Intervals

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We will use the following notation:

[a, b] denotes all x such that $a \leq x \leq b$

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[a, b[denotes all x such that $a \leq x < b$

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]*a*, *b*[denotes all x such that a < x < b

Some authors use different notation, for instance (a, b] or (a, b) in the second case. We will use the above notation, as it is also used by the IB.

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$[a, \infty[$ denotes all x such that $a \leq x$

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- $[a, \infty[$ denotes all x such that $a \leq x$
- $]a, \infty[$ denotes all x such that a < x
- $]-\infty, b]$ denotes all x such that $x \leq b$

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- $[a, \infty[$ denotes all x such that $a \leq x$
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- $[a, \infty[$ denotes all x such that $a \leq x$
- $]a, \infty[$ denotes all x such that a < x
- $]-\infty, b]$ denotes all x such that $x \leq b$
- $] \infty$, *b*[denotes all *x* such that x < b

Note that we never include ∞ (or $-\infty$) as it is not a number.

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Remember that intervals are just sets of numbers (often infinite), so all the operations on sets can be used. We will practice those operations on the next slides.

• • • • • • • • • •

Let:

$$A =]1, 4]$$
 $B =] - \infty, 3[$

Find $A \cup B$, $A \cap B$, A - B oraz B - A.

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Let:

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Find $A \cup B$, $A \cap B$, A - B oraz B - A.

It is often helpful to mark both sets on a number line:

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$$A =]1, 4]$$
 $B =] - \infty, 3[$

A is marked with red, B with blue.



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• $A \cup B$ is the union of the sets, so it is the part coloured by at least one of the colours.

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- $A \cup B$ is the union of the sets, so it is the part coloured by at least one of the colours.
- $A \cap B$ is the intersection, so it is the part coloured by both colours.

- *A* ∪ *B* is the union of the sets, so it is the part coloured by at least one of the colours.
- $A \cap B$ is the intersection, so it is the part coloured by both colours.
- *A B* is the difference between *A* and *B*, so it is the part coloured **only** in red.

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- *A* ∪ *B* is the union of the sets, so it is the part coloured by at least one of the colours.
- $A \cap B$ is the intersection, so it is the part coloured by both colours.
- *A B* is the difference between *A* and *B*, so it is the part coloured **only** in red.
- B A is the difference between B and A, so it is the part coloured only in blue.

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$A \cup B =] - \infty, 4]$

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$A \cup B =] - \infty, 4]$



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$A \cap B =]1,3[$

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$A \cap B =]1,3[$



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$$A - B = [3, 4]$$

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Why is 3 in this set?

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Why is 3 in this set? 3 belongs to A - B, since it belongs to A and doesn't belong to B. $B =] -\infty, 3[$, so 3 is outside of B.

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$$B - A =] - \infty, 1]$$

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Let:

$$A =]0, 5]$$
 $B = [1, 3[$

Find $A \cup B$, $A \cap B$, A - B oraz B - A.

Lomasz Lechowski	
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Let:

$$A =]0, 5]$$
 $B = [1, 3[$

Find $A \cup B$, $A \cap B$, A - B oraz B - A.

Again it is useful to mark the sets on the number line.

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$A \cup B =]0, 5]$

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$A \cup B =]0, 5]$



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$$A \cap B = [1, 3[$$

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$A\cap B=[1,3[$



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$A - B =]0, 1[\cup[3, 5]]$

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$A - B =]0, 1[\cup[3, 5]]$



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$$B - A = \emptyset$$

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Let:

$$A =] - \infty, 4]$$
 $B =]1, \infty[$

Find the sets A', B'.

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We will use red for A and blue for B:



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We will use red for A and blue for B:



• A' is the complement of A, so it is the part **not** coloured in red.

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We will use red for A and blue for B:



• A' is the complement of A, so it is the part **not** coloured in red.

• B' is the complement of B, so it is the part **not** coloured in blue.

Image: A matrix and a matrix

$$A' =]4, \infty[$$

TOTAL ST		
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$$B' =] - \infty, 1]$$

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If you have any questions, you can email me at T.J.Lechowski@gmail.com.

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Image: A matrix