

Number

...or **NUMB**, for the correct order of operations, take care when using a calculator.

- Brackets
- Orders (or powers)
- Division and Multiplication
- Addition and Subtraction

Types of number

Integer: a 'whole' number
Factors: the divisors of an integer
• Factors of 12 are 1, 2, 3, 4, 6, 12
Multiples: a 'times table' for an integer (with infinite multiples)
• Multiples of 12 are 12, 24, 36, ...
Prime number: an integer which has exactly two factors (1 and the number itself). Note it is not a prime number.

Units

Highest Common Factor (HCF)
• Factors of 6 are 1, 2, 3, 6
Factors of 9 are 1, 3, 9
HCF of 6 and 9 is 3

Lowest Common Multiple (LCM)

• Multiples of 6 are 6, 12, 18, 24, ...
Multiples of 9 are 9, 18, 27, 36, ...
LCM of 6 and 9 is 18

Power notation

Write a number as a product of its prime factors, and follow for repeated factors.
• $120 = 2 \times 2 \times 2 \times 3 \times 5$

Indices and roots

Special indices for any value a
 $a^0 = 1$
 $a^{-1} = \frac{1}{a}$
 $a^{\frac{1}{2}} = \sqrt{a}$

Ordering with fractions

Adding or subtracting fractions, use a common denominator.
• $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$

Multiplying fractions

Multiplying fractions: multiply numerators and denominators.
• $\frac{1}{2} \times \frac{1}{3} = \frac{1 \times 1}{2 \times 3} = \frac{1}{6}$

Working fractions 'top' the second fraction

Working fractions 'top' the second fraction, then multiply.
• $\frac{1}{2} \div \frac{1}{3} = \frac{1}{2} \times \frac{3}{1} = \frac{3}{2}$

Problems involving

Problems involving a - denominator
• $\frac{1}{2} \div \frac{1}{3} = \frac{1}{2} \times \frac{3}{1} = \frac{3}{2}$
The given values change directly or inversely, depending where possible.
• $a \propto b \Rightarrow \frac{a}{b} = \frac{1}{2}$

Least of the most frequently used ones

100	10	1	0.1	0.01	0.001
100	10	1	0.1	0.01	0.001

Algebra

Look for the biggest square number factor of the coefficient.
• $100 = 10 \times 10 \times 1 \times 1$

Standard form

Standard form numbers are of the form: $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.

Scientific notation

1 square = 10000 kilograms
1 kilogram = 1000 grams
1 kilometre = 1000 metres
1 metre = 100 centimetres
= 1000 millimetres
1 centimetre = 10 millimetres

1 day = 24 hours
1 hour = 60 minutes = 3600 seconds
1 minute = 60 seconds

Converting

Transfer the number, then add or 'transfer' digits to moved up or down.
Decimal places: use the decimal point.
• 100.1001 = 100.1001

Significant figures

Significant figures: use the first non-zero digit.
• 100.1001 to 3sf: 100
• 10.1001 to 3sf: 10.1
• 1.01001 to 3sf: 1.01
• 0.101001 to 3sf: 0.101

Order notation

Find the range of numbers that will round to a given value.
• $a = 5.55$ (2 decimal places)
 $5.55 \leq a < 5.56$
• $a = 55$ (2 significant figures)
 $55 \leq a < 56$
Note use of \leq and $<$, and that the last significant figure is in 5.

Algebraic notation

$a^2 + a + 1$
 $2a + a + 1 = 3a + 1$
 $a^2 + a + 1 = a^2 + a + 1$
 $a^2 + a + 1 = a^2 + a + 1$
 $a^2 + a + 1 = a^2 + a + 1$
 $a^2 + a + 1 = a^2 + a + 1$

Equations and inequalities

An equation is true for some particular value of x
• $2x + 1 = 5$ is true for $x = 2$
• You can identify a value for every value of x
• $2x + 1 = 5$ is true for $x = 2$
• You can identify a value for every value of x

Order of notation

For any value a
 $a^2 + a^2 = 2a^2$
 $a^2 + a^2 = 2a^2$
 $a^2 + a^2 = 2a^2$
 $a^2 + a^2 = 2a^2$
 $a^2 + a^2 = 2a^2$

Algebraic notation

• $(\frac{1}{2})^2 = \frac{1}{4}$ or $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Geometry & measures



Area and volume

Equation of straight line $y = mx + c$ or $y = mx$ as in the gradient, c is the y -intercept.
• Find the equation of the line that joins (0, 2) to (2, 1).
Find the gradient.
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 2}{2 - 0} = -\frac{1}{2}$
• Find the y -intercept.
From the line $y = mx + c$, $2 = -\frac{1}{2} \times 0 + c$
Equation is $y = -\frac{1}{2}x + 2$

Pythagoras' Theorem

Pythagoras' Theorem: In a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
 $a^2 + b^2 = c^2$
Special values of a , b , c are: 3, 4, 5; 5, 12, 13; 7, 24, 25; 8, 15, 17; 9, 40, 41; 10, 24, 26; 11, 60, 61; 12, 35, 37; 13, 84, 85; 14, 48, 50; 15, 20, 25; 16, 63, 65; 17, 144, 145; 18, 80, 82; 19, 180, 181; 20, 99, 101; 21, 220, 221; 22, 165, 167; 23, 276, 277; 24, 100, 104; 25, 252, 253; 26, 169, 173; 27, 296, 297; 28, 196, 200; 29, 400, 401; 30, 441, 445; 31, 462, 463; 32, 505, 509; 33, 528, 531; 34, 578, 582; 35, 609, 613; 36, 636, 640; 37, 672, 675; 38, 714, 718; 39, 744, 747; 40, 781, 785; 41, 812, 815; 42, 840, 845; 43, 873, 877; 44, 904, 908; 45, 936, 939; 46, 969, 971; 47, 1002, 1005; 48, 1036, 1040; 49, 1071, 1075; 50, 1106, 1110; 51, 1142, 1147; 52, 1179, 1185; 53, 1216, 1223; 54, 1254, 1261; 55, 1292, 1299; 56, 1331, 1339; 57, 1370, 1379; 58, 1410, 1419; 59, 1450, 1460; 60, 1491, 1501; 61, 1532, 1543; 62, 1574, 1585; 63, 1616, 1627; 64, 1659, 1671; 65, 1702, 1715; 66, 1746, 1759; 67, 1790, 1803; 68, 1835, 1849; 69, 1880, 1897; 70, 1926, 1935; 71, 1972, 1981; 72, 2019, 2029; 73, 2066, 2077; 74, 2114, 2125; 75, 2162, 2173; 76, 2210, 2221; 77, 2259, 2271; 78, 2308, 2321; 79, 2358, 2371; 80, 2408, 2421; 81, 2459, 2473; 82, 2510, 2525; 83, 2562, 2577; 84, 2614, 2629; 85, 2666, 2681; 86, 2719, 2731; 87, 2772, 2785; 88, 2826, 2839; 89, 2880, 2893; 90, 2934, 2947; 91, 2989, 2999; 92, 3044, 3055; 93, 3099, 3111; 94, 3154, 3167; 95, 3210, 3223; 96, 3266, 3279; 97, 3322, 3335; 98, 3379, 3393; 99, 3436, 3451; 100, 3494, 3509.

Area and volume

Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$
Volume of cuboid = $\text{length} \times \text{width} \times \text{height}$
Area of trapezium = $\frac{1}{2} (a + b) \times h$
Volume of cylinder = $\pi r^2 \times \text{height}$
Area of circle = πr^2
Volume of sphere = $\frac{4}{3} \pi r^3$
Area of sector = $\frac{\theta}{360} \times \pi r^2$
Volume of cone = $\frac{1}{3} \pi r^2 \times \text{height}$
Area of annulus = $\pi (R^2 - r^2)$
Volume of frustum = $\frac{1}{3} \pi (R^2 + Rr + r^2) \times \text{height}$
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Pixl Maths Paper June 2014

Judd E. Hollander



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