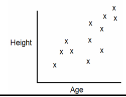
Number

Estimations and approximations	Round to one significant figure and estimate. Find the answers to the ones on the right.	98 x 51.2 becomes 100 x 50 4.6 + 104.7 becomes 5+100
Factors of a number	These are all the numbers that go into another without a remainder	Factors of 8: 1,2,4,8
Product of prime factors	Think factor tree! Keep dividing by the lowest possible prime number until you can't divide any longer.	24 = 2 x 2 x 2 x 3 27 = 3 x 3 x 3 42 = 2 x 3 x 7
HCF (Highest Common Factor)	The largest number that goes into 2 different numbers. List the factors of the smaller number and see which is the largest one which will go into the 2nd number.	"Find the HCF of 8 and 28" Factors of 8 = 1,2,4 and 8 Factors of 28 = 1,2,4,7,14 and 28 Largest number in both = 4
LCM (Lowest Common Multiple)	The lowest number 2 different numbers will both go in to. Just list out the times tables of each and see which is the smallest number that appears in both lists.	LCM of 4 and 6 4TTs = 4,8,**12**,16,20,24,28 6TTs = 6,**12**,18,24,30,36 first number they both go in to = 12 = LCM
Simplify Fractions	Can you cancel the fraction? Look for common factors. Can you divide the numerator and the denominator by 2,3,4 etc	2/10 =1 /5 as you can divide top and bottom by 2. 7/21 =1/3 as both numerator and denominator divide by 7
Finding a fraction of a quantity	Divide by the bottom, times by the top. If you need 3/8 of a number, divide by 8 and then multiply by 3.	2/5 of £60 £60 ÷ 5 = £12 2 x 12 = £24
Ordering fractions	Get a common denominator and find equivalent fractions. At this point see which has the largest numerator when you list them out. 9 times out of 10 the denominator you want is in the question!	1/2, 2/3, 5/6 and 7/12 All of these can be made into 12th s. 6/12, 8/12, 10/12 and 7/12. Now just put them in order of size. Make sure you answer using the original values.
Adding Fractions	The denominators must be the same. When they are just add the numerators. You can use equivalent fractions to find the common denominator.	1/3 + 1/4 = 4/12 + 3/12 = 7/12 1/5+ 2/3= 3/15 + 10/15 =13/15
Subtracting Fractions	The denominators must be the same (as with addition). When it is just subtract the numerators.	4/7 - ½ = 8/14 - 7/14 = 1/14 1/3 -1/5 = 5/15 – 3/15 = 2/15
Multiplying Fractions	Multiply the numerators multiply the denominators and simplify if possible. Top times top, bottom times bottom.	2/7 x 3/5 = 6/35 4/5 x 3/4 = 12/20 or 3/5
Dividing fractions	TNT, turn and times. Turn the second fraction upside-down and multiply as shown in the method above for multiplying.	1/4 ÷ 3/5 is the same as 1/4 x 5/3 Now just use the method above and simplify.
Writing a number as a % of another	Non calculator: make the fraction out of 100. % means out of 100	12/20 = 60/100 = 60% (Multiply both by 5)
Finding 10%,5%,1% of a quantity	To find 10% just divide the original number by 10, to find 1% divide it by 10 again. 5% is half of 10%	£36 10% = £3.60 5% = £1.80 and 1% = £0.36 or 36p
Increase/decrease a number by a %	Find the % required and add it on (increase) or take it off (decrease)	Increase £30 by 10% 10% = £3 so 30+3 = £33
Fractions to decimals	Some are obvious such as ¾ is 0.75 For those that are not simply divide the numerator by the denominator.	Some others to note: 1/8 = 0.125 3/10 = 0.3 7/100 = 0.07 43/100 = 0.43
Decimals to fractions	Some are obvious 0.1 = 1/10 If not obvious write it over 10, 100 or 1000 and simplify.	0.7 = 7/10 0.23 = 23/100 0.46 = 46/100 or 23/50
Percent to decimals	Simply divide by 100 and vice versa when converting decimals to percents.	0.23 x 100 = 23% 47% ÷ 100 – 0.47
Fractions to percentages	Percentage is just a fraction out of 100	2/25 multiply by 4 = 8/100 or 8%
Multiplying decimals	Count the total digits after the decimal place. Get rid of the decimals and multiply the two numbers. However many digits you started with after the decimals is the number you finish with.	0.4 x 0.2 (2 digits after the decimals in total) 4 x 2 = 8 so my answer is 0.08 as I need to finish with 2 digits after the decimals. 0.3 x 0.15 = 0.045
Ratio	Simplify them like fractions	A ratio of 5:10 is = 1:2
Ratio Sharing	Add the total parts. A ratio of 4:2:1 has 7 parts (not 3) Divide the amount to be shared Multiply by each part (making sure you use the correct units (£s here))	£60 in a 3:2:1 ratio 6 total parts so £60 divided by 6 = £10. Each part is worth £10 3 x £10 = £30 2 x £10 = £20 1 x £10 = £10
Proportion	Find out the value of one item and then multiply it by the number you need.	3 cakes need 450g of sugar. Find how much sugar 5 cakes needs. 450 ÷ 3 = 150g per cake. Now multiply this by 5 to give 750g needed for 5 cakes.
Unitary measures (Best Buys)	Divide the price by the quantity to compare 2 or more items. The lowest value is the better buy	£1.20 for 300ml of cola Or £1.50 for 400ml of cola? 120/300 = 0.4 150/400 = 0.375 The 2nd one is better value

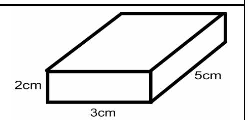
Algebra

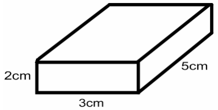
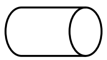
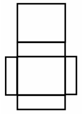
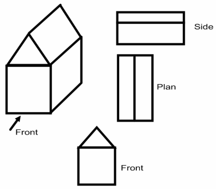
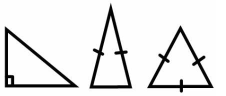
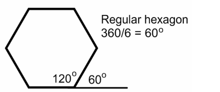
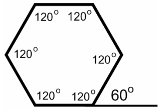
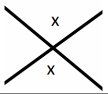
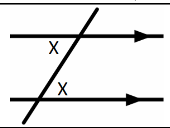
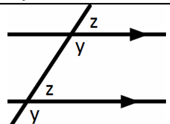
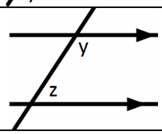
Topic/Skill	Tips	Example
Simplifying expressions	Just collect the 'like terms' such as all the x's, all the y's and any numbers.	2x + 3y – 3 –y + 2x + 9 becomes 4x + 2y + 6
x times x	The answer is x^2 and not 2x	
p + p + p	This 3p not p^3	
m x m x m	This is m^3 and not 3m	
Powers	When multiplying numbers with powers you just add the powers. When dividing you subtract to powers. Careful with 'p' when here is no power (the power is 1)	$p^5 \times p^3 = p^8$ $p^7 \div p^4 = p^3$
Solving equations	When there is an unknown on one side simply undo the equation be using the inverse operations. If one side has +2 you need to subtract it. Id it had -3 add it.	3x -2 = 13 (add 2 to 13) 3x = 15 (divide by 3) x = 5 **OR** 4x + 3 = 19 (minus 3 from 19) 4x = 16 (divide by 4) x = 4
Equations	x/2 = 4 etc just multiply 4 by 2 so x = 8	p/5 = 6 then p = 5x6 so p = 30
Equations with an unknown on both sides	Get the x's on one side and the numbers on the other. Use either the balance method or change sides change signs.	2x – 1 = x + 4 take an x off both sides x – 1 = 4 add 1 to both sides x = 5
Factoring	HCF of letters and numbers outside, the rest inside. Expand to check if its right when you finish.	6x – 3 becomes 3(2x-1) 15x + 10 becomes 5(x+2) $4x^2$ - 6x becomes 2x(2x-3)
Expanding	Single brackets – multiply everything on the outside by the inside – careful with negative signs!	5(3x+2) 15x+10 **OR** 2x(3x-4) $6x^2$ - 8x
Expanding double brackets *(not in all foundation GCSEs)*	(x+3)(x+2) Multiply each term by one another using F.O.I.L and then simplify. First, Outer, Inner, Last (Be careful with negatives)	(x+2)(x+3) x times x = $\mathbf{x^2}$ 2 times x is **2x**, 3 times x is **3x** and finally 2 times 3 = **6** Now simplify by collecting up: x^2 + 5x + 6
Inequalities	2 < x "x is bigger than 2" so 3,4, etc x < 3 "x is less than 3" so 2,1,0, -1 etc x ≤ 5 "x is 5 or less" so 5,4,2,,0,-1 etc 4 ≤ x "x is 4 or more" so 4,6,10 etc	You may have to show these on a number line. If so use an open dot ○ for < and a closed dot ● for ≤
Sequences	Look out for (i) A common difference (is it going up or down by 2 or 3 each time?) (ii) Square numbers 1,4,9,16,25… (iii) Cube numbers 1,8,27,64…	Rules such as "Add 2 each time" or "Square numbers" If asked for the 'nth term sequence' use the method below.
nth term formula of a sequence	Find the difference. Multiply that by n and see what you need to add to find t The example is going up by 4 each time. 4 x 1 = 4 so we need to subtract 1 to get 3. the nth term is 4n -1	3,7,11,15 n 1 2 3 4 t 3 7 11 15
Formulae	If you get a formula solve it like an equation. Just put the information into the formula to find the missing value. The example to the right could have x = 4 so C = 3(4) + 5 which is £17	"bob charges £3 per window and a £5 call out charge" C = 3x + 5 with x being the number of windows cleaned and C being the cost.
Substituting into a formulae	Just follow the rules and put the numbers in. Be careful on the order if x = 3 and you need $2x^2$ square 3 first and then multiply by 2	a = 3, b = 2 and c = 5 Find: (i)2a which is just 2(3) = 6 (ii) 3a – 2b so 3(3) – 2(2) = 5 (iii) b^2 - 5 which is $(2)^2$ - 5 = -1
Plotting straight line graphs	Just fill out the table using substitution as above y = 2x + 1 x 0 1 2 3 y Complete the table in the exam with the information from the box on the right.	When x = 0 y = 2(0) + 1 = 1 When x = 1 y = 2(1) + 1 = 3 When x = 2 y = 2(2) + 1 = 5 When x = 3 y = 2(3) + 1 = 7 Now just plot (0,1) (1,3) (2,5) and (3,7) and draw a straight line through the points.
Midpoint of a line	Add the x coordinates and divide by 2, add the y coordinates and divide by 2	Find the midpoint of a line through 1,2 and 5,8 (1+5)/2, (2+8)/2 = 3,5

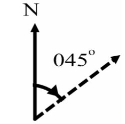
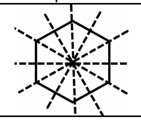
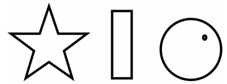
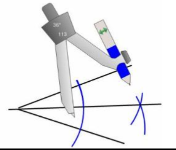
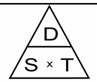
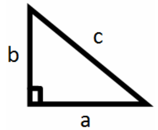
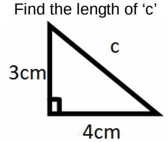
Statistics/Handling Data

Topic/Skill	Tips	Example
Tally Chart	Use them to count up items in a data set before putting into a frequency table	
Mean (simple average)	Add the values up, divide by how many values there are. Find the mean of 3,4,7,6,4,6	$\frac{3+4+7+6+4+6}{6} = 5$
Median	Middle number. Put them in order and find the middle one. If there are two find half way between the two numbers.	4,5,2,3,6,7,6 in order 2,3,4,5,6,6,7 Median = 5
Mode or Modal	The number that appear most times in a list (there can be more than one mode)	4,5,2,3,6,4,7,8,4,5 Mode = 4
Range	Highest take lowest. Find the smallest value and subtract it from the largest.	3,15,26,37,97 range = 94
Pie Charts	A pie chart is a circle which means there are 360°. Look out for right angles as they show ¼ of the data.	If there are 40 people in a survey then each person will be worth 9° of the pie chart as 360/40 = 9
Simple Probability (Theoretical)	The number of things you want to happen divided by the number of things that could happen. 1 Head on a coin, two sides so the probability of head = ½	Probability of rolling a 4 on a fair 6 sided die is 1/6 There is one 4 and 6 different things it can be
Relative frequency	Just multiply the probability by the number of trials. It's often called experimental probability.	The probability a football team wins a game is 1/5. How many games will they win out of 40? 1/5 x 40 = 8
Scatter Graphs or diagrams	These show two sets of data plotted against each other. Maths test score and Science test score might be an example	
Correlation	From a scatter graph you may have to comment on the correlation. Positive = one goes up as the other does. Negative = one goes down as the other goes up. No correlation = no relationship between the data	Positive: Ice Cream sales and temperature Negative: Hot Chocolate sales and temperature No: Favourite football team and hair colour.
Line of best fit	Draw this on the scatter graph with roughly the same number of points either side to show the correlation.	
Stem and Leaf diagrams	Arrange the data in ascending order (smallest to largest). Pick a stem, usually 10's, and then add the leaves in order of size. Include a key! For example 3|4 = 34 Example 9,12,13,13,18,23,27,34	0|9 1|2,3,3,8 2|3,7 3|4 Key 1|8 = 18 (3 appears twice!)
Two way tables	These show two pieces of information in one table. An example might be gender and eye colour. Usually you will have to find missing information	Blue Brown Boys Girls
Questionnaires	How many times do you visit the cinema on average per month? 0 □ 1-2 □ 3-4 □ 5 or more □	Features: (i) Include other and none (ii) Time frame (iii) no overlapping answers (iv) not subjective

Shape, Space and Measures – Check in the front of the exam for formulae!

Topic/Skill	Tips	Example
Area of rectangle	Multiply the two side lengths. Answer should be cm^2, m^2 etc etc	Area is the space trapped inside a shape
Perimeter (rectangle)	Add ALL side lengths and the answer should be cm, m,km etc and NOT cm^2	"walk around the outside of the shape"
Area of a triangle	Multiply the base by the height and half your answer. Answer in cm^2, m^2 etc etc	
Circles	Area = πr^2 (answers in cm^2 etc) Circumference = $2\pi r$ (cm, mm etc)	Area = space inside Circumference = distance around the outside. r = radius Note: r^2 is just r x r
Volume of a cuboid	Length x width x height. Your answer will be cm^3,m^3,km^3 etc…anything 'cubed' In this example it would be 2 x 3 x 5 = 30cm^3 Volume is always 'cubed'	

Surface area of a cuboid	Find the area of each panel and add them. Drawing a net may help OR you can see there will be 3 different size panels. Find the area of each one and add two lots of each together. Area is always 'squared'	
Volume of a cylinder	Find the area of the circle on the end and multiply it by the height of the cylinder. Answer will be in something cubed such as cm^3	
Sketching the net of a cuboid	Just think what the box would look like if you unfolded it – don't forget the lid. Your dimensions should be accurate. This should only ever be a 2D drawing.	
Solids	Faces = think faces of dice, edges = side lengths & vertices = corners	A Cube has 6 faces, 8 vertices and 12 edges
Angles in a polygons	Angles in triangles = 180° angles in quadrilaterals = 360°	Quadrilateral is a 4 sided shape (square rectangle etc)
Angle facts	On a straight line = 180° and angles around a point = 360°	
Angle Types	Acute, less than 90°, Obtuse, 90° to 180° & Reflex angles greater than 180°	
Plans and Elevation	Plan View is from the top (birds eye view) Side and Front elevations will be stated. All drawings must be 2D and not 3D. Shown to the right is the 3d drawing with an arrow pointing to the front elevation. The top right is the side elevation. The middle is the plan view and the bottom is the front view. Use a ruler and pencil and make sure you use the correct measurements.	
Types of triangles	Right Angle Triangles have a 90° angle. Isosceles triangles have 2 equal sides and 2 equal base angle Equilateral triangles have 3 equal sides and 3 equal angles (60° each).	
Exterior angles of a regular polygon	For <u>regular</u> polygons divide 360 by the number of sides. The picture shows a regular hexagon which has 6 sides. 360/6 = 60 which means the exterior angle is 60°	
Interior angles of regular a polygon	Find the exterior, draw a straight line and subtract the exterior angle from 180°. For the sum just add the interior angles. Pictured to the right is a regular Hexagon. Each interior angle is 120° (we know the exterior angle is 60° from above)	
Opposite angles	Opposite angles are equal. x = x Remember also that angles on a straight line = 180°	
Alternate angles	Alternate angles or Z angles are equal. (You must use alternate angles in the exam!)	
Correspon ding Angles	Corresponding angles or F angles are also the same y = y and z = z (y and z are not equal though). (You must use corresponding angles in the exam!)	
Co-interior Angles	Co-interior angles of C angles = 180° y + z = 180° (You must use co-interior angles in the exam!)	
Bearings	3 rules = (i) Measure from North (ii) Measure clockwise (iii) Your answer must have 3 digits When finding the bearing of B from A	Angle of 45° = bearing of 045°

	we measure from A. Draw your north line at A. Draw a line from A to B and measure clockwise from A to B.	
Translating a shape	Translate means to move the shape. Top number left/right, right = + & left = - Bottom number up/down, up = + down = - Check the scale of the axis on the exam paper!	$\begin{pmatrix}2\\3\end{pmatrix}$ $\begin{pmatrix}-5\\-3\end{pmatrix}$ $\begin{pmatrix}1\\-4\end{pmatrix}$ $\begin{pmatrix}-6\\2\end{pmatrix}$ You may be asked to state fully a transformation. So in these cases " A translation by (2,3) is fine for example
Rotations of shapes	State (i) Direction (ii) Angle and (iii) centre of rotations.	Clockwise, 45° about (0,1) USE THE TRACING PAPER!
Reflections	Learn the lines x = 1 y = 3 and so on. Use a mirror if you are unsure	Describe the transformation fully i.e. "reflected in line x=2"
Enlargeme nts of shapes	You will be given a scale factor and centre.	Just make the side lengths twice as big if the scale factor is 2 for example.
Line Symmetry	How many mirror lines can you draw on the shape? A Regular Hexagon for example has 6 lines of symmetry. Be careful with patterns within shapes!	
Rotational Symmetry	How many times does the shape fit back on itself when you turn it 360°? Be careful with patterns as they will influence the order of symmetry. (See the last example). Use tracing paper if you need!	 Order 5 Order 2 Order 1
Bisecting an angle and loci.	Use a compass and keep it set in one position throughout the bisection. Bisecting an angle is shown to the right. You MUST leave your construction lines. Bisect means 'cut in half' Loci are the set of fixed points and will often include drawing a circle.	
Metric units	Mm,cm,meters and km = length Grams, kg and tonnes = mass/weight ml,cl and litres = volume	Mans height around 1.8-2m Adults weight 70kg Glass of coke is about 250ml
Imperial units	Feet and inches = length/height Lbs and ounces = mass/weight Pints and fluid ounces = volume	Mans height around 6ft Adults weight is around 200lb Glass of coke is a half pint
Speed distance time	Speed = distance ÷ time (divided) Distance = speed x time Time = distance ÷ speed (divided) USE THE CORRECT UNITS!	
Reading scales	Check the units and check the amount the scale is increasing by each time.	Speed dials, weighing scales and thermometers etc
Pythagoras Theorem for Right Angle Triangles	 $a^2 + b^2 = c^2$ a and b are the 2 shorter sides and c is the hypotenuse (longest side) Square the 2 shorter sides, add them and square root the answer. Check the question wants the hypotenuse!	Find the length of 'c'  **a = 4, b = 3 c = ?** $a^2 + b^2 = c^2$ $4^2 + 3^2 = c^2$ $16 + 9 = c^2$ $25 = c^2$ 5cm = c

Support networks

Email: steve@m4ths.com

Websites: www.m4ths.com **&** www.youtube.com/user/maths247

Tips

(1) You must show workings. It's possible to fail the paper and get everything right if you only write answers. Show all workings.
(2) Check how many marks the question is worth. If it's a 1 mark question, simply write an answer and move on.
(3) State the units. cm, m², £ and so on unless it's written for you.
(4) Check your answer is sensible. 169 x 11 could never be 532 for example.
(5) Learn how to use a calculator. The Casio is the easiest to use.

Name________________________________ Target Grade_____

All about the

C

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Please note: This help sheets lacks mathematical rigour in favour of accessibility and should not be used as a base of knowledge

Number

<table>
<tr><th>Topic/Skill</th><th>Tips</th><th>Example</th></tr>
<tr><td>Non Calculator Multiplication</td><td colspan="2">Use the grid method to find 231 x 49.
Multiply each number in the left column by each number on the top row and fill out the boxes.
<table>
<tr><td>x</td><td>200</td><td>30</td><td>1</td></tr>
<tr><td>40</td><td>8000</td><td>1200</td><td>40</td></tr>
<tr><td>9</td><td>1800</td><td>270</td><td>9</td></tr>
</table>
Now add the 6 numbers (8000,1800,1200,270,40 and 9) using column addition.</td></tr>
<tr><td>Non Calculator Division</td><td>Use short division 25/4
The 4 goes on the outside and 25 on the inside.
Ask yourself "How many times does 4 go into 2? The answer</td><td>06.25
4 | 25.000</td></tr>
<tr><td>Place Value</td><td>Remember the HTU chart?
Hundreds, tens and units..</td><td>State the value of 4 in the number 34210
4 is in the thousands column so the value is 4000.</td></tr>
<tr><td>A square number</td><td>A number multiplied by itself – NOT 2 times a number.
1,4,9,16,25,36…..</td><td>3^2 = 3 x 3 = 9 (and NOT 6)
5^2 = 5 x 5 = 25 (NOT 10)</td></tr>
<tr><td>Square root</td><td>This is the reverse of squaring a number.</td><td>6^2 = 36 so $\sqrt{36}$ = 6
9^2 = 81 so $\sqrt{81}$ = 9</td></tr>
<tr><td>A cube number</td><td>A number multiplied by itself twice (The cube root is the inverse).</td><td>4^3= 4x4x4 = 64 (NOT 12) …….2^3 = 8 (NOT 6)</td></tr>
<tr><td>BODMAS (order of operations)</td><td>Brackets first, then powers.
Multiplication or division
THEN finally any addition or subtraction left to do.</td><td>3 + 4 x 2 = 11 (do the multiplication first)
Another one 3 + $(4+1)^2$
Brackets first $(5)^2$ = 25 and then add 3 = 28</td></tr>
<tr><td>Integer</td><td>Whole number</td><td>1,4 & 2 are integers ½ is not</td></tr>
<tr><td>Reciprocal</td><td>The reciprocal is 1/the number</td><td>The reciprocal of 5 is 1/5</td></tr>
<tr><td>Rounding to 1 DP</td><td>If the number after the decimal place is 5 or more, round up. If 4 or less keep the value the same.</td><td>2.43 = 2.4 (3 is less than 5)
5.67 = 5.7 (7 is more than 5)
1.09 = 1.1 (9 is more than 5)</td></tr>
<tr><td>Rounding to 1 SF</td><td>When reading a number from left to right the 1st value that is not 0 is the 1st significant figure. Round like decimals.</td><td>243 to 1 SF = 200
5.6 to 1 SF = 6
47 to 1 SF = 50</td></tr>
<tr><td>Multiplying and dividing negative numbers</td><td>If the signs are the same the answer is positive, if they are different the answer is negative.</td><td>-2 x 4 = -8
-3 x -5 = 15
3 ÷ -3 = -1
-16 ÷ -4 = 4</td></tr>
<tr><td>Adding and subtracting negative numbers</td><td>If the signs between the numbers are the same then add, if not subtract.</td><td>2 – 4 = -2
3 - - 5 = 8
-2 + - 5 = -7
-4 - - 5 = 1</td></tr>
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