

Graphs, Notation and Symbols Used in Secondary School

Mathematics

INFORMATION DOCUMENT

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Mathematics

(1997 version)

Direction de la formation générale des jeunes

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In mathematics, special graphs, notation and symbols are regularly used to represent concepts that are often quite abstract. Students are frequently confused by so many conventions, especially when their meaning changes from one level of education to the next, from one teacher to another or from one year to the next.

In order to standardize the teaching and ensure a more uniform understanding of the graphs, notation and symbols used in secondary school mathematics courses, the ministère de l'Éducation has provided teachers, schools, publishers, and authors of tests and examinations with a document which specifies the meaning of each of these conventions. This publication, which is a revised version of the document bearing the same title (code 16-3306A, 1982), is designed to make these conventions as universal as possible.

This document lists only those conventions that are most commonly used or that are necessary for the sake of consistency. Teachers are therefore encouraged to use the graphs, notation and symbols found in this publication.

Mihran Djiknavorian
Mathematics Coordinator
Ministère de l'Éducation

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
\neg	$\neg P$	<ul style="list-style-type: none"> • Symbol for a logical negation; • $\neg P$ reads "not P" or "the negation of P."
\wedge	$P \wedge Q$	<ul style="list-style-type: none"> • Symbol for a logical conjunction; • $P \wedge Q$ reads "P and Q" or "the conjunction of P and Q."
\vee	$P \vee Q$	<ul style="list-style-type: none"> • Symbol for a logical disjunction; • $P \vee Q$ reads "P or Q" or "the disjunction of P and Q."
$\underline{\vee}$	$P \underline{\vee} Q$	<ul style="list-style-type: none"> • Symbol for an exclusive logical disjunction; • $P \underline{\vee} Q$ reads "P or Q" or "the exclusive disjunction of P and Q."
\rightarrow	$P \rightarrow Q$	<ul style="list-style-type: none"> • Symbol for a conditional; • $P \rightarrow Q$ reads "if P, then Q"; • In this expression, P is called the antecedent and Q, the consequent.
\leftrightarrow	$P \leftrightarrow Q$	<ul style="list-style-type: none"> • Symbol for a biconditional; • $P \leftrightarrow Q$ reads "P if and only if Q."
\Rightarrow	$P \Rightarrow Q$	<ul style="list-style-type: none"> • Symbol for a logical implication; • $P \Rightarrow Q$ reads "P implies Q."
\Leftrightarrow	$P \Leftrightarrow Q$	<ul style="list-style-type: none"> • Symbol for a logical equivalence; • $P \Leftrightarrow Q$ reads "P is logically equivalent to Q."

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
U		<ul style="list-style-type: none"> • Symbol for a universe or universal set.
\in	$b \in E$	<ul style="list-style-type: none"> • Symbol for a member of a set; • $b \in E$ reads “b belongs to E” or “b is an element of E.”
\notin	$b \notin E$	<ul style="list-style-type: none"> • Symbol indicating that an element is not a member of a set; • $b \notin E$ reads “b does not belong to E” or “b is not an element of E.”
\forall	$\forall x \in E$	<ul style="list-style-type: none"> • Symbol for the universal quantifier; • $\forall x \in E$ reads “for every element x belonging to set E.”
\exists	$\exists x \in E$	<ul style="list-style-type: none"> • Symbol for the existential quantifier; • $\exists x \in E$ reads “for at least one element x belonging to set E” or “there exists at least one element x belonging to set E.”
$\exists!$	$\exists! x \in E$	<ul style="list-style-type: none"> • Symbol for the unique existential quantifier; • $\exists! x \in E$ reads “there exists one and only one element x belonging to set E.”
\emptyset		<ul style="list-style-type: none"> • Symbol for the empty set; • $\{ \}$ can also represent the empty set.
$\{ \quad \}$	$\{a, b, c\}$	<ul style="list-style-type: none"> • Notation for listing the elements of a set (roster method); • $\{a, b, c\}$ reads “the set of elements a, b and c.”

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
$\{ \blacksquare \mid \blacksquare \}$	$\{x \in \mathbb{N} \mid x \text{ is a divisor of } 12\}$	<ul style="list-style-type: none"> • Set described with set-builder notation; • $\{x \in \mathbb{N} \mid x \text{ is a divisor of } 12\}$ reads "x is a natural number such that x is a divisor of 12"; • the vertical line reads "such that."
\subseteq	$A \subseteq E$	<ul style="list-style-type: none"> • Symbol for a subset; • $A \subseteq E$ reads "A is a subset of E." or "A is included in or equal to E."
$\not\subseteq$	$A \not\subseteq E$	<ul style="list-style-type: none"> • Symbol indicating that a set is not a subset of another set; • $A \not\subseteq E$ reads "A is not a subset of E." or "A is neither included in nor equal to E."
\subset	$A \subset E$	<ul style="list-style-type: none"> • Symbol for a proper subset; • $A \subset E$ reads "A is a proper subset of E."
$\not\subset$	$A \not\subset E$	<ul style="list-style-type: none"> • Symbol indicating that a set is not a proper subset of another set; • $A \not\subset E$ reads "A is not a proper subset of E."
$n(\blacksquare)$	$n(E)$	<ul style="list-style-type: none"> • Notation for cardinality; • $n(E)$ reads "the number of elements in set E" or "the cardinality of set E."
$\mathcal{P}(\blacksquare)$	$\mathcal{P}(E)$	<ul style="list-style-type: none"> • Notation for a power set; • notation for the set of subsets of a set; • $\mathcal{P}(E)$ reads "the power set of E" or "P of E."

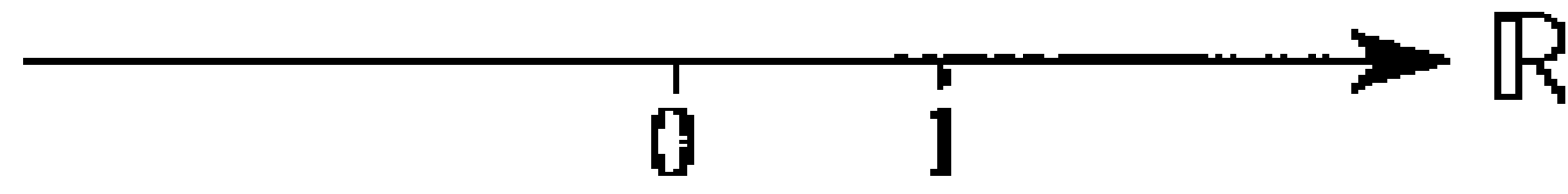
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
\cap	$A \cap B$	<ul style="list-style-type: none"> • Symbol for the intersection of sets; • $A \cap B$ reads "A intersection B" or "A intersect B."
\cup	$A \cup B$	<ul style="list-style-type: none"> • Symbol for the union of sets; • $A \cup B$ reads "A union B."
\setminus	$A \setminus B$	<ul style="list-style-type: none"> • Symbol for the difference of sets; • $A \setminus B$ reads "A minus B."
E'	E'	<ul style="list-style-type: none"> • Notation for the complement of a set in the universe U; • E' reads "the complement of E in the universe U" or "E prime."
\times	$A \times B$	<ul style="list-style-type: none"> • Symbol for the Cartesian product; • $A \times B$ reads "A cross B" or "the Cartesian product of A and B"; • Refer to page 11 for another use of this symbol.
(a, b)	(a, b)	<ul style="list-style-type: none"> • Notation for an ordered pair; • (a, b) reads "the ordered pair a b."
$f(a)$	$f(x)$	<ul style="list-style-type: none"> • Notation for the image of an element under a relation or a function; • $f(x)$ reads "f of x."

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
$f(A)$	$f(A)$	<ul style="list-style-type: none"> • Notation for the image of a set under a function whose domain is A; • $f(A)$ reads “f of A.”
$f : A \rightarrow B$	$f : A \rightarrow B$	<ul style="list-style-type: none"> • Notation for a function; • $f : A \rightarrow B$ reads “the function f from the source set A to the target set B.”
$x \mapsto$	$x \mapsto f(x)$	<ul style="list-style-type: none"> • Symbol for the rule of correspondence of a function; • $x \mapsto f(x)$ reads “x has $f(x)$ as its image.”
$f : A \rightarrow B : x \mapsto y = f(x)$	$f : A \rightarrow B : x \mapsto y = f(x)$	<ul style="list-style-type: none"> • Notation for a function; • $f : A \rightarrow B : x \mapsto y = f(x)$ reads “f from A to B such that every element x of A is associated with an element y in B such that $y = f(x)$.”
$\text{dom } R$	$\text{dom } R$	<ul style="list-style-type: none"> • Notation for the domain of a relation; • $\text{dom } R$ reads “the domain of R.”
$\text{ran } R$	$\text{ran } R$	<ul style="list-style-type: none"> • Notation for the range of a relation; • $\text{ran } R$ reads “the range of R.”
$g \circ f$	$g \circ f$	<ul style="list-style-type: none"> • Notation for the composition of relations; • $g \circ f$ reads “g of f.”
f^{-1}	f^{-1}	<ul style="list-style-type: none"> • Notation for the inverse; • f^{-1} reads “the inverse of f” or “f to the minus one”; • Refer to page 10 for another use of this notation.

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
Δ	Δy	<ul style="list-style-type: none"> • Notation for change; • Δy reads "delta y" or "change in y"; • Refer to page 19 for another use of this notation.
a^n	a^n	<ul style="list-style-type: none"> • Notation for a power; • a^n reads "the n^{th} power of a" or "a to the n."
\sqrt{a}	\sqrt{a}	<ul style="list-style-type: none"> • Notation for a radical; • \sqrt{a} reads "the positive square root of a" or "the radical of a."
$\sqrt[n]{a}$	$\sqrt[n]{a}$	<ul style="list-style-type: none"> • Notation for the n^{th} root; • $\sqrt[n]{a}$ reads "the n^{th} root of a"; • if n is an odd number, there exists one n^{th} root of a; • if n is an even number and a is a positive number or zero, there are two n^{th} roots of a and these roots are additive inverses; • if n is an even number and a is a negative number, there is no n^{th} root of a.
$\log_b x$	$\log_b x$	<ul style="list-style-type: none"> • Notation for a logarithm to base b; • $\log_b x$ reads "logarithm of x to base b."
$\ln x$	$\ln x$	<ul style="list-style-type: none"> • Notation for a logarithm to base e; • $\ln x$ reads "logarithm of x to base e" or "natural logarithm of x" or "Napierian logarithm of x."

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
log ■	log x	<ul style="list-style-type: none"> • Notation for a logarithm to base 10; • log x reads "logarithm of x to base 10" or "common logarithm of x."
sin ■	sin x	<ul style="list-style-type: none"> • Notation for sine; • sin x reads "sin x" or "sine x" or "sine of x."
cos ■	cos x	<ul style="list-style-type: none"> • Notation for cosine; • cos x reads "cos x" or "cosine x" or "cosine of x."
tan ■	tan x	<ul style="list-style-type: none"> • Notation for tangent; • tan x reads "tan x" or "tangent x" or "tangent of x."
cot ■	cot x	<ul style="list-style-type: none"> • Notation for cotangent; • cot x reads "cot x" or "cotangent x" or "cotangent of x."
sec ■	sec x	<ul style="list-style-type: none"> • Notation for secant; • sec x reads "sec x" or "secant x" or "secant of x."
cosec ■	cosec x	<ul style="list-style-type: none"> • Notation for cosecant; • cosec x reads "cosec x" or "cosecant x" or "cosecant of x."
arc sin ■	arc sin x	<ul style="list-style-type: none"> • Notation for the arc sine function; • arc sin x reads "arc sin x" or "arc sine x" or "arc sine of x."
arc cos ■	arc cos x	<ul style="list-style-type: none"> • Notation for the arc cosine function; • arc cos x reads "arc cos x" or "arc cosine x" or "arc cosine of x."

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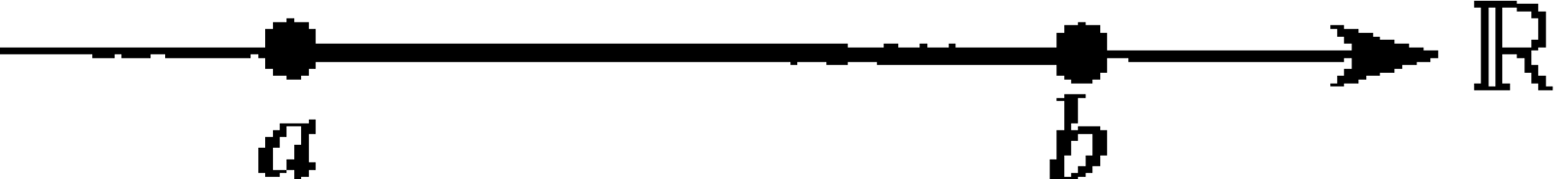
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
<p>arc tan ■</p> <p>\mathbb{N}</p> <p>\mathbb{Z}</p> <p>\mathbb{Q}</p> <p>\mathbb{D}</p> <p>\mathbb{Q}'</p> <p>\mathbb{R}</p> 	<p>arc tan x</p>	<ul style="list-style-type: none"> • Notation for the arc tangent function; • arc tan x reads “arc tan x” or “arc tangent x” or “arc tangent of x.” <ul style="list-style-type: none"> • Symbol for the set of natural numbers; • $\mathbb{N} = \{0, 1, 2, 3, \dots\}$. <ul style="list-style-type: none"> • Symbol for the set of integers; • $\mathbb{Z} = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$. <ul style="list-style-type: none"> • Symbol for the set of rational numbers; • $\mathbb{Q} = \{x \mid x = \frac{a}{b}, \text{ where } a \text{ and } b \text{ are integers and } b \text{ is not equal to zero}\}$. <ul style="list-style-type: none"> • Symbol for the set of decimal numbers; • $\mathbb{D} = \{x \mid x = \frac{a}{b}, \text{ where } a \text{ is an integer and } b = 10^n \text{ where } n \in \mathbb{N}\}$. <ul style="list-style-type: none"> • Symbol for the set of irrational numbers; • the complement of \mathbb{Q} in \mathbb{R}. <ul style="list-style-type: none"> • Symbol for the set of real numbers; • $\mathbb{R} = \mathbb{Q} \cup \mathbb{Q}'$. <ul style="list-style-type: none"> • Graph of the real number line.



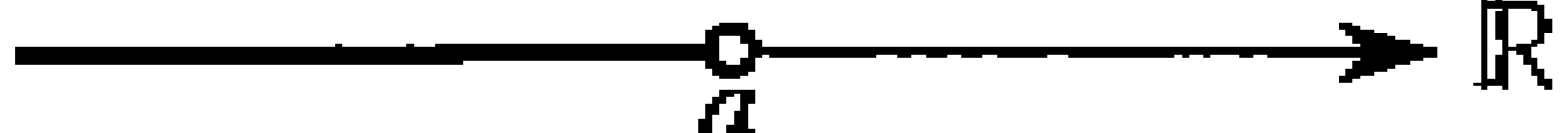
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
i		<ul style="list-style-type: none"> • Symbol for the imaginary number whose square is equal to -1; • $i^2 = -1$.
C		<ul style="list-style-type: none"> • Symbol for the set of complex numbers; • $C = \{z \mid z = a + bi, \text{ where } a \text{ and } b \text{ are real numbers and } i^2 = -1\}$.
Z*	Z*	<ul style="list-style-type: none"> • Notation indicating that zero has been removed from the sets N, Z, Q, D and R; • Z^* reads “Z star” or “Z starred”; • $Z^* = \{ \dots, -3, -2, -1, 1, 2, 3, \dots \}$.
Z ₊	Z ₊	<ul style="list-style-type: none"> • Notation indicating the set of positive numbers belonging to the sets Z, Q, Q', D and R; • Z_+ reads “the set of positive integers”; • $Z_+ = \{0, 1, 2, 3, \dots \}$.
Z ₋	Z ₋	<ul style="list-style-type: none"> • Notation indicating the set of negative numbers belonging to the sets Z, Q, Q', D and R; • Z_- reads “the set of negative integers”; • $Z_- = \{ \dots, -3, -2, -1, 0 \}$.
Z ₊ *	Z ₊ *	<ul style="list-style-type: none"> • Notation indicating only the positive numbers belonging to the sets Z, Q, D and R; • Z_+^* reads “the set consisting only of positive integers”; • $Z_+^* = \{1, 2, 3, \dots \}$.

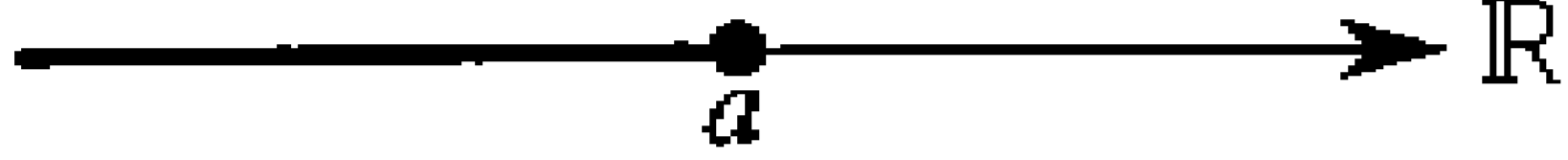

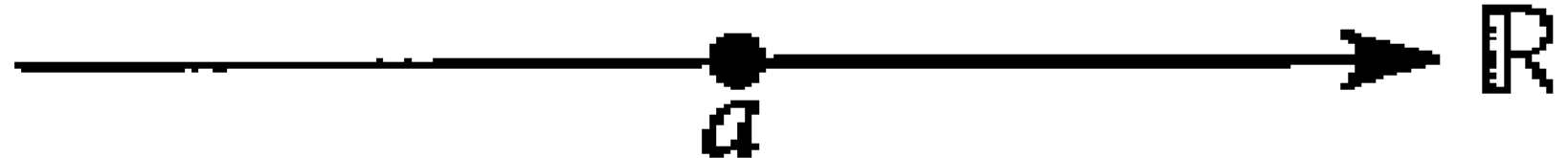
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
\mathbb{Z}_-^*	\mathbb{Z}_-^*	<ul style="list-style-type: none"> • Notation indicating only the negative numbers belonging to the sets \mathbb{Z}, \mathbb{Q}, \mathbb{D} and \mathbb{R}; • \mathbb{Z}_-^* reads “the set consisting only of negative integers”; • $\mathbb{Z}_-^* = \{ \dots, -3, -2, -1 \}$.
$-a$	$-a$	<ul style="list-style-type: none"> • Notation for the additive inverse or opposite of a number; • $-a$ reads “the opposite of a” or “minus a”; • Refer to page 11 for another use of this notation.
a^{-1}	a^{-1}	<ul style="list-style-type: none"> • Notation for the multiplicative inverse or reciprocal of a number; • $a^{-1} = \frac{1}{a}$ reads “the reciprocal of a” or “a to the minus 1”; • Refer to page 5 for another use of this notation.
$\overline{\quad}$	$1.\overline{234}$	<ul style="list-style-type: none"> • Notation for the period of an infinite decimal; • $1.\overline{234}$ reads “1.234, where 34 is repeating”; • $1.\overline{234} = 1.234\ 343\ 434\ 343\ \dots$ and its period is 34; • Refer to pages 16 and 18 for other uses of this symbol.
$(\quad)^2$	$(a + b)^2$	<ul style="list-style-type: none"> • Symbol for grouping of terms; • $(a + b)^2$ reads “a plus b all squared” or “the square of a plus b.”

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
+	$2 + 3$ $f + g$	<ul style="list-style-type: none"> • Symbol for addition; • $2 + 3$ reads "2 plus 3" or "add 2 and 3"; • $f + g$ reads "f plus g."
-	$3 - 2$ $f - g$	<ul style="list-style-type: none"> • Symbol for subtraction; • $3 - 2$ reads "3 minus 2" or "subtract 2 from 3"; • $f - g$ reads "f minus g."
×	2×3	<ul style="list-style-type: none"> • Symbol for multiplication; • 2×3 reads "2 times 3" or "multiply 2 by 3"; • Refer to page 4 for another use of this symbol.
÷	$a \div b$	<ul style="list-style-type: none"> • Symbol for division; • $a \div b$ reads "a divided by b" or "divide a by b."
$\frac{\blacksquare}{\blacksquare}$	$\frac{a}{b}$	<ul style="list-style-type: none"> • Notation for a fraction, a division, a ratio or a rational number"; • $\frac{a}{b}$ reads "a is divided by b" or "the division of a by b" or "a over b" or "the fraction a over b" or "the ratio of a to b."
:	$a : b$	<ul style="list-style-type: none"> • Symbol for a ratio; • $a : b$ reads "the ratio of a to b"
■	$ a $	<ul style="list-style-type: none"> • Notation for absolute value; • a reads "the absolute value of a."

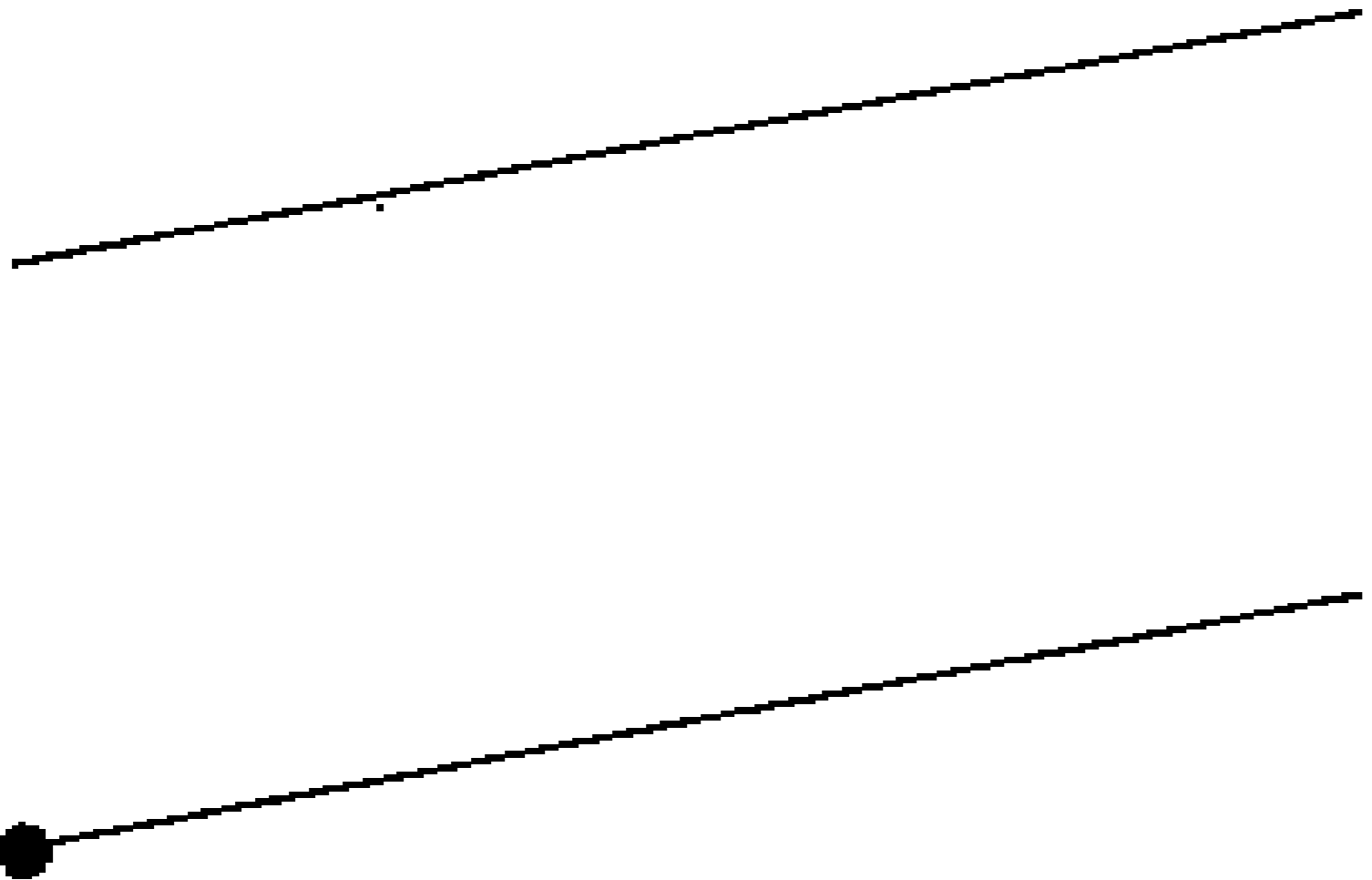
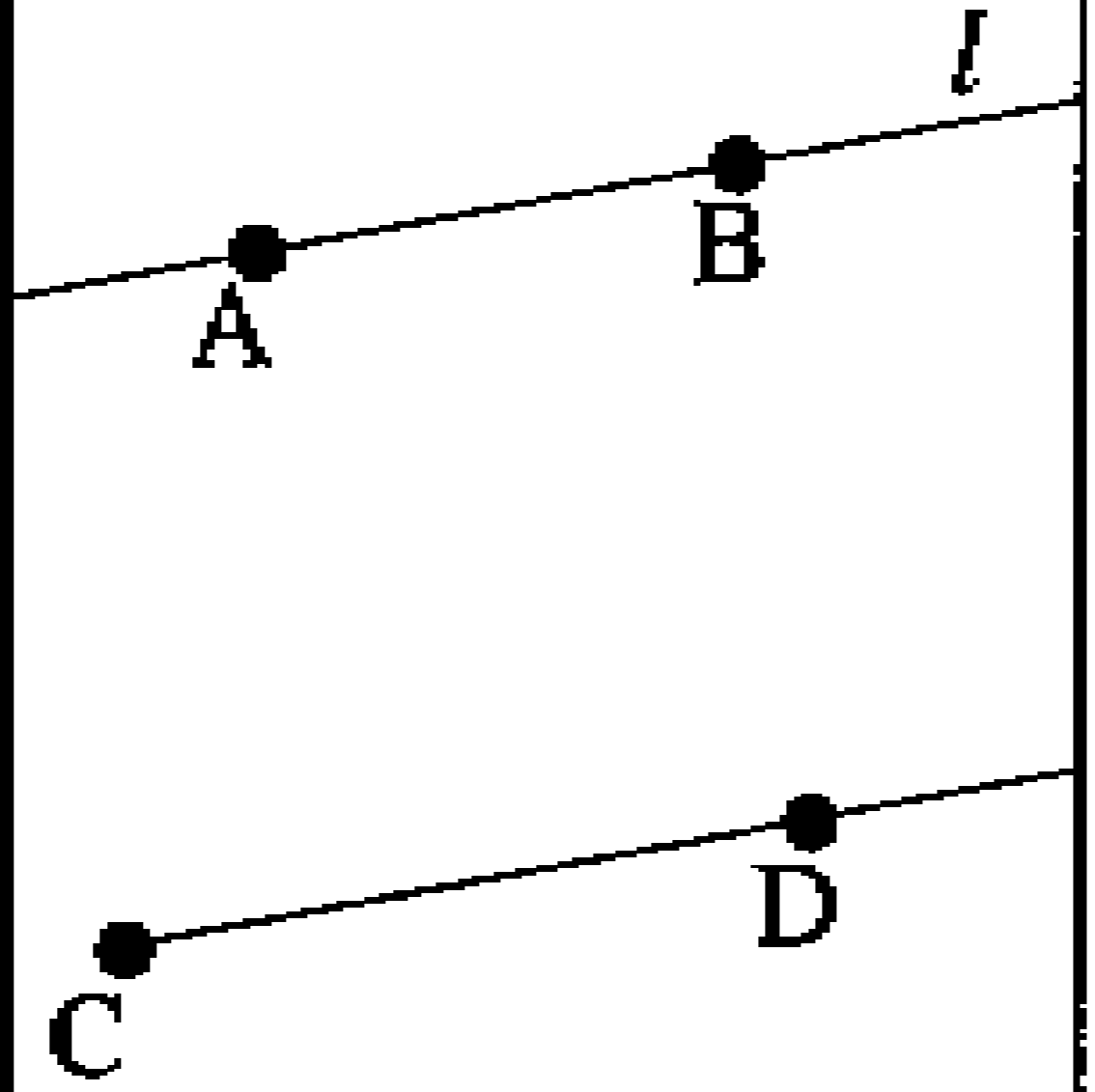
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
$\lceil \blacksquare \rceil$	$\lceil a \rceil$	<ul style="list-style-type: none"> • Notation for the greatest integer less than or equal to a real number; • $\lceil a \rceil$ reads "the greatest integer less than or equal to a."
=	$a = b$	<ul style="list-style-type: none"> • Symbol for equality; • $a = b$ reads "a is equal to b" or "a equals b."
\neq	$a \neq b$	<ul style="list-style-type: none"> • Symbol for non-equality; • $a \neq b$ reads "a is not equal to b."
<	$a < b$	<ul style="list-style-type: none"> • Symbol for an inequality; • $a < b$ reads "a is less than b."
>	$a > b$	<ul style="list-style-type: none"> • Symbol for an inequality; • $a > b$ reads "a is greater than b."
\leq	$a \leq b$	<ul style="list-style-type: none"> • Symbol for an inequality; • $a \leq b$ reads "a is less than or equal to b."
\geq	$a \geq b$	<ul style="list-style-type: none"> • Symbol for an inequality; • $a \geq b$ reads "a is greater than or equal to b."
\approx	$a \approx b$	<ul style="list-style-type: none"> • Symbol for an approximation; • $a \approx b$ reads "a is approximately equal to b" or "a is roughly equal to b."



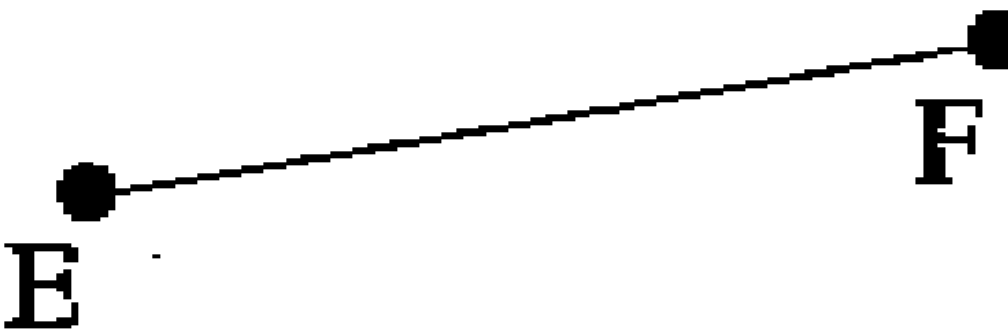


GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
\triangleq $\square \times 10^{\square}$ ∞ $] \square, \square [$ 	$1 \text{ cm } \triangleq 1 \text{ km}$ $a \times 10^n$ $]a, b[$	<ul style="list-style-type: none"> • Symbol for change of scale; • $1 \text{ cm } \triangleq 1 \text{ km}$ reads "1 cm corresponds to 1 km." • Scientific notation; • number expressed in the form $a \times 10^n$ where $1 \leq a < 10$, $a \in \mathbb{D}$ and $n \in \mathbb{Z}$. • Symbol for infinity; • ∞ reads "infinity." • Notation for an open interval; • $]a, b[$ reads "open interval with end points a and b" or "open interval $a b$"; • $]a, b[$ is also written $\{x \in \mathbb{R} \mid a < x < b\}$. • Graph of the open interval $]a, b[$.
$[\square, \square]$ 	$[a, b]$	<ul style="list-style-type: none"> • Notation for a closed interval; • $[a, b]$ reads "closed interval with end points a and b" or "closed interval $a b$"; • $[a, b]$ is also written $\{x \in \mathbb{R} \mid a \leq x \leq b\}$. • Graph of the closed interval $[a, b]$.

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
<p data-bbox="556 416 681 459">]■, ■[</p> 	<p data-bbox="1100 416 1225 459">$[a, b[$</p>	<ul data-bbox="1421 416 2548 830" style="list-style-type: none"> • Notation for a bounded interval open on the right and closed on the left; • $[a, b[$ reads “interval open on the right with endpoints a and b”; • $[a, b[$ is also written $\{x \in \mathbb{R} \mid a \leq x < b\}$. • Graph of the bounded interval $[a, b[$, which is open on the right.
<p data-bbox="556 955 681 998">]■, ■]</p> 	<p data-bbox="1100 955 1225 998">$]a, b]$</p>	<ul data-bbox="1421 955 2548 1369" style="list-style-type: none"> • Notation for a bounded interval open on the left and closed on the right; • $]a, b]$ reads “interval open on the left with endpoints a and b”; • $]a, b]$ is also written $\{x \in \mathbb{R} \mid a < x \leq b\}$. • Graph of the bounded interval $]a, b]$, which is open on the left.
<p data-bbox="541 1494 695 1537">]$-\infty$, ■[</p> 	<p data-bbox="1086 1494 1240 1537">$]-\infty, a[$</p>	<ul data-bbox="1421 1494 2518 1800" style="list-style-type: none"> • Notation for an unbounded interval open on the right; • $]-\infty, a[$ reads “the set of real numbers less than a”; • $]-\infty, a[$ is also written $\{x \in \mathbb{R} \mid x < a\}$. • Graph of the unbounded interval $]-\infty, a[$, which is open on the right.

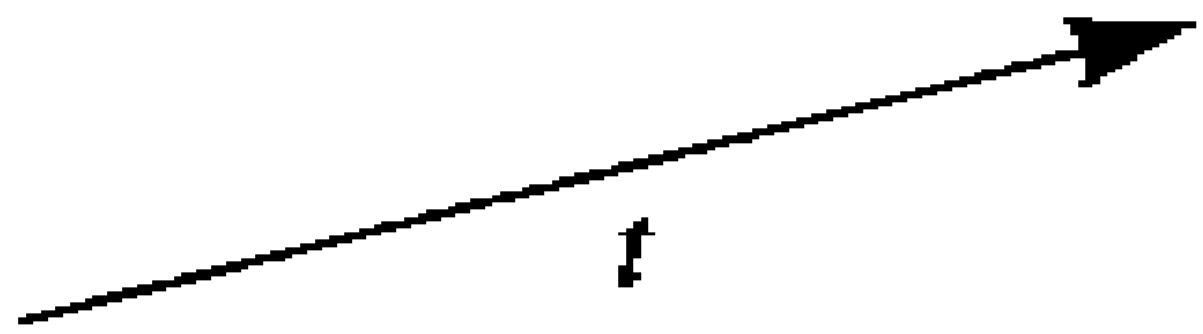
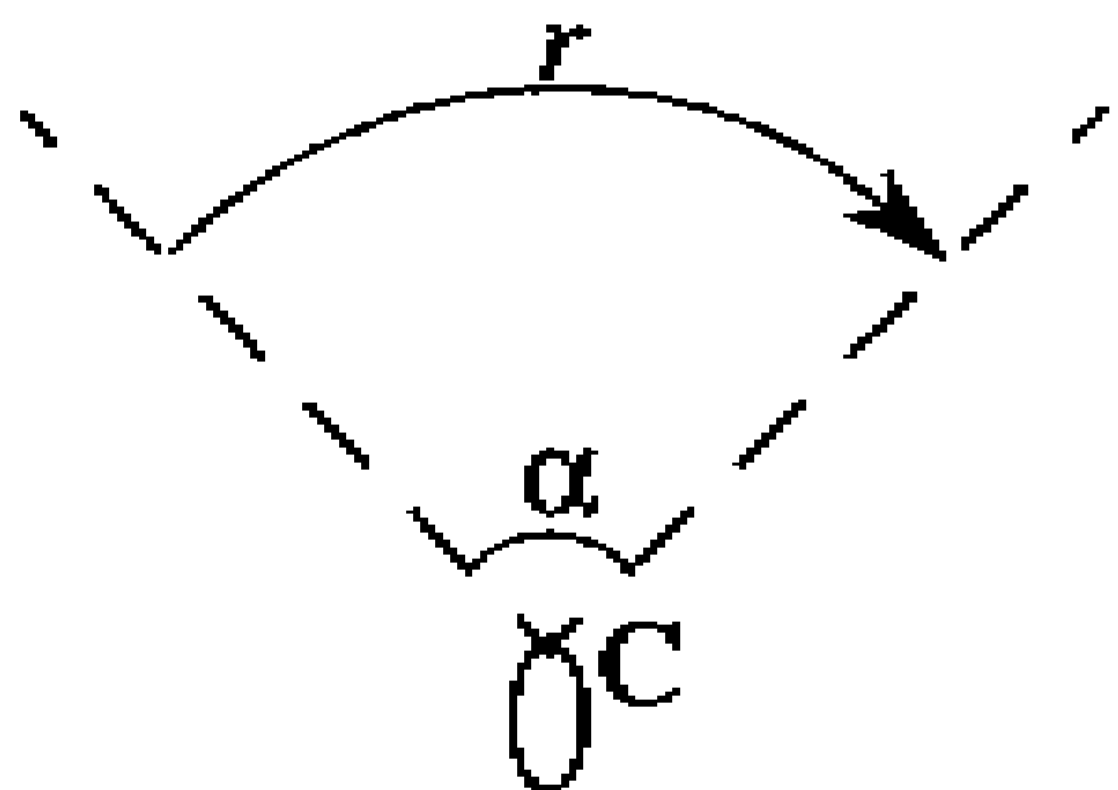
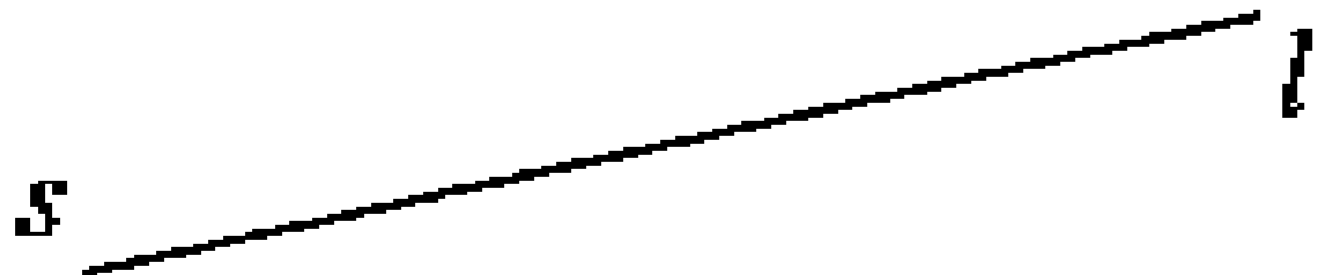
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
$] -\infty, a]$ 	$] -\infty, a]$	<ul style="list-style-type: none"> • Notation for an unbounded interval closed on the right; • $] -\infty, a]$ reads “the set of real numbers less than or equal to a”; • $] -\infty, a]$ is also written $\{x \in \mathbb{R} \mid x \leq a\}$. • Graph of the unbounded interval $] -\infty, a]$, which is closed on the right.
$] a, +\infty[$ 	$] a, +\infty[$	<ul style="list-style-type: none"> • Notation for an unbounded interval open on the left; • $] a, +\infty[$ reads “the set of real numbers greater than a”; • $] a, +\infty[$ is also written $\{x \in \mathbb{R} \mid x > a\}$. • Graph of the unbounded interval $] a, +\infty[$, which is open on the left.
$[a, +\infty[$ 	$[a, +\infty[$	<ul style="list-style-type: none"> • Notation for an unbounded interval closed on the left; • $[a, +\infty[$ reads “the set of real numbers greater than or equal to a”; • $[a, +\infty[$ is also written $\{x \in \mathbb{R} \mid x \geq a\}$. • Graph of the unbounded interval $[a, +\infty[$, which is closed on the left.

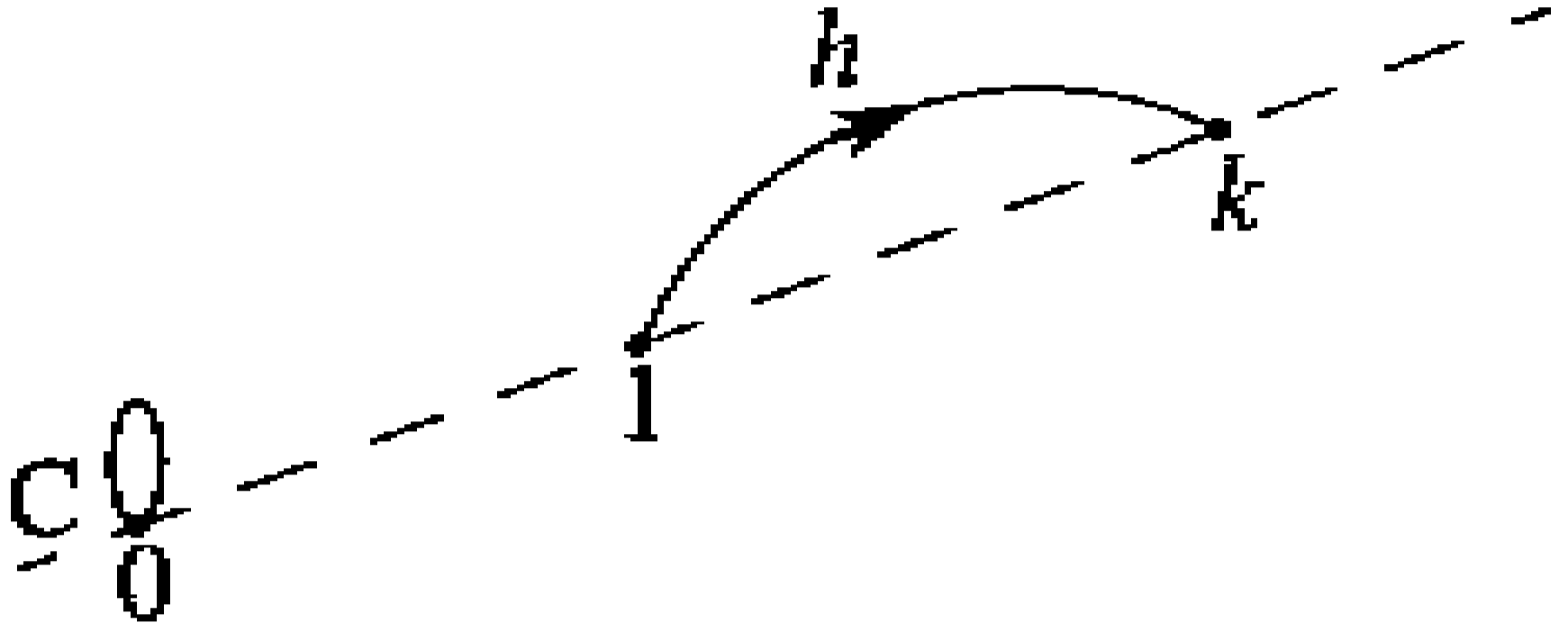
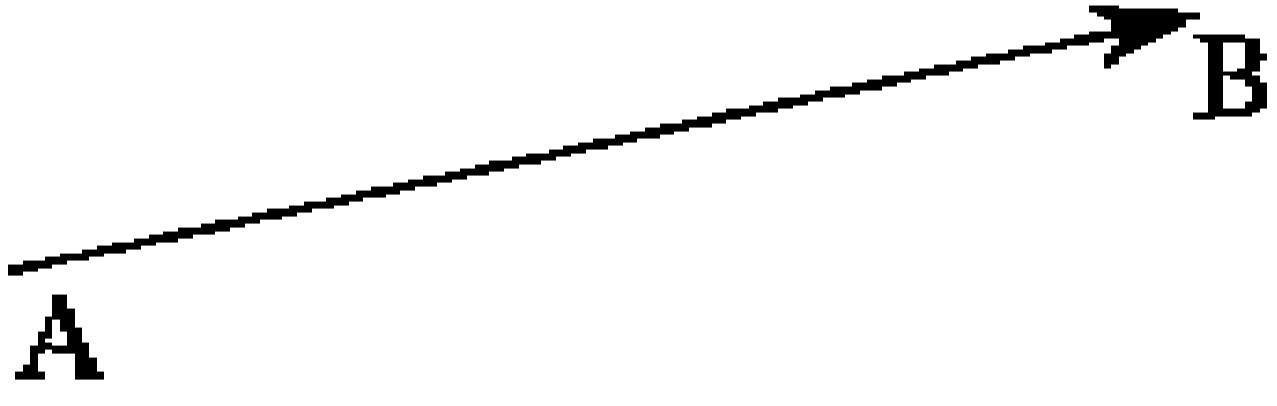
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
Ω		<ul style="list-style-type: none"> • Symbol for the set of all the possible outcomes of a random experiment; • Ω reads "omega."
P(\blacksquare)	P(E)	<ul style="list-style-type: none"> • Notation for the probability of an event; • P(E) reads "P of E" or "the probability of event E."
P($\blacksquare/\blacksquare$)	P(B/A)	<ul style="list-style-type: none"> • Notation for the conditional probability of an event with respect to another; • P(B/A) reads "the probability of B given A." or "the probability that event B will occur after event A has occurred."
\sum	$\sum_{i=1}^n a_i$	<ul style="list-style-type: none"> • Notation for the summation of terms; • $\sum_{i=1}^n a_i$ reads "the sum of the numbers a_i, from $i = 1$ to $i = n$."
\bar{x}	\bar{x}	<ul style="list-style-type: none"> • Notation for the arithmetic mean of a distribution; • \bar{x} reads "x bar" or "the arithmetic mean of x"; • Refer to pages 10 and 18 for other uses of this notation.
Med		<ul style="list-style-type: none"> • Symbol for the median of a distribution; • Med reads "the median."
Mod		<ul style="list-style-type: none"> • Symbol for the mode of a distribution; • Mod reads "the mode."




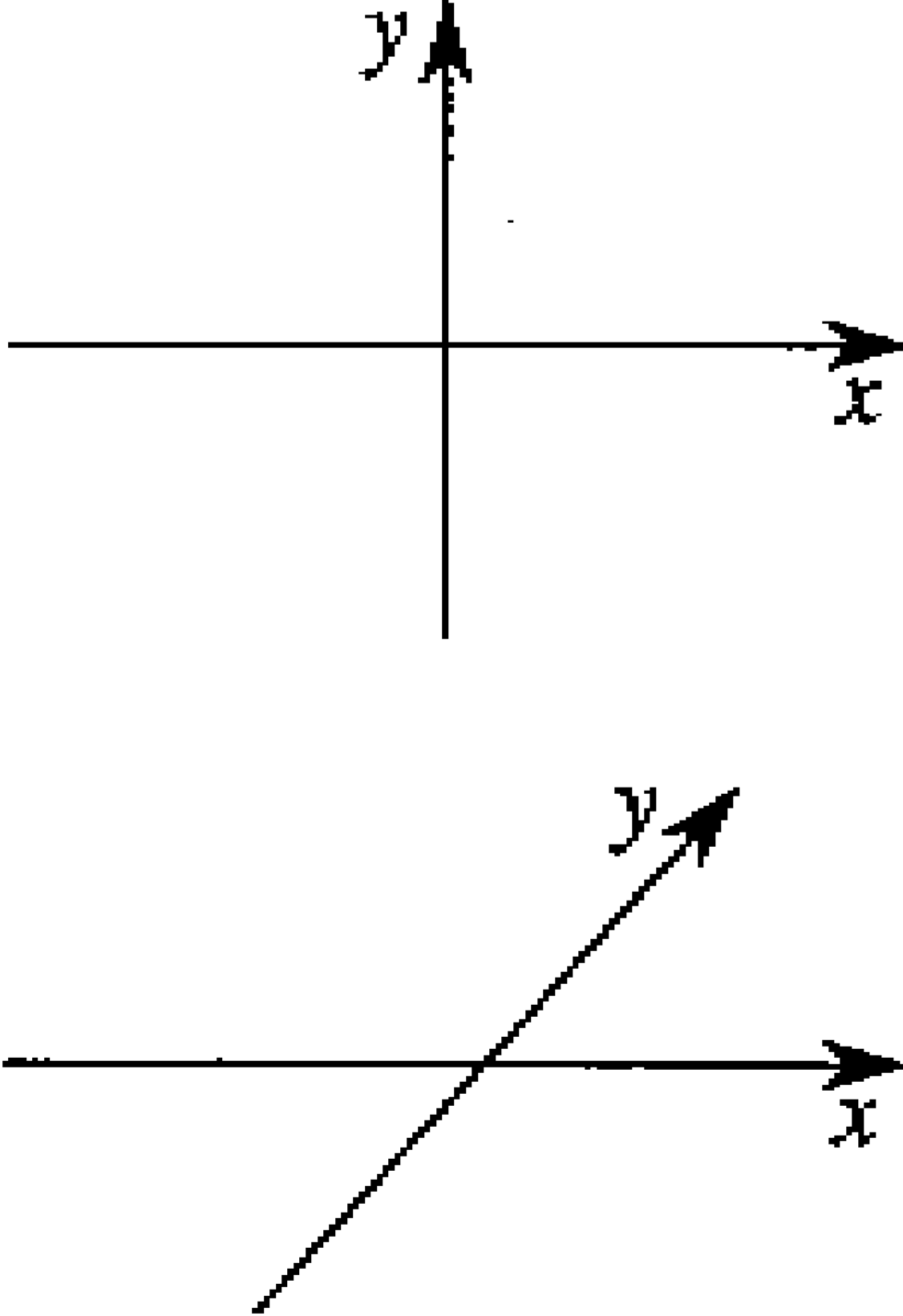
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
Q_1	Q_1	<ul style="list-style-type: none"> • Notation for a quartile or a quintile; • Q_1 reads "the first quartile" or "the first quintile" or "Q one."
Q		<ul style="list-style-type: none"> • Symbol for the semi-interquartile range; • Q reads "the semi-interquartile range."
σ		<ul style="list-style-type: none"> • Symbol for the standard deviation of a population; • σ reads "sigma"; • The symbol s is used for a population sample.
$n!$	$n!$	<ul style="list-style-type: none"> • Notation for a factorial; • $n!$ reads "n factorial."
•	A•	<ul style="list-style-type: none"> • Representation of a point; • <i>example:</i> point A; • Refer to page 22 for another use of this representation.
		<ul style="list-style-type: none"> • Representation of a line; • <i>example:</i> line l or line AB. • Representation of a half-line (ray); • a half-line (ray) is denoted by a letter representing its origin, followed by a second letter representing another point on that half-line; • <i>example:</i> half-line CD.

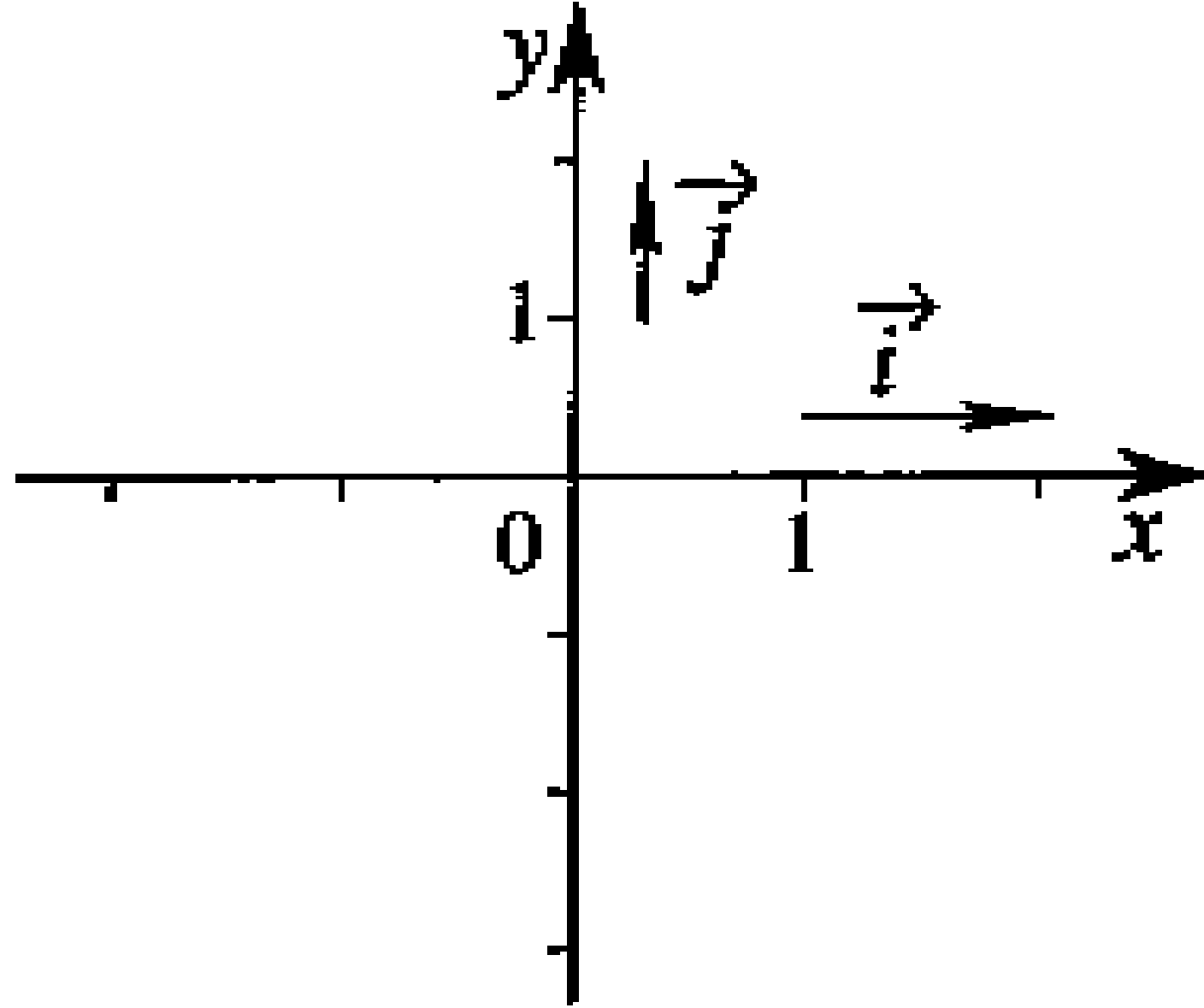
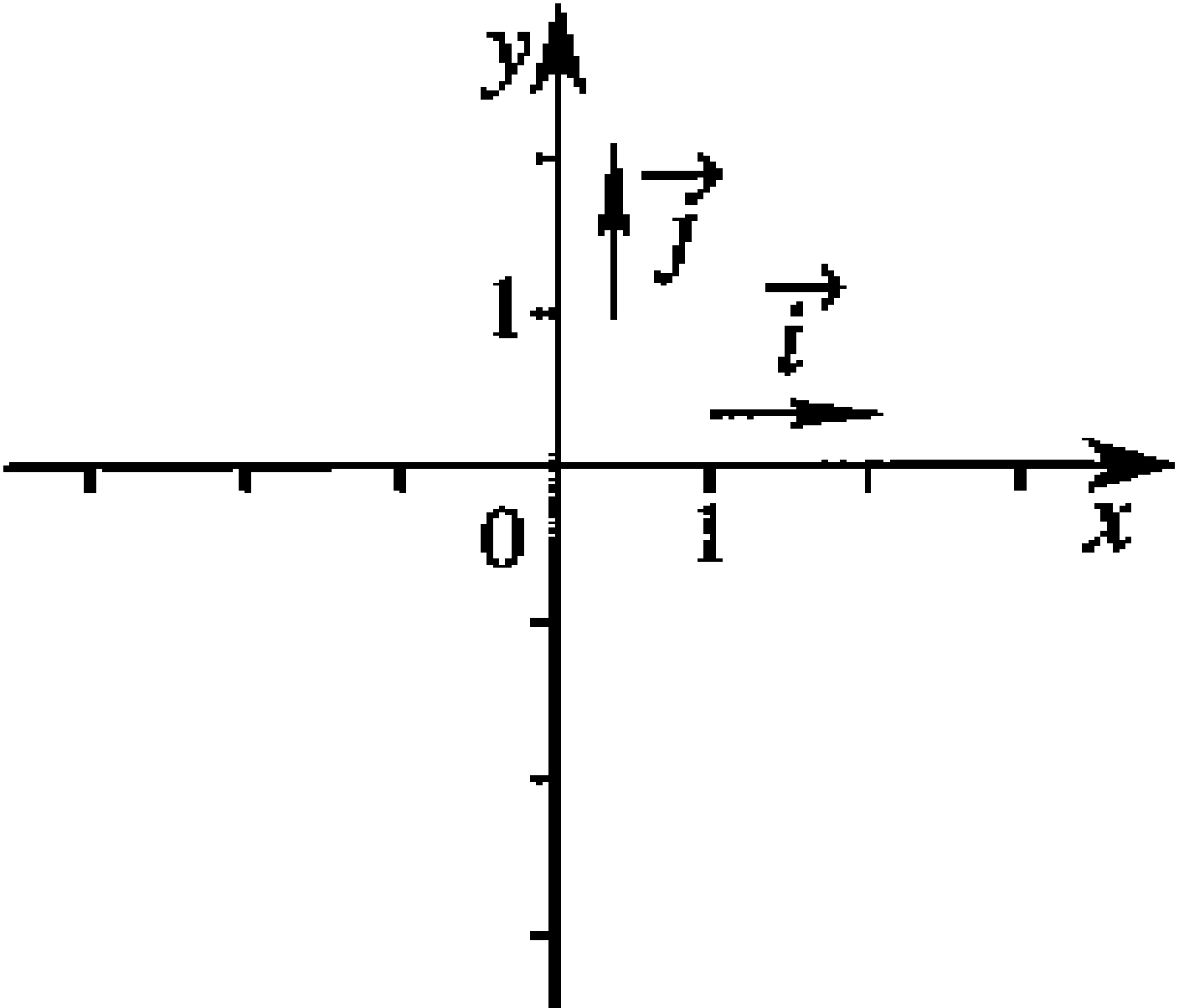
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
	\overline{AB}	<ul style="list-style-type: none"> • Notation for a segment; • \overline{AB} reads "segment AB"; • Refer to pages 10 and 16 for other uses of this notation.
		<ul style="list-style-type: none"> • Representation of a segment; • a segment is denoted by two letters representing its two end points; • <i>example</i>: segment EF.
$d(\overline{l}, \overline{l})$	$d(A, B)$ $d(P, l)$	<ul style="list-style-type: none"> • Notation for distance; • $d(A, B)$ reads "the distance from A to B"; • $d(P, l)$ reads "the distance from point P to line l."
$//$	$AB // CD$ $\overline{AB} // \overline{CD}$	<ul style="list-style-type: none"> • Symbol for parallelism; • $AB // CD$ reads "line AB is parallel to line CD" or "AB is parallel to CD"; • $\overline{AB} // \overline{CD}$ reads "segment AB is parallel to segment CD" or "segments AB and CD are parallel."
\perp	$AB \perp CD$ $\overline{AB} \perp \overline{CD}$	<ul style="list-style-type: none"> • Symbol for perpendicularity; • $AB \perp CD$ reads "line AB is perpendicular to line CD" or "AB is perpendicular to CD"; • $\overline{AB} \perp \overline{CD}$ reads "segment AB is perpendicular to segment CD" or "segments AB and CD are perpendicular."
		<ul style="list-style-type: none"> • Symbol for a right angle in a geometric plane figure.

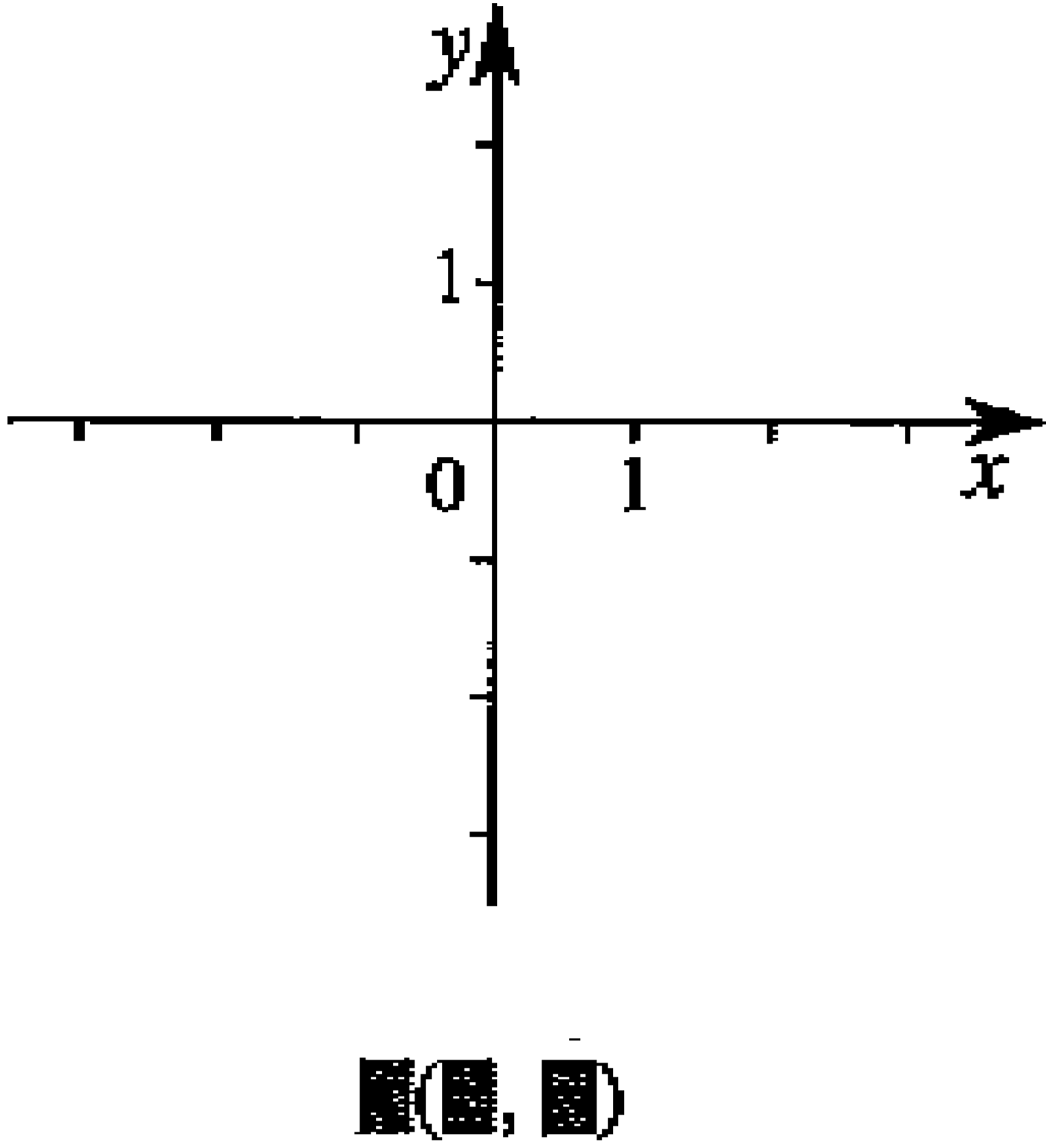
GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
\angle ■	$\angle ABC$ $\angle A$ $\angle 1$	<ul style="list-style-type: none"> • Notation for an angle; • $\angle ABC$ reads "angle ABC"; • $\angle A$ reads "angle A"; • $\angle 1$ reads "angle 1."
⌒ ■	\widehat{AB} \widehat{ABC}	<ul style="list-style-type: none"> • Notation for an arc; • \widehat{AB} reads "arc A B"; • \widehat{ABC} reads "arc AC passing through B" or "arc ABC."
m ■	$m\overline{AB}$ $m\angle ABC$	<ul style="list-style-type: none"> • Notation for a measure; • $m\overline{AB}$ reads "the measure of segment AB"; • $m\angle ABC$ reads "the measure of angle ABC."
Δ ■	ΔABC	<ul style="list-style-type: none"> • Notation for a triangle; • ΔABC reads "triangle ABC" or "triangle with vertices A, B and C"; • Refer to page 6 for another use of this notation.
\cong	$\Delta ABC \cong \Delta DEF$	<ul style="list-style-type: none"> • Symbol for congruency (isometric figures); • $\Delta ABC \cong \Delta DEF$ reads "triangle ABC is congruent to triangle DEF" or "triangle ABC and triangle DEF are isometric."
\sim	$\Delta ABC \sim \Delta DEF$	<ul style="list-style-type: none"> • Symbol for similarity; • $\Delta ABC \sim \Delta DEF$ reads "triangle ABC is similar to triangle DEF" or "triangle ABC and triangle DEF are similar."

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
<p style="text-align: center;">t</p>  <p style="text-align: center;">r</p>  <p style="text-align: center;">s</p> 	<p style="text-align: center;">t_1 $t_{(a, b)}$</p> <p style="text-align: center;">t</p> <p style="text-align: center;">r_1 $r_{(C, \alpha)}$</p> <p style="text-align: center;">s_1</p>	<ul style="list-style-type: none"> • Symbol that usually designates a translation; • t_1 reads “translation t one”; • In the Cartesian plane, $t_{(a, b)}$ designates the translation that maps the ordered pair $(0, 0)$ onto the ordered pair (a, b). <p style="text-align: center;">• Representation of the translation t.</p> <ul style="list-style-type: none"> • Symbol that usually designates a rotation; • r_1 reads “rotation r one.” <ul style="list-style-type: none"> • Representation of the rotation r; • A rotation is also denoted by $r_{(C, \alpha)}$, where C represents the centre of rotation and α, the angle of rotation. <ul style="list-style-type: none"> • Symbol that usually designates symmetry with respect to a line; • s_1 reads “reflection s one.” <ul style="list-style-type: none"> • Representation of the axis of symmetry s; • An axis of symmetry is also denoted by s_l, where l represents the axis of symmetry.

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
<p style="text-align: center;">h</p>  <p style="text-align: center;">\vec{AB}</p>  <p style="text-align: center;">\uparrow</p>	<p style="text-align: center;">h_1</p> <p style="text-align: center;">$h_{(C, k)}$</p> <p style="text-align: center;">\vec{AB}</p> <p style="text-align: center;">$\vec{AB} \uparrow \vec{CD}$</p> <p style="text-align: center;">$(A, C) \uparrow (B, D)$</p>	<ul style="list-style-type: none"> • Symbol that usually designates a dilatation; • h_1 reads “dilatation h one.” • Representation of the dilatation h; • A dilatation is also denoted by $h_{(C, k)}$, where C represents its centre and k, the scale factor. • Notation for a directed line segment; • \vec{AB} reads “directed line segment AB”; • Refer to page 22 for another use of this notation. • Represents directed line segment AB. • Symbol for equality; • $\vec{AB} \uparrow \vec{CD}$ reads “directed segments AB and CD are equal”; • $(A, C) \uparrow (B, D)$ reads “ordered pairs (A, C) and (B, D) are equal.”

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
	\vec{v} \overrightarrow{AB}	<ul style="list-style-type: none"> • Notation for a vector; • \vec{v} reads "vector v"; • \overrightarrow{AB} reads "vector AB"; • Refer to page 21 for another use of this notation.
	$\ \vec{v}\ $	<ul style="list-style-type: none"> • Notation for the norm of a vector (vector length); • $\ \vec{v}\$ reads "the norm of vector v" or "the length of vector v."
	$\vec{u} \cdot \vec{v}$	<ul style="list-style-type: none"> • Notation for a scalar product; • $\vec{u} \cdot \vec{v}$ reads "the scalar product of u and v"; • Refer to page 17 for another use of this notation.
		<ul style="list-style-type: none"> • Representation of a system of perpendicular axes. • Representation of a system of oblique axes.

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
<div style="text-align: center;"> \vec{i} \vec{j}   </div>		<ul style="list-style-type: none"> • Notation for a vector parallel to the x-axis. • Notation for a vector parallel to the y-axis. • Representation of an orthogonal coordinate system. • Representation of an orthonormal coordinate system.

GRAPHS NOTATION SYMBOLS	EXAMPLE	COMMENTS
 <p data-bbox="585 944 716 987">$P(3, 4)$</p>	<p data-bbox="1124 944 1255 987">$P(3, 4)$</p>	<ul data-bbox="1450 439 2609 1181" style="list-style-type: none"> • Representation of an orthonormal (Cartesian) coordinate system; • This Cartesian plane is often called a Cartesian coordinate system; • Two-dimensional space in $\mathbb{R} \times \mathbb{R}$ or \mathbb{R}^2. • Notation for the Cartesian coordinates of a point in a Cartesian plane; • $P(3, 4)$ reads “point P with coordinates 3 and 4”; • the first coordinate is called the x-coordinate (or abscissa) of P and the second is called the y-coordinate (or ordinate) of P.

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