Cardinal and ordinal numbers

Cardinal		ordinal	
1	One	1st	first
2	Two	2nd	second
3	Three	3rd	third
4	Four	4th	fourth
5	Five	5th	fifth
6	Six	6th	sixth
90	Ninety	90th	ninetieth
100	Hundred	100th	hundredth
101	A hundred and one	101st	one hundred and first
221	Two hundred and twenty one	221st	two hundred and twenty first
1000	One thousand	1000th	(one) thousandth
2008	Two thousand and eight	2008th	two thousand and eighth

555,555 five hundred and fifty five thousand five hundred and fifty five
555,555th five hundred and fifty five thousand five hundred and fifty fifth

Cardinal and ordinal numbers

Note that **years** are generally expressed in English not with the hundreds or thousands but as **two separate two-digit numbers**:

- nineteen ninety-eight (1998)
- ten sixty-six (1066)
- nineteen oh one (1901)

Exceptions are:

⇒ two thousand (2000)
⇒ two thousand and ten (2010)

Dates are written and expressed in the following ways:

- 19th July 1998 = the nineteenth of July nineteen ninety-eight (GB)
- July 19, 1998 = July nineteenth, nineteen ninety-eight (USA)

Larger ordinal numbers are written as follows:

Fractions (=rational numbers)

1/2	one half
1/3	one third
1/4	one quarter [= one fourth]
1/5	one fifth
− 1/17	minus one seventeenth
3/17	?
3/8	three eighths
26/9	twenty-six ninths
− 5/34	minus five thirty-fourths
2 3/7	two and three sevenths

Real Numbers

−0.067	minus nought point zero six seven
81.59	eighty-one point five nine
$-2.3 \cdot 10^6$	minus two point three times ten to the six
−2 300 000	minus two million three hundred thousand
$4 \cdot 10^{-3}$	four times ten to the minus three
0.004 = 4/1000	four thousandths
π [= 3.14159 . . .]	pi (pronounced as ‘pie’)
e [= 2.71828 . . .]	e (base of the natural logarithm)

decimals

2.4 ‘two point four’ The period between 2 and 4 is known as the **decimal point**.

If 100 is divided by 3, the quotient is 33.33.
In spoken English this is, ‘thirty three point three, three recurring’.

If 100 is divided by 3, and the quotient is written 33.333 it is correct to three significant figures.
If the quotient is written 33.33, it is correct to two significant figures.

Arithmetical operations

2 + 2 = 4 two plus two equals four.
two plus two is four.

This arithmetical operation is called **addition**.
The result of this operation is called **the sum**.
‘if two is added to two, the sum is four.’

4 – 2 = 2 four minus two equaşs two.
four minus two is two.

This arithmetical operation is called **subtraction**.
The reult of this operation is called **the difference**.
‘if two is subtracted from four, the difference is two.’

Arithmetical operations

4 ÷ 2 = 2 Four divided by 2 equals two.
four divided by two is two.
This arithmetical operation is called **division**.
The result of this operation is **the quotient**.
If ten is divided by five, the quotient is two.

4 x 2 = 8 Four multiplied by two equals eight.
This arithmetical operation is called **multiplication**.
The result of this operation is called **the product**.
If four is multiplied by two, the product is eight.

Arithmetical operations

Q: If 10 is divided by 2, what is the quotient?
A: If 10 is divided by 2, the quotient is 5.

What is the quotient if 18 is divided by 9?
If 90 is added to 10, and the sum is divided by 2, what is the quotient?

If 500 is subtracted from 560, the difference is divided by 30, then 2 is added to the quotient, what is the sum?

292÷2	64 ÷ 4	(10+20) ÷ 3
(32+17) x 2	(41-3)÷19	((6-2)÷2)+96

Basic arithmetic operations

$(2 - 3)\cdot 6 + 1 = -5$

two minus three in brackets times six plus one equals minus five

$(1-3)/2 + 4 = -1/3$

one minus three over two plus four equals minus one third

$4!$ [$= 1 \cdot 2 \cdot 3 \cdot 4$] four factorial

Powers and roots

4^2 : four to the power of two
The subscript above is called the power or the exponent.

Alternative way
4^2 : four squared 5^2: ?

4^6 : four to the power of six 5^6: ?
5^2 : five squared 3^2: ?
4^3 : four cubed 6^3: ?

4^{-2} : four to the power of minus two 5^{-2}: ?
5^{-3} : five to the power of minus three 7^{-3}: ?

X^{-2} : the reciprocal of X^2 y^{-2}: ?
X^{-3} : the reciprocal of X^3 y^{-3}: ?

Exponentiation and roots

5^2 [= 5 · 5 = 25]	five squared
5^3 [= 5 · 5 · 5 = 125]	five cubed
5^4 [= 5 · 5 · 5 · 5 = 625]	five to the (power of) four
5^{-1} [= 1/5 = 0.2]	five to the minus one
5^{-2} [= $1/5^2$ p = 0.04]	five to the minus two
$\sqrt{3}$ [= 1.73205 . . .]	the square root of three
$\sqrt[3]{64}$ [= 4]	the cube root of sixty four
$\sqrt[5]{32}$ [= 2]	the fifth root of thirty two

6^2 = ?

6^3 = ?

7^4 = ?

3^{-1} = ?

8^{-2} = ?

Powers and roots

	1	2	3	4	5	6
A	6^{2}	7^{7}	8^{-6}	9^{3}	17^{-3}	92^{17}
B	16^{-2}	16^{5}	173^{-8}	24^{5}	72^{14}	56^{6}
C	15^{2}	26^{-5}	17^{-8}	24^{-25}	172^{-12}	6^{-2}

$\sqrt[2]{49}$: square root of forty nine
$\sqrt[3]{64}$: cube root of sixty four
$\sqrt[4]{64}$: fourth root of sixty four
$\sqrt[5]{75}$: fifth root of seventy five
$\sqrt[6]{70}$: sixth root of seventy

Algebraic expressions

$A = a^2$	capital a equals small a squared
$a = x + y$	a equals x plus y
$b = x - y$	b equals x minus y
$c = x \cdot y \cdot z$	c equals x times y times z
$c = xyz$	c equals x y z
$(x + y)z + xy$	x plus y in brackets times z plus x y
$x^2 + y^3 + z^5$	x squared plus y cubed plus z to the (power of) five
$x^n + y^n = z^n$	x to the n plus y to the n equals z to the n
$(x - y)^{3m}$	x minus y in brackets to the (power of) three m
	x minus y, all to the (power of) three m
$2^x 3^y$	two to the x times three to the y
$ax^2 + bx + c$	a x squared plus b x plus c
$\sqrt{x} + \sqrt[3]{y}$	the square root of x plus the cube root of y
$\sqrt[n]{x + y}$	the n-th root of x plus y
$\frac{a+b}{c-d}$	a plus b over c minus d
$\binom{n}{m}$	(the binomial coefficient) n over m

inequalities

$x > y$	x is greater than y
$x \geq y$	x is greater (than) or equal to y
$x < y$	x is smaller than y
$x \leq y$	x is smaller (than) or equal to y

3 > 2	4 < 5	15 > 11	12 < 14
4 > 3	7 < 9	24 > 14	45 < 59
A ≤ B	C ≥ D	E ≤ F	G ≥ H
Y ≤ Z	X ≥ Y	T ≤ S	H ≥ I

inequalities

$x > 0$	x is positive
$x \geq 0$	x is positive or zero; x is non-negative
$x < 0$	x is negative
$x \leq 0$	x is negative or zero

a > 0	b < 0	c > 0	d < 0
4 > ?	7 < ?	24 > ?	45 < ?
a ≤ 0	b ≥ 0	e ≤ 0	f ≥ 0
g ≤ 0	h ≥ 0	n ≤ 0	m ≥ 0
a ≤ 2	b ≥ 5	e ≤ 3	f ≥ 9
g ≤ 7	h ≥ 8	n ≤ 4	m ≥ 6

Expressions of units

Most units in English are treated as normal countable nouns that take a singular and a plural:

- 10 m = ten metres
- 85,000 gal = eighty-five thousand gallons
- 35°C = thirty-five degrees Celsius
- 40 kg = forty kilograms (kilos)
- 85 lb = eight-five pounds

There are exceptions: *one hundred bar*.

However, when a unit is used to modify another noun, then it is written as follows: *a ten-degree rise in temperature*. Here the expression *ten-degree* modifies the noun *rise*; it is written in the singular and joined together with a hyphen.

Expressions of units

Note the following: m^2 = square metres, m^3 = cubic metres, and units such as:

- N/m^2 = newtons per square metre

The Americans still use the old British units: *gallons, feet, pounds* – abbreviated to *gal, ft, lb*. The following conversions apply:

a) 1 US gallon = 3.7854 litres (1 UK gallon = 4.546 litres);
b) 1 inch = 2.54 centimetres
c) 1 foot = 0.3048 m
d) 1 pound = 453.592 g

Note the American spelling of the following units: *liter, meter, kilometer* (British *-re* → American *-er*).

Commonly used mathematical symbols

Symbol	Meaning
±	Plus or minus
=	Equals
≡	Is identical with
≅	Approximately equals
≠	Is not equal to
>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
–	Minus
÷	Sign of division
/	Divided by
×	Times, by
·	Multiplied by
x^2	x squared
x^3	x cubed

Symbol	Meaning
x^n	x to the [power of] n x [raised] to the nth power
√	(the) square root (of)
→	Approaches, tends to
∝	Varies as
| |	Absolute value
∞	Infinity
$n!$	Factorial, n(n-1)(n-2)...1
Σ	Sum of a series of numbers
∴	Therefore
dx	Differential of x
Δx	Increment of x
∂u/∂x	Partial derivative
∇	Nabla

s we express the following equation

$$a^2 + b^2 = c^2$$