not swim

Answer: $\frac{13}{30}$

(b) plays neither sport

Answer: $\frac{1}{6}$

(c) plays at least one of the sports

Answer: $\frac{5}{6}$

(d) plays exactly one of the sports

Answer: $\frac{2}{3}$

- 4 40 people were asked about pets. 25 own a cat (C), 17 own a dog (D) and 6 own both. A person is chosen at random. Find the probability that the person owns...

(a) a cat only

Answer: $\frac{19}{40}$

(b) a dog

Answer: $\frac{17}{40}$

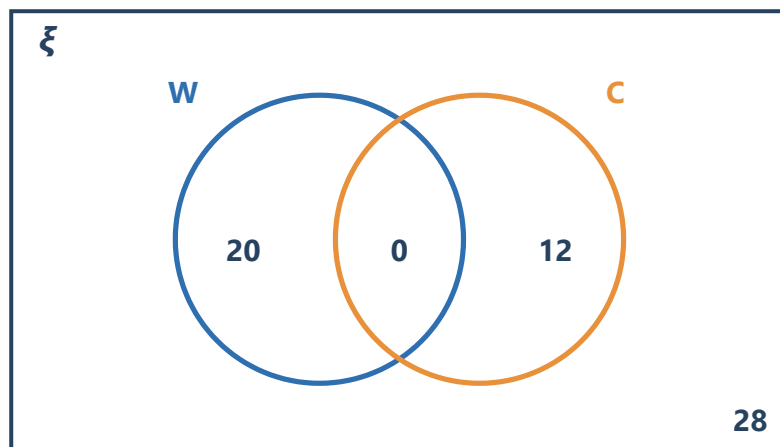
(c) no cat

Answer: $\frac{3}{8}$

(d) neither pet

Answer: $\frac{1}{10}$

- 5 The numbers of students in a year group who walk (W) and cycle (C) to school are shown. Find the probability that a student chosen at random walks or cycles.



Answer: $\frac{8}{15}$

- 6 In a Venn diagram, $n(A) = 12$, $n(B) = 9$, $n(A \cap B) = 4$ and $n(\xi) = 30$. Find the probability that a randomly chosen element is in neither A nor B.

Answer: $\frac{13}{30}$

- 7 In a group of 24 students, 13 are in set A and 12 are in set B, and 5 are in both. Ali says: " $P(A) = \frac{13}{24}$ and $P(B) = \frac{12}{24}$, so $P(A \text{ or } B) = \frac{25}{24}$." Explain why Ali must be wrong.

Answer: A probability cannot be more than 1