IB Math Studies 1 **BELL WORK**

$M = \{2, 3, 5, 7, 8, 9\}$ and $N = \{3, 4, 6, 9, 10\}$

a True or false? **i** $4 \in M$ **ii** $6 \notin M$

b List the sets: **i** $M \cap N$ **ii** $M \cup N$

intersection

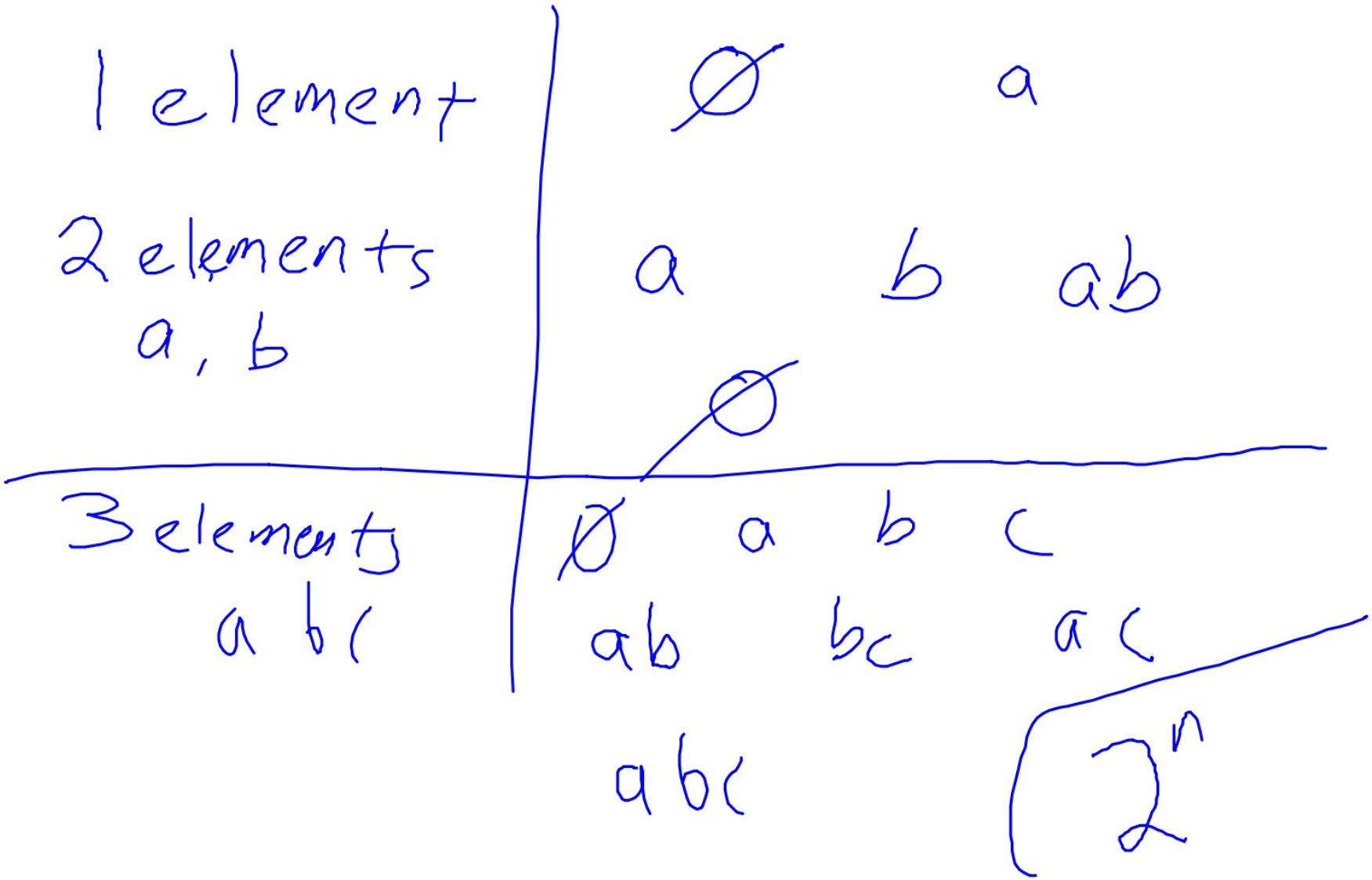
$\{3, 9\}$

union

$\{2, 3, 4, 5, 6, 7, 8, 9, 10\}$

c Is **i** $M \subseteq N$ **ii** $\{9, 6, 3\} \subseteq N$?

No, Yes


1 element
∅ a
2 elements
a, b
a b ab
∅
3 elements
a b c
∅
a b c
ab bc ac
abc
2^n

Chapter 7

Sets and Venn diagrams

Syllabus reference: 1.1, 3.5

B SET BUILDER NOTATION

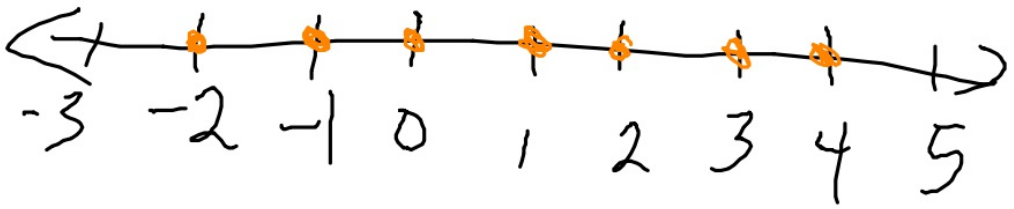
$$A = \{x \mid -2 \leqslant x \leqslant 4, \ \ x \in \mathbb{Z}\}$$

the set of all — such that

reads "the set of all x such that x is an integer between -2 and 4, including -2 and 4."

$$A = \{-2, -1, 0, 1, 2, 3, 4\}$$

We can represent A on a number line

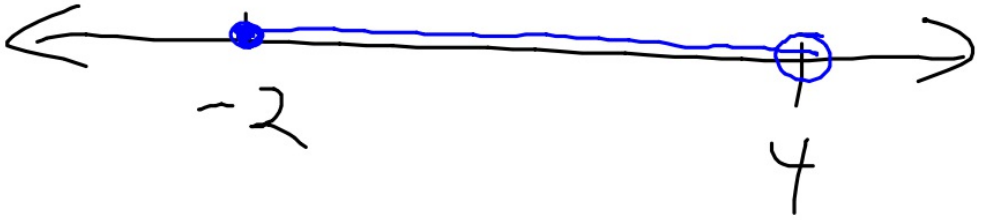


$n(A) = 7$

$B = \{x \mid -2 \leqslant x < 4,\ x \in \mathbb{R}\}$

B is the set of all x such that x is a real number ~~between -2 and 4, including -2, but not 4.~~ greater than or equal to -2 and less than 4.

We represent B on a ~~number~~ line as:



$n(B) =$ ∞

is $-6 \in B$ NO!

Suppose $A = \{x \mid 3 < x \leqslant 10,\ x \in \mathbb{Z}\}$.

a Write down the meaning of the set builder notation.

b List the elements of set A.

c Find $n(A)$.

C COMPLEMENTS OF SETS

UNIVERSAL SETS

The symbol U is used to represent the **universal set** under consideration.

Suppose we are only interested in the natural numbers from 1 to 20, and we want to consider subsets of this set. We say the set $U = \{x \mid 1 \leqslant x \leqslant 20, \ x \in \mathbb{N}\}$ is the *universal set* in this situation.

The **complement** of A, denoted A', is the set of all elements of U which are **not** in A.

If the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$,

and the set $A = \{1, 3, 5, 7, 8\}$,

then the complement of A is $A' = \{2, 4, 6\}$

Three obvious relationships are observed connecting A and A'. These are:

- $A \cap A' = \varnothing$ as A' and A have no common members.
- $A \cup A' = U$ as all elements of A and A' combined make up U.
- $n(A) + n(A') = n(U)$

Find C' given that:

a $U = \{\text{all positive integers}\}$ and $C = \{\text{all even integers}\}$

$C' = \{\text{all odd integers}\}$

b $C = \{x \mid x \geqslant 2,\ x \in \mathbb{Z}\}$ and $U = \mathbb{Z}$

$C' = \{x \mid x < 2,\ x \in \mathbb{Z}\}$

$x \leq 1$

Suppose $U = \{x \mid -5 \leqslant x \leqslant 5,\ x \in \mathbb{Z}\}$,

$A = \{x \mid 1 \leqslant x \leqslant 4,\ x \in \mathbb{Z}\}$, and

$B = \{x \mid -3 \leqslant x < 2,\ x \in \mathbb{Z}\}$.

List the elements of these sets:

a A

1, 2, 3, 4

b B

-3, -2, -1, 0, 1

c A'

{-5, -4, -3, -2, -1, 0, 5}

d B'

{-5, -4, 2, 3, 4, 5}

e $A \cap B$

{1}

f $A \cup B$

g $A' \cap B$

h $A' \cup B'$

7B all

7C #1-5