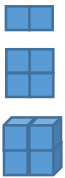
Number C1.1

- Natural numbers: for counting $0, 1, 2, 3$ ...
- Integers: whole numbers ..., $-2, -1, 0, 1, 2$ ...
- Primes: two factors $2(2 \times 1), 3(3 \times 1), n(n \times 1)$ ...
- Squares: $1(1 \times 1), 4(2 \times 2), n^2(n \times n)$ ...
- Cubes: $1(1 \times 1 \times 1), 8(2 \times 2 \times 2), n^3(n \times n \times n)$ ...
- Rational numbers: fractional $\frac{1}{2}, \frac{3}{3}, -\frac{5}{1}, \frac{n}{m}$ ...
- Irrational numbers: not an exact fraction $\pi, \sqrt{2}, \varphi, e$ ...
- Reciprocals: $\frac{2}{3}$ and $\frac{3}{2}$, 5^2 and 5^{-2}, $\frac{n}{m}$ and $\frac{m}{n}$ ...



Number C1.1

- **Factors:** $2 \times 3(6), 3 \times 4(12), n \times m(nm)$ ...

2	6	
3		

n	nm
m	

multiple	*factor*
factor	

- **Multiples:** $6(2 \times 3), 12(3 \times 4), nm(n \times m)$

- **Prime factors:** $2 \times 3 \times 5(30)$,

$2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2(72)$

÷

2	30
3	15
5	5
	1

- **HCF and LCM:**

$30 =$	2				$\times$	3			$\times$	5
$72 =$	2	$\times$	2	$\times$	2	$\times$	3	$\times$	3	
HCF =	2				$\times$	3				
LCM =	2	$\times$	2	$\times$	2	$\times$	3	$\times$	3	$\times$ 5

HCF = $2 \times 3 = 6$ and LCM = $2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$

Number C1.2

mathsimum

- **Set**: a pre-defined group of objects or numbers

$A = \{x: x \text{ is an integer}\}$

- **Elements**: members of a set $B = \{1, 3, 5, 7, \dots\}$
- Universal set: contains all sets and elements ξ or U
- Number of elements in a set: $\mathrm{n}(A)$
- Union: elements that belong to either set $A \cup B$
- Intersection: elements that belong to both sets $A \cap B$

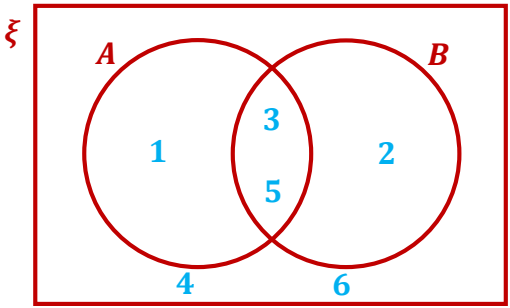
Number C1.2

$A = \{x: x \text{ is an odd number on a 6-sided die}\}$

$B = \{x: x \text{ is a prime number on a 6-sided die}\}$

$A \cup B = \{1, 2, 3, 5\}$ and $\mathrm{n}(A \cup B) = 4$

$A \cap B = \{3, 5\}$ and $\mathrm{n}(A \cap B) = 2$



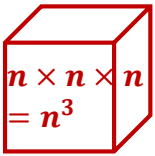
Number C1.3

- **Squares:** $1(1\times1), 4(2\times2), n^2(n\times n)$ ...
- **Square roots:** $\sqrt{1}=1, \sqrt{4}=2, \sqrt{n^2}=n$ ...

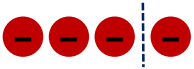
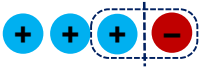
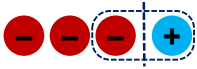
$$\sqrt{n^2}=n \quad \boxed{\begin{matrix} n\times n \\ =n^2 \end{matrix}}$$

- **Cubes:** $1(1\times1\times1), 8(2\times2\times2), n^3(n\times n\times n)$ ...
- **Cube roots:** $\sqrt[3]{1}=1, \sqrt[3]{8}=2, \sqrt[3]{n^3}=n$ ...

$$\sqrt[3]{n^3}=n$$



Number C1.4

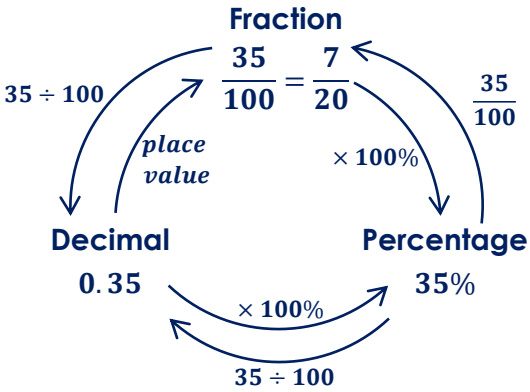
$+ = 1$	$- = -1$	$+ - = 0$
$3 + 1 = 4$ 	$3 - (-1) = 4$ 	$-3 + (-1) = -4$ 
$3 + (-1) = 2$ 	$-3 + 1 = -2$ 	$-3 - (-1) = -2$ 

$\times$	$+$	$-$
$+$	$+$	$-$
$-$	$-$	$+$

$\times$	5	-2
3	15	-6
-1	-5	2

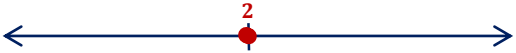
Number C1.5

Improper fraction			Mixed number		
$\frac{ac+b}{c}$			$a\frac{b}{c}$		
$\frac{11}{4}$	$\frac{2\times 4}{4}$	$\frac{3}{4}$	$2\frac{3}{4}$	$\frac{8}{4}=2$	$\frac{3}{4}$

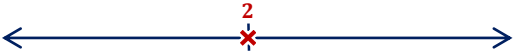


Number C1.6

- Equal to: $x = 2 (only\ 2)$, ...

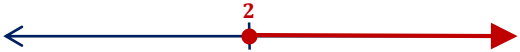


- Not equal to: $x \neq 2 (1, 3 \ldots)$, ...



- Greater than: $x > 2 (3, 4, \ldots)$, ...

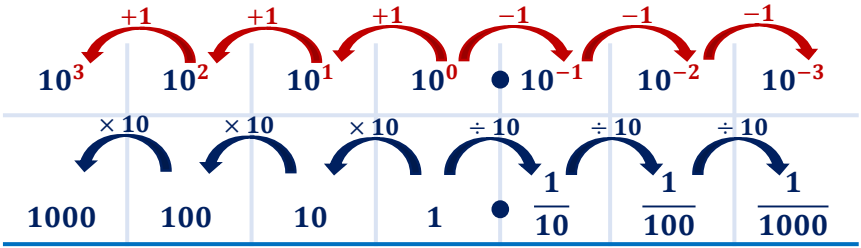
- Greater than or equal to: $x \geq 2 (2, 3, 4, \ldots)$, ...



- Less than: $x < 2 (1, 0, \ldots)$, ...

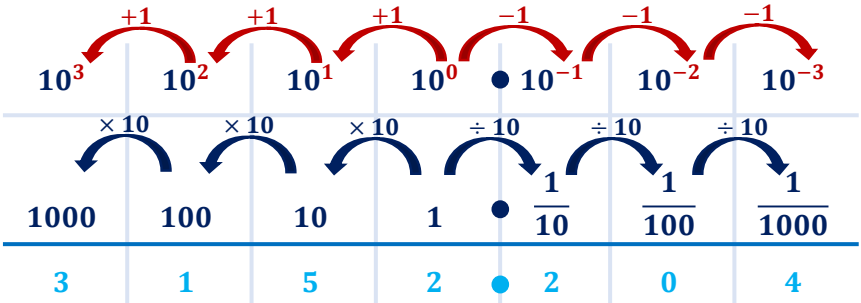
- Less than or equal to: $x \leq 2 (2, 1, 0, \ldots)$, ...

Number C1.7



- **Index laws:** $10^1 = 10,\ x^1 = x$
- $10^0 = 1,\ x^0 = 1\ (x \neq 0)$
- $10^{-1} = \frac{1}{10^1},\ x^{-n} = \frac{1}{x^n}$
- $10^1 \times 10^3 = 10^{1+3} = 10^4,\ x^m \times x^n = x^{m+n}$
- $(10^3)^2 = 10^3 \times 10^3 = 10^6,\ (x^m)^n = x^{mn}$
- $10^{\frac{1}{2}} \times 10^{\frac{1}{2}} = \left(10^{\frac{1}{2}}\right)^2 = (\sqrt{10})^2 = 10,\ x^{\frac{m}{n}} = \sqrt[n]{x^m}$
- $10^1 \div 10^3 = 10^{1-3} = 10^{-2},\ x^m \div x^n = x^{m-n}$

Number C1.7

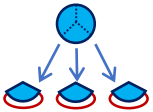
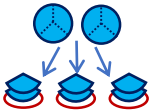
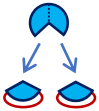
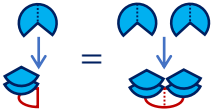


- **Standard form:** $100 = 1 \times 100 = 1 \times 10^2$, $0.004 = 4 \times \frac{1}{1000} = 4 \times 10^{-3}$,

  $x \times 10^n$ $(1 \leq x < 10$ *and* n *is an integer*$)$

- $3 \times 10^3 + 1 \times 10^2 = 3000 + 100 = 3100 = 3.1 \times 10^3$
- $3 \times 10^3 - 1 \times 10^2 = 3000 - 100 = 2900 = 2.9 \times 10^3$
- $3 \times 10^3 \times 1 \times 10^2 = 3 \times 1 \times 10^3 \times 10^2 = 3 \times 10^5$
- $\frac{3 \times 10^3}{1 \times 10^2} = \frac{3}{1} \times \frac{10^3}{10^2} = 3 \times 10^1$

Number C1.8

3	
3×2	
$\frac{1}{3} = 1 \div 3, \frac{a}{b} = a \div b$	
$\frac{1}{3} \times 2 = \frac{2}{3}, \frac{a}{b} \times m = \frac{am}{b}$	
$\frac{2}{3} \times \frac{1}{2} = \frac{2}{3} \div 2 = \frac{1}{3}, \frac{a}{b} \times \frac{m}{n} = \frac{am}{bn}$	
$\frac{2}{3} \div \frac{1}{2} = \frac{2}{3} \times 2 = \frac{4}{3}, \frac{a}{b} \div \frac{m}{n} = \frac{a}{b} \times \frac{n}{m} = \frac{an}{bm}$	

Number C1.8

$$\frac{2}{3}+\frac{1}{3}=\frac{3}{3}=1, \frac{a}{c}+\frac{b}{c}=\frac{a+b}{c}$$

$$\frac{a}{b}+\frac{c}{d}=\frac{a}{b}\times\frac{d}{d}+\frac{c}{d}\times\frac{b}{b}=\frac{ad+cb}{bd}$$

$$\frac{2}{3}+\frac{1}{2}=\frac{2}{3}\times\frac{2}{2}+\frac{1}{2}\times\frac{3}{3}=\frac{4}{6}+\frac{3}{6}=\frac{7}{6}$$

$$\frac{2}{3}-\frac{1}{3}=\frac{1}{3}, \frac{a}{c}-\frac{b}{c}=\frac{a-b}{c}$$

$$\frac{2}{3}-\frac{1}{2}=\frac{2}{3}\times\frac{2}{2}-\frac{1}{2}\times\frac{3}{3}=\frac{4}{6}-\frac{3}{6}=\frac{1}{6}$$

$$\frac{a}{b}-\frac{c}{d}=\frac{a}{b}\times\frac{d}{d}-\frac{c}{d}\times\frac{b}{b}=\frac{ad-cb}{bd}$$

Number C1.9

- **Rounding to a given number of decimal places:**

0.0756 *to* $2\ d.p. \approx 0.08$ (counting from the 0.1th place)

0.0736 *to* $2\ d.p. \approx 0.07$

- **Rounding to a given number of significant figures:**

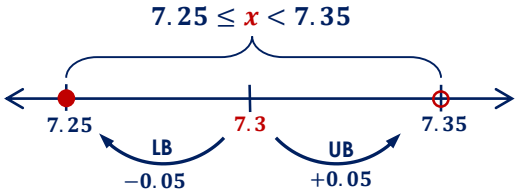
0.0736 *to* $2\ s.f. \approx 0.074$ (counting from the first non-zero digit)

0.0734 *to* $2\ s.f. \approx 0.073$

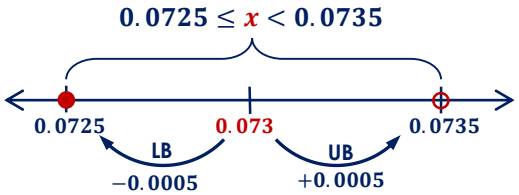
Number C1.10

Limits of accuracy:

- Upper and lower bounds of 7.3 accurate to 1 d.p.

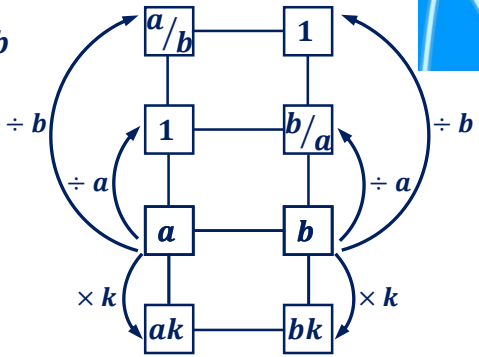


- Upper and lower bounds of 0.073 accurate to 3 d.p.

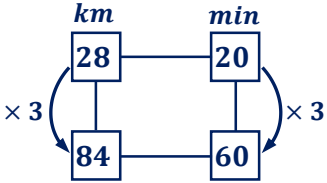


Number C1.11

- Ratio: comparison of parts $a : b$
- Proportion:
  fraction of the whole $\dfrac{a}{a+b}$
- Direct proportion:
  multiplicative relationship



- Total average speed:
  $\dfrac{\text{total distance covered}}{\text{total time taken}}$
- $28\ km$ in $20\ min = 84\ km/h$



Number C1.12

- **Percentage of a quantity:**

$$35\%\ of\ 60 = \frac{35}{100} \times 60 = 21, \frac{n}{100} \times x = nx \div 100$$

- **Quantity as a percentage of another:**

$$35\ as\ \%\ of\ 60 = \frac{35}{60} \times 100 \approx 58.\dot{3}\%, \frac{n}{x} \times 100 = 100n \div x$$

- **Percentage increase:**

$$60\ increased\ by\ 35\% = 60 \times 1.35 = 81, n(1 + x\%) = n\left(1 + \frac{x}{100}\right)$$

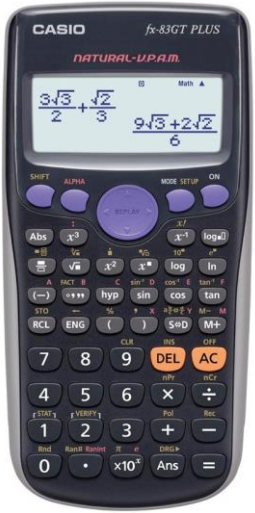
- **Percentage decrease:**

$$60\ decreased\ by\ 35\% = 60 \times 0.65 = 39, n(1 - x\%) = n\left(1 - \frac{x}{100}\right)$$

- **Percentage change:**

$$35\ to\ 60 = \frac{60 - 35}{35} \times 100 \approx 71.4\%, \frac{actual\ change}{original\ amount} \times 100$$

Number C1.13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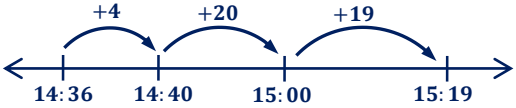
fx-83GT PLUS
NATURAL-V.P.A.M.
Math
SHIFT
ALPHA
MODE SETUP
ON
Abs
log
ln
hyp
sin
cos
tan
RCL
ENG
M+
DEL
AC
Ans

Number C1.14

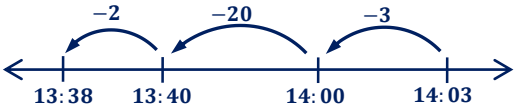
Station A	14:36
Station B	14:03
Station C	15:19

- How long does it take to get from Station A to Station C:



$4 + 20 + 19 = 43\ minutes$

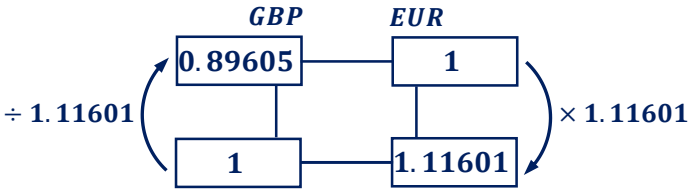
- When do you start walking if it takes 25 min to get to Station B:



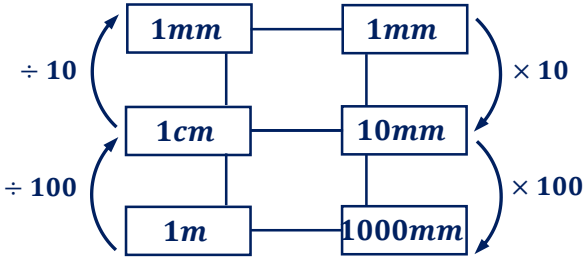
13:38

Number C1.15

- **Currency conversion:**



- **Unit conversion:**



Number C1.16

- **Simple interest:**

$\$60$ *at* 5% *interest p.a. for* 2 *years*:

$\textit{Interest}: 60 \times 0.05 \times 2 = 6, I = P \times R \times T$

$\textit{Total amount}: 60 + 60 \times 0.05 \times 2 = 66, A = P + I = P(1 + R \times T)$

- **Compound interest:**

$\$60$ *at* 5% *interest p.a. for* 2 *years*:

$\textit{Total amount}: 60(1 + 0.05)^2 = 60 \times 1.05^2 = 66.15, A = P(1 + x\%)^t$

$\textit{Interest}: 60 \times 1.05^2 - 60 = 6.15, I = P(1 + x\%)^t - P$