

10. SIGNS AND SYMBOLS

10.1. The increased use of signs and symbols and their importance in technical and scientific work have emphasized the necessity of standardization on a national basis and of the consistent use of the standard forms.

10.2. Certain symbols are standardized—number symbols (the digits, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9); letter symbols (the letters of the alphabet, a, b, c, d, etc.); and graphic symbols (the mathematical signs +, −, ±, ×, ÷).

10.3. The signs +, −, ±, ×, and ÷, etc., are closed against accompanying figures and symbols. When the × is used to indicate “crossed with” (in plant or animal breeding) or magnification, it will be separated from the accompanying words by a space.

i–vii + 1–288 pages
The equation $A+B$
The result is 4×4
 $20,000 \pm 5,000$

Early June × Bright (crossed with)
× 4 (magnification)

Symbols with figures

10.4. In technical publications the degree mark is used in lieu of the word *degree* following a figure denoting measurement.

10.5. Following a figure, the spelled form is preferred. The percent symbol is used in areas where space will not allow the word *percent* to be used.

In that period the price rose 12, 15, and 19 percent.

not In that period the price rose 12 percent, 15 percent, and 19 percent.

10.6. Any symbol set close up to figures, such as the degree mark, dollar mark, or cent mark, is used before or after each figure in a group or series.

\$5 to \$8 price range
5'–7' long, *not* 5–7' long
3¢ to 5¢ (no spaces)
±2 to ±7; 2°±1°

but
§ 12 (thin space)
from 15 to 25 percent
45 to 65 °F *not* 45° to 65° F

Letter symbols

10.7. Letter symbols are set in italic (see rule 10.8) or in roman (see rule 9.56) without periods and are capitalized only if so shown in copy, since the capitalized form may have an entirely different meaning.

Equations

10.8. In mathematical equations, use italic for all letter symbols—capitals, lowercase, small capitals, and superiors and inferiors (exponents and subscripts); use roman for figures, including superiors and inferiors.

10.9. If an equation or a mathematical expression needs to be divided, break before $+$, $-$, $=$, etc. However, the equal sign is to clear on the left of other beginning mathematical signs.

10.10. A short equation in text should not be broken at the end of a line. Space out the line so that the equation will begin on the next line; or better, center the equation on a line by itself.

10.11. An equation too long for one line is set flush left, the second half of the equation is set flush right, and the two parts are balanced as nearly as possible.

10.12. Two or more equations in a series are aligned on the equal signs and centered on the longest equation in the group.

10.13. Connecting words of explanation, such as *hence*, *therefore*, and *similarly*, are set flush left either on the same line with the equation or on a separate line.

10.14. Parentheses, braces, brackets, integral signs, and summation signs should be of the same height as the mathematical expressions they include.

10.15. Inferiors precede superiors if they appear together; but if either inferior or superior is too long, the two are aligned on the left.

Chemical symbols

10.16. The names and symbols listed below are approved by the International Union of Pure and Applied Chemistry. They are set in roman without periods.

Element	Sym- bol	Atomic num- ber	Atomic weight ¹	Element	Sym- bol	Atomic num- ber	Atomic weight ¹
Actinium	Ac	89	227.0278	Mercury	Hg	80	200.59
Aluminum	Al	13	26.98154	Molybdenum ...	Mo	42	95.94
Americium	Am	95	(243)	Neodymium	Nd	60	144.24
Antimony	Sb	51	121.75	Neon	Ne	10	20.179
Argon	Ar	18	39.948	Neptunium	Np	93	237.0482
Arsenic	As	33	74.9216	Nickel	Ni	28	58.69
Astatine	At	85	(210)	Niobium	Nb	41	92.9064
Barium	Ba	56	137.33	Nitrogen	N	7	14.0067
Berkelium	Bk	97	(247)	Nobelium	No	102	(259)
Beryllium	Be	4	9.01218	Osmium	Os	76	190.2
Bismuth	Bi	83	208.9804	Oxygen	O	8	15.9994
Bohrium	Bh	107	(262.0)	Palladium	Pd	46	106.42
Boron	B	5	10.81	Phosphorus	P	15	30.97376
Bromine	Br	35	79.904	Platinum	Pt	78	195.08
Cadmium	Cd	48	112.41	Plutonium	Pu	94	(244)
Calcium	Ca	20	40.08	Polonium	Po	84	(209)
Californium	Cf	98	(251)	Potassium	K	19	39.0983
Carbon	C	6	12.011	Praseodymium	Pr	59	140.9077
Cerium	Ce	58	140.12	Promethium ...	Pm	61	(145)
Cesium	Cs	55	132.9054	Protactinium ...	Pa	91	231.0359
Chlorine	Cl	17	35.453	Radium	Ra	88	226.0254
Chromium	Cr	24	51.996	Radon	Rn	86	(222)
Cobalt	Co	27	58.9332	Rhenium	Re	75	186.207
Copper	Cu	29	63.546	Rhodium	Rh	45	102.9055
Curium	Cm	96	(247)	Rubidium	Rb	37	85.4678
Dubnium	Db	105	(262.0)	Ruthenium	Ru	44	101.07
Dysprosium	Dy	66	162.50	Rutherfordium	Rf	104	(261.0)
Einsteinium	Es	99	(252)	Samarium	Sm	62	150.36
Erbium	Er	68	167.26	Scandium	Sc	21	44.9559
Europium	Eu	63	151.96	Seaborgium	Sg	106	(263.0)
Fermium	Fm	100	(257)	Selenium	Se	34	78.96
Fluorine	F	9	18.998403	Silicon	Si	14	28.0855
Francium	Fr	87	(223)	Silver	Ag	47	107.8682
Gadolinium	Gd	64	157.25	Sodium	Na	11	22.98977
Gallium	Ga	31	69.72	Strontium	Sr	38	87.62
Germanium	Ge	32	72.59	Sulfur	S	16	32.06
Gold	Au	79	196.9665	Tantalum	Ta	73	180.9479
Hafnium	Hf	72	178.49	Technetium	Tc	43	(98)
Hassium	Hs	108	(265.0)	Tellurium	Te	52	127.60
Helium	He	2	4.00260	Terbium	Tb	65	158.9254
Holmium	Ho	67	164.9304	Thallium	Tl	81	204.383
Hydrogen	H	1	1.00794	Thorium	Th	90	232.0381
Indium	In	49	114.82	Thulium	Tm	69	168.9342
Iodine	I	53	126.9045	Tin	Sn	50	118.69
Iridium	Ir	77	192.22	Titanium	Ti	22	47.88
Iron	Fe	26	55.847	Tungsten	W	74	183.85
Krypton	Kr	36	83.80	Ununnilium ...	Uun	110	(269.0)
Lanthanum	La	57	138.9055	Ununium ...	Uuu	111	(272.0)
Lawrencium	Lr	103	(260)	Ununbium ...	Uub	112	(277.0)
Lead	Pb	82	207.2	Uranium	U	92	238.0289
Lithium	Li	3	6.941	Vanadium	V	23	50.9415
Lutetium	Lu	71	174.967	Xenon	Xe	54	131.29
Magnesium	Mg	12	24.305	Ytterbium	Yb	70	173.04
Manganese	Mn	25	54.9380	Yttrium	Y	39	88.9059
Meitnerium	Mt	109	(266.0)	Zinc	Zn	30	65.38
Mendelevium ..	Md	101	(258)	Zirconium	Zr	40	91.22

¹The atomic weights of many elements are not invariant but depend on the origin and treatment of the material. The values of atomic weight given here apply to elements as they exist naturally on Earth and to certain artificial elements. Values in parentheses are used for radioactive elements whose atomic weights cannot be quoted precisely without knowledge of the origin of the elements. The value given is the atomic mass number of the isotope of that element of longest known half life.

Standardized symbols

10.17. Symbols duly standardized by any national scientific, professional, or technical group are accepted as preferred forms within the field of the group. The issuing office desiring or requiring the use of such standardized symbols should see that copy is prepared accordingly.

Signs and symbols

10.18. The following list contains some signs and symbols frequently used in printing. The forms and style of many symbols vary with the method of reproduction employed. It is important that editors and writers clearly identify signs and symbols when they appear within a manuscript.

ACCENTS

- ˊ acute
- ˘ breve
- ˆ cedilla
- ˆ circumflex
- ¨ dieresis
- ˘ grave
- ˉ macron
- ˜ tilde

- ⊙ dot in triangle in circle
- ⊕ cross in circle
- © copyright
- ♃ Ceres
- ♃ Pallas
- ♃ Juno
- ♃ Vesta

- ⦿ (184 N)
- ⌨ key
- ¶ (206 N)
- ¶ paragraph

ARROWS

- direction
- ↖ direction
- ↗ direction
- ↻ direction
- ↺ direction
- ↻ bold arrow
- ↻ open arrow
- ⇌ reversible reaction

BULLETS

- solid circle; bullet
- bold center dot
- movable accent

CHEMICAL

- ‰ salinity
- ℥ minim
- ↕ exchange
- ↑ gas

CIRCLED SYMBOLS

- ⊙ angle in circle
- ⊖ circle with parallel rule
- ⊕ triangle in circle
- ⊙ dot in circle

CODE

- No. 1 6 pt. code dot
- No. 2 8 pt. code dot
- No. 3 10 pt. code dot
- No. 4 8 pt. code dot
- No. 4 10 pt. code dot
- No. 1 6 pt. code dash
- No. 2 8 pt. code dash
- No. 3 10 pt. code dash
- No. 4 8 pt. code dash
- No. 4 10 pt. code dash

COMPASS

- ° degree
- degree with period
- ′ minute
- ′ minute with period
- ″ second
- ″ second with period
- ″ canceled second

DECORATIVE

- ⊕ bold cross
- ⊕ cross patte
- ⊕ cross patte
- ⊕ cross patte

ELECTRICAL

- ℜ reluctance
- ↔ reaction goes both right and left
- ↑ reaction goes both up and down
- ↓ reversible
- direction of flow; yields
- direct current
- ⇌ electrical current
- ⇌ reversible reaction
- ⇌ reversible reaction
- ⇌ alternating current
- ⇌ alternating current
- ⇌ reversible reaction beginning at left
- ⇌ reversible reaction beginning at right
- Ω ohm; omega
- MΩ megohm; omega
- μΩ microohm; mu omega
- ω angular frequency, solid angle; omega
- Φ magnetic flux; phi
- Ψ dielectric flux; electrostatic flux; psi
- γ conductivity; gamma

ELECTRICAL—Con.

ρ resistivity; rho
 Λ equivalent conductivity
 HP horsepower

MATHEMATICAL

— vinculum (above letters)
 \therefore geometrical proportion
 \therefore difference, excess
 \parallel parallel
 \parallel s parallels
 \nparallel not parallels
 $| |$ absolute value
 \cdot multiplied by
 $:$ is to; ratio
 $+$ divided by
 \therefore therefore; hence
 \because because
 \therefore proportion; as
 \ll is dominated by
 $>$ greater than
 \sqsupset greater than
 \supseteq greater than or equal to
 \equiv greater than or equal to
 \supseteq greater than or less than
 ∇ is not greater than
 $<$ less than
 \sqsubset less than
 \supseteq less than or greater than
 \nless is not less than
 \less smaller than
 \less less than or equal to
 \less less than or equal to
 \equiv or \geq greater than or equal to
 \less equal to or less than
 \less equal to or less than
 \less is not greater than equal to or less than
 \less equal to or greater than
 \less is not less than equal to or greater than
 \perp equilateral
 \perp perpendicular to
 \vdash assertion sign
 \doteq approaches

MATHEMATICAL—Con.

\doteq approaches a limit
 \sphericalangle equal angles
 \neq not equal to
 \equiv identical with
 \nequiv not identical with
 \mathbb{N} score
 \approx or \doteq nearly equal to
 $=$ equal to
 \sim difference
 \cong perspective to
 \cong congruent to approximately equal
 \doteq difference between
 \cong geometrically equivalent to
 $($ included in
 $)$ excluded from
 \subset is contained in
 \cup logical sum or union
 \cap logical product or intersection
 $\sqrt{\quad}$ radical
 $\sqrt{\quad}$ root
 $\sqrt{\quad}$ square root
 $\sqrt{\quad}$ cube root
 $\sqrt{\quad}$ fourth root
 $\sqrt{\quad}$ fifth root
 $\sqrt{\quad}$ sixth root
 π pi
 e base (2.718) of natural system of logarithms; epsilon
 ϵ is a member of; dielectric constant; mean error; epsilon
 $+$ plus
 $\mathbf{+}$ bold plus
 $-$ minus
 $\mathbf{-}$ bold minus
 $/$ shill(ing); slash; virgule
 \pm plus or minus
 \mp minus or plus
 \times multiplied by
 $\mathbf{=}$ bold equal
 $\#$ number
 \textcircled{P} per
 $\%$ percent
 \int integral
 $|$ single bond
 \backslash single bond
 $/$ single bond

MATHEMATICAL—Con.

\parallel double bond
 \parallel double bond
 \parallel double bond
 \textcircled{C} benzene ring
 ∂ or δ differential; variation
 ∂ Italian differential
 \rightarrow approaches limit of
 \sim cycle sine
 \int horizontal integral
 \oint contour integral
 \propto variation; varies as
 Π product
 Σ summation of; sum; sigma
 $!$ or \perp factorial product

MEASURE

lb pound
 ʒ dram
 $f\text{ʒ}$ fluid dram
 ʒ ounce
 $f\text{ʒ}$ fluid ounce
 O pint

MISCELLANEOUS

\S section
 \dagger dagger
 \ddagger double dagger
 $\%$ account of
 $\%$ care of
 \mathbb{N} score
 \textcircled{P} paragraph
 \textcircled{b} Anglo-Saxon
 \textcircled{c} center line
 \textcircled{c} conjunction
 \perp perpendicular to
 $"$ or $"$ ditto
 \propto variation
 \textcircled{R} recipe
 \square move right
 \square move left
 $\textcircled{\circ}$ or $\textcircled{\circ}$ or $\textcircled{1}$ annual
 $\textcircled{\circ\circ}$ or $\textcircled{2}$ biennial
 \in element of
 \textcircled{D} scruple
 f function
 $!$ exclamation mark
 $\textcircled{+}$ plus in square
 $\textcircled{2}$ perennial

MISCELLANEOUS—Con.

- ϕ diameter
 ē mean value of *e*
 U mathmodifier
 c mathmodifier
 □ dot in square
 △ dot in triangle
 ☒ station mark
 @ at

MONEY

- ¢ cent
 ¥ yen
 £ pound sterling
 ¢ mills

MUSIC

- ♮ natural
 ♭ flat
 ♯ sharp

PLANETS

- ☿ Mercury
 ♀ Venus
 ⊕ Earth
 ♂ Mars
 ♃ Jupiter
 ♄ Saturn
 ♅ Uranus
 ♆ Neptune
 ♇ Pluto
 ♁ dragon's head, ascending node
 ♂ dragon's tail, descending node
 ♄ conjunction
 ♀ opposition
 ☉ or ☊ Sun
 ♁ Sun's lower limb
 ☽ Sun's upper limb
 ☉ solar corona
 ⊕ solar halo
 ☾ Moon
 ● new Moon
 ☾ first quarter
 ● first quarter
 ☾ third quarter
 ● last quarter
 ☾ last quarter
 ☾ last quarter
 ○ full Moon
 ● full Moon

PLANETS—Con.

- ☾ eclipse of Moon
 ☾ lunar halo
 ☾ lunar corona
 ♃ Ceres
 ♃ Juno

PUNCTUATION

- { } braces
 [] brackets
 () parentheses
 < > square parentheses;
 angle brackets
 ¡ Spanish open quote
 ¿ Spanish open quote

SEX

- ♂ or ♂ male
 □ male, in charts
 ♀ female
 ○ female, in charts
 ♀ hermaphrodite

SHAPES

- ◆ solid diamond
 ◇ open diamond
 ○ circle
 ▲ solid triangle
 △ triangle
 □ square
 ■ solid square
 ▭ parallelogram
 ▭ rectangle
 ☐ double rectangle
 ★ solid star
 ☆ open star
 ⊓ right angle
 ∠ angle
 ✓ check
 ✓ check
 β German ss
 β italic German ss
 🖱 solid index
 🖱 solid index
 🖱 index
 🖱 index

GEOLOGIC SYSTEMS¹

- Q Quaternary
 T Tertiary
 K Cretaceous

- J Jurassic
 T Triassic
 P Permian
 P Pennsylvanian
 M Mississippian
 D Devonian
 S Silurian
 O Ordovician
 C Cambrian
 pC Precambrian
 C Carboniferous

VERTICAL

- | 5 unit vertical
 | 8 point vertical
 | 9 unit vertical

WEATHER

- T thunder
 ⚡ thunderstorm;
 sheet lightning
 < sheet lightning
 ↓ precipitate
 ☂ rain
 ← floating ice crystals
 → ice needles
 ▲ hail
 ☉ sleet
 ∞ glazed frost
 ⊔ hoarfrost
 √ frostwork
 ✖ snow or sextile
 ☒ snow on ground
 ⚡ drifting snow (low)
 ≡ fog
 ∞ haze
 ☾ Aurora

ZODIAC

- ♈ Aries; Ram
 ♉ Taurus; Bull
 ♊ Gemini; Twins
 ♋ Cancer; Crab
 ♌ Leo; Lion
 ♍ Virgo; Virgin
 ♎ Libra; Balance
 ♏ Scorpio; Scorpion
 ♐ Sagittarius; Archer
 ♑ Capricornus; Goat
 ♒ Aquarius; Water bearer
 ♓ Pisces; Fishes

¹ Standard letter symbols used by the Geological Survey on geologic maps. Capital letter indicates the system and one or more lowercased letters designate the formation and member where used.