Set Notation and Venn diagrams

Starter

1. **(Review of last lesson)** A passcode has 5 entries and each entry can be the letters A, B, C or D. How many different pass codes are there?

Working: 5 entries so 5 boxes
There are 4 ways to fill each box
So $4 \times 4 \times 4 \times 4 \times 4 = 4^5 = 1024$ pass codes

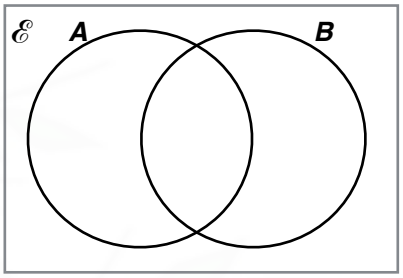
E.g. 1 Simplify: (a) $\{a,\ b,\ c\} \cup \{c,\ d\}$ (b) $\{a,\ b,\ c\} \cap \{c,\ d\}$

Working:
(a) $\cup$ means union i.e. elements either in one or both sets
So $\{a,\ b,\ c,\ d\}$
(b) $\cap$ means intersection i.e. elements in the overlap
So $\{c\}$

Visual representation of key set notation

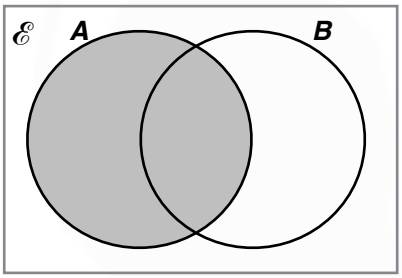
E.g. 2 In diagrams like the one to the right, shade the region given by:

(a) A (b) $A \cup B$
(c) $A \cap B$ (d) A'
(e) $(A \cup B)'$ (f) $(A \cap B)'$

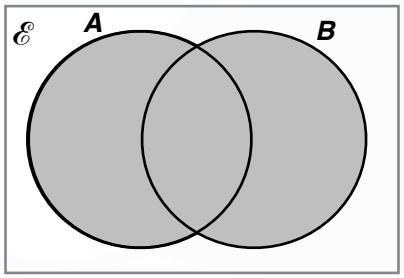


Working:

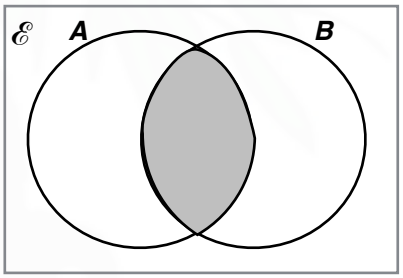
(a) Shade the set A



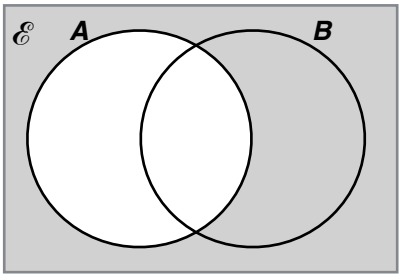
(b) $\cup$ means union



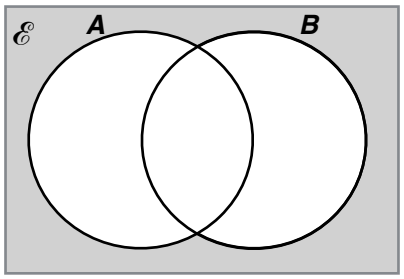
(c) $\cap$ means intersection



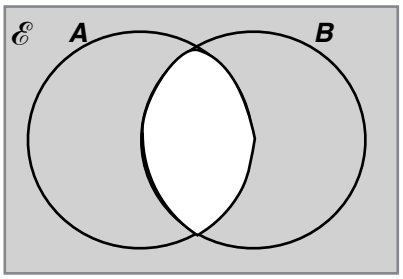
(d) A' — shade everything but A



(e) $(A \cup B)'$ shade everything not in A or B

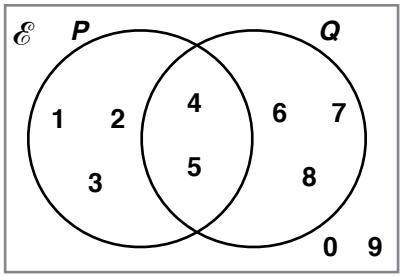


(f) $(A \cap B)'$ shade outside the overlap



E.g. 3 Let $\mathscr{E}$ = the digits from 0 to 9.
Let $P = \{1, 2, 3, 4, 5\}$
Let $Q = \{4, 5, 6, 7, 8\}$
(a) Draw a Venn diagram to show this information.
List the sets:
(b) $P \cap Q$ (c) $P \cup Q$ (d) P'
(e) $n(Q')$ (f) $n\big((P \cup Q)'\big)$ (g) $(P \cap Q)'$

Working:
(a) See diagram
0 and 9 are outside the circles



(b) ∩ means intersection (overlap)
$P \cap Q = \{4, 5\}$

(c) ∪ means union (in P, or Q or in both)
$P \cup Q = \{1, 2, 3, 4, 5, 6, 7, 8\}$

(d) P' — complement (not in P)
$P' = \{6, 7, 8, 9, 0\}$

(e) Q' — complement (not in Q)
$Q' = \{1, 2, 3, 9, 0\}$ so $n(Q') = 5$

(f) $P \cup Q = \{1, 2, 3, 4, 5, 6, 7, 8\}$
$(P \cup Q)'$ is what is ***not*** in $P \cup Q$ so $(P \cup Q)' = \{0, 9\}$
$\therefore n\big((P \cup Q)'\big) = 2$ ***there are two elements in the set***

(g) $(P \cap Q)' \equiv$ not in the intersection of P and Q
$P \cap Q = \{4, 5\}$
$(P \cap Q)' = \{1, 2, 3, 6, 7, 8, 9, 0\}$

Video: Set notation

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p244 M8.5 Qu 1-7
A*-G class textbook:	No exercise
9-1 homework book:	p83 M8.5 Qu 1-5
A*-G homework book:	No exercise

Homework book answers (only available during a lockdown)