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		File type: <input type="text"/>		Author's choice? (my favourite resources) <input type="checkbox"/>
				(↑ Latest: 29/08/16↑)
				** = Author's choice

Topic Number	Resource	Link	File	Type	Description	Level	Updated	ID
	Digit Order	http://www.thechalkface.net/resources/digit_order.xls	xls	Activity	A simple tool for understanding place value. Four random digits (from 0 to 9) are generated, and you have to rearrange them to make either the largest or smallest possible number.	KS3	11/09/12	1
Number	Number Pyramids 1	http://www.thechalkface.net/resources/number_pyramids.ppt	ppt	Presentation	Each block is the sum of the two blocks directly below it. The presentation includes some missing block problems.	KS3	25/05/10	2
Number	Number Pyramids 2	http://www.thechalkface.net/resources/number_pyramids.xls	xls	Spreadsheet	To accompany the Number Pyramids presentation, this spreadsheet gives the opportunity to investigate rearranging the numbers on the bottom row for different totals at the top.	KS3	28/05/10	3
Number	BODMAS Bank Robbery	http://www.thechalkface.net/resources/bank_robbery.ppt	ppt	Presentation	Two scenarios underlining the importance of performing calculations in the right order.	KS3	23/01/10	4
Number	BODMAS video**	http://www.thechalkface.net/videos/bodmas.wmv	wmv	Video	An all-singing all-dancing presentation of the mathematical convention of priority of brackets, orders, division, multiplication, addition and subtraction.	Other	02/03/09	5
Number	Powers of 10	http://www.thechalkface.net/resources/powers_of_10.ppt	ppt	Presentation	A PowerPoint version of the superb progression from outer galaxies to inner atoms taken from Magnet Lab at micro.magnet.fsu.edu	KS3	24/02/10	6
Number	Powers of 10 PRET**	http://www.thechalkface.net/resources/Powers_of_10_PRET.pdf	pdf	Homework	Based on the Practice/Recall/Extend/Think format, this homework activity involves research, literacy, memory, skills and stretch sections, enabling self differentiation. Involves multiplying and dividing by 10, 100, 0.1, 0.01, etc. Extension looks at numbers written as powers of 10. Includes solutions.	KS3	30/09/14	7
Number	Countdown	http://www.thechalkface.net/resources/countdown.xls	xls	Game	This is the numbers game from Countdown, the TV show. Shuffle the cards, choose between 0 and 4 of the large numbers, and make up to 6 in total from small numbers. Set the timer (customisable), generate your target number and off you go.	KS3	22/02/12	8
Number	Very Strange Game	http://www.thechalkface.net/resources/very_strange_game.xls	xls	Game	This is basically a random number generator with certain rules for participants to comply with. Fold your arms if it's a multiple of 4, stand up if it's a prime, etc.	KS3	07/05/09	9
Number	LCD Digits	http://www.thechalkface.net/resources/digits.xls	xls	Spreadsheet	The LCD display on a calculator shows numbers using combinations of 7 different sections. Which of these is used the most? Which the least? Includes clock.	KS3	31/05/10	10
Number	Letterworth	http://www.thechalkface.net/resources/letterworth.xls	xls	Problem	If letters are assigned values according to where they are in the alphabet, and words are the sum of their letter values, can you find any words that score 50?	KS3	08/04/10	11
Number	Times Table Drill**	http://www.thechalkface.net/resources/times_table_drill.xls	xls	Spreadsheet	Gives a 5 by 5 table of multiplication questions which may be copied down and completed. Answers may be revealed by clicking the button.	KS3	07/09/11	12
Number	Tables Generator	http://www.thechalkface.net/resources/tables_generator.xls	xls	Spreadsheet	Automatically generates times table questions based on the user's input (specify either a range or specific numbers to focus on). Choose the number of questions, show or hide answers, and generate print-out or on-screen test pages.	KS3	11/02/12	13
Number	Sainsburys Pricing	http://www.thechalkface.net/resources/Sainsburys.ppt	ppt	Problem	A proportionality problem based on an odd 'special offer' at Sainsburys.	KS3	21/06/11	14
Number	Grid Multiplication	http://www.thechalkface.net/resources/grid_multiplication.xls	xls	Spreadsheet	Calculates the product of two 2-digit or 3-digit numbers, giving the results of each step sequentially using the grid method.	KS3	11/02/10	15
Number	Negative Drill	http://www.thechalkface.net/resources/negative_drill.xls	xls	Spreadsheet	Asks a variety of types of questions with negative numbers, gradually getting harder, keeping track of your score and throwing up more of the type of questions you struggle with.	KS3	08/09/11	16
Number	Negative Temperature	http://www.thechalkface.net/resources/negative_temperature.pdf	pdf	Worksheet	Max and min January temperatures are shown for a variety of cities. Students must fill in the missing values for either max, min or range of temperatures (also illustrated as a chart). As an extension, students may guess which city is represented by which temperature.	KS3	25/09/12	17
Number	Negatives PRET**	http://www.thechalkface.net/resources/Negatives_PRET.pdf	pdf	Homework	Based on the Practice/Recall/Extend/Think format, this homework activity involves research, literacy, memory, skills and stretch sections, enabling self differentiation. Involves adding and subtracting negative numbers. Extension section begins to look at multiplying with negatives. Includes solutions.	KS3	30/09/14	18
Number	Fractions Intro	http://www.thechalkface.net/resources/fractions_intro.ppt	ppt	Presentation	Introduction to fractions by asking the question "how can you share 3 pizzas between 4 people?" Includes some examples of different ways of writing fractions.	KS3	16/10/12	19
Number	Displaying Fractions	http://www.thechalkface.net/resources/displaying_fractions.ppt	ppt	Presentation	A variety of images showing the wide scope of meaning attached to the concept of a fraction.	KS3	20/11/08	20
Number	Ordering Fractions	http://www.thechalkface.net/resources/ordering_fractions.xls	xls	Interactive demonstration	Examples, with working, for how to compare the size of two fractions, how to add fractions and how to convert between improper and mixed number forms. The values of the fractions may be altered, and steps can be advanced one by one using the spinner.	KS3	24/11/12	21
Number	Adding Fractions	http://www.thechalkface.net/resources/adding_fractions.ppt	ppt	Presentation	Uses elephants and giraffes to explain why fractions must have the same 'name' (denominator) in order to be added.	KS3	28/05/10	22
Number	Adding Fractions How To**	http://www.thechalkface.net/resources/Adding_Fractions_How_To.pdf	pdf	Fact Cards	A thorough explanation ideal for consolidating early work on adding fractions. Emphasizes the key requirement (a common denominator) and gives examples.	KS3	11/11/14	23

Number	Adding Mixed Numbers	http://www.thechalkface.net/resources/adding_mixed_numbers.pdf	pdf	Worksheet	Includes notes and examples for two different methods for adding fractions in mixed number form. Full solutions included.	KS3	25/05/15	24
Number	Equivalent Fractions PRET**	http://www.thechalkface.net/resources/equivalent_fractions_pret.pdf	pdf	Homework	Based on the Practice/Recall/Extend/Think format, this homework activity involves research, literacy, memory, skills and stretch sections, enabling self differentiation. Involves converting fractions to equivalent fractions with a given numerator or denominator, and some simplifying of fractions. Includes solutions.	KS3	27/10/14	25
Number	Adding Fractions PRET**	http://www.thechalkface.net/resources/adding_fractions_pret.pdf	pdf	Homework	Based on the Practice/Recall/Extend/Think format, this homework activity involves research, literacy, memory, skills and stretch sections, enabling self differentiation. Involves adding and subtracting fractions. Includes solutions.	KS3	27/10/14	26
Number	Fractions of Amounts	http://www.thechalkface.net/resources/fractions_of_amounts.ppt	ppt	Presentation	Introducing the idea of finding a fraction of a given quantity.	KS3	26/11/08	27
Number	Fractions of Amounts	http://www.thechalkface.net/resources/fractions_of_amounts.xls	xls	Spreadsheet	This generates as many questions as desired, with the option to specify whole number answers, on fractions of amounts.	KS3	08/06/11	28
Number	Percentages of Amounts PRET**	http://www.thechalkface.net/resources/percentages_of_amounts_pret.pdf	pdf	Homework	Based on the Practice/Recall/Extend/Think format, this homework activity involves research, literacy, memory, skills and stretch sections, enabling self differentiation. Involves finding simple percentages of amounts by converting to fractions, extending towards combining simple percentages. Includes solutions.	KS3	27/10/14	29
Number	Fractions of Amounts Dice Bingo	http://www.thechalkface.net/resources/fractions_dice_bingo.xls	xls	Activity	Rolling a pair of dice gives a numerator and denominator. Finding this fraction of 60 gives a number from the selection for a bingo-style game.	KS3	16/06/09	30
Number	Multiplying Fractions PRET**	http://www.thechalkface.net/resources/Multiplying_Fractions_PRET.pdf	pdf	Homework	Based on the Practice/Recall/Extend/Think format, this homework activity involves research, literacy, memory, skills and stretch sections, enabling self differentiation. Involves multiplying fractions (non mixed numbers) including pre-simplifying. Includes solutions.	KS3	30/09/14	31
Number	Introducing Percentages	http://www.thechalkface.net/resources/introducing_percentages.ppt	ppt	Presentation	Starting with a 'guess the topic' combination of things with 'cent' in them, this introduces the idea of percentages as fractions of 100.	KS3	28/05/10	32
Number	Percentages	http://www.thechalkface.net/resources/percentages.ppt	ppt	Presentation	An introduction to the concept of % using picture clues, followed by questions converting between simple fractions and percentages. Includes chunking introduction, and different methods for calculating a percentage of an amount. Also includes 2 methods and a bunch of questions on percentage change (increase and decrease).	KS3	24/11/12	33
Number	Recurring Decimals Investigation	http://www.thechalkface.net/resources/Recurring_Decimal_Investigation.pdf	pdf	Investigation	Designed to work as an independent investigation, students use a calculator to find the recurring decimal representation of different twelfths. The worksheet also requires students to simplify fractions to determine why some (such as 6/12) give a terminating decimal.	GCSE	16/02/15	34
Number	Useful Percentages	http://www.thechalkface.net/resources/useful_percentages.pdf	pdf	Fact Cards	A6 sized cards containing 8 of the more common/useful percentages, their decimal and fraction equivalents and a description of the calculation they represent (eg divide by 10 then double).	KS3	27/10/14	35
Number	Percentage Change How To	http://www.thechalkface.net/resources/Percentage_Change_How_To.pdf	pdf	Fact Cards	Examples and method for calculating percentage change (increase, decrease, reverse increase or decrease). A simple explanation of the method followed by three examples. Designed for printing on A5.	GCSE	11/11/14	36
Number	Percentage Calculations**	http://www.thechalkface.net/videos/percentage_calculations.xls	xls	Spreadsheet	Generates a random FDP equivalence test, random percentage of amounts questions, and random percentage increase and decrease questions, including solutions. Includes macros.	KS3	08/02/14	37
Number	Percentage Change**	http://www.thechalkface.net/resources/percentage_change.pdf	pdf	Worksheet	Developing the concept of percentage increase, decrease and reverse percentage increase or decrease through using a multiplier. Includes a table to fill in the blanks, and some interpreting of worded questions.	GCSE	27/10/14	38
Number	Percentages Homework**	http://www.thechalkface.net/resources/percentages_homework.xls	xls	Homework	A computer-based homework. Students need to answer questions on percentages of amounts, percentage change (increase and decrease) and reverse percentage change. Also includes some compound interest questions. Work is automatically marked so students can retry questions they get wrong, and submit either by printing out or emailing to their teacher.	GCSE	11/10/12	39
Number	Millionaire's Dilemma**	http://www.thechalkface.net/resources/millionaire_dilemma.pdf	pdf	Worksheet	Using the concept of compound interest, this activity compares three different account options for a savvy millionaire saver. Would you rather a lower interest rate but an up-front bonus payment, or a higher interest rate but huge initial fees? Includes full solutions and graph.	GCSE	11/11/14	40
Number	FDP conversions	http://www.thechalkface.net/resources/fdp_conversion.pdf	pdf	Fact Cards	A summary table showing some of the common methods for converting between fractions, decimals and percentages.	KS3	17/05/12	41
Number	FDP Conversion Test	http://www.thechalkface.net/resources/FDP_test.xls	xls	Spreadsheet	Interactive test - randomly generated at the click of a button. Includes print-out functionality. Tests conversion between fractions, decimals and percentages for the 8 common percentages: 100%, 75%, 50%, 25%, 20%, 10%, 5%, 1%.	KS3	05/11/12	42
Number	Fractions Consolidation	http://www.thechalkface.net/resources/fractions_consolidation.xls	xls	Hand-out	The main elements of the study of fractions, decimals and percentages condensed into easy-to-read revision-style sheets.	KS3	06/10/11	43

Number	Infinite Series**	http://www.thechalkface.net/resources/infinite_series.xls	xls	Investigation	An introduction to infinite series for pre-A-level students, perhaps for use as extension work when building up fraction skills. Gives the limits of a whole range of geometric series, including a neat interactive visual proof.	GCSE	28/09/13	44
Number	Recurring Decimals**	http://www.thechalkface.net/resources/Recurring_Decimals.pdf	pdf	Fact Cards	List of the first 20 unit fractions with their decimal equivalent (includes a blank copy for students to fill in themselves). Also cheat sheets for converting a fraction to a decimal and vice versa. Also gives a method for a recurring decimal with a non-recurring prefix.	GCSE	15/12/12	45
Number	Recurring Decimals**	http://www.thechalkface.net/resources/Recurring_Decimals.xls	xls	Teacher Tool	A spreadsheet designed to give the exact decimal form of a fraction (recurring or terminating) or the fractional form of a decimal. Enter the whole number parts, the preceding non-recurring part and the recurring section to find the fraction it represents.	GCSE	15/12/12	46
Number	Upper and Lower Bounds**	http://www.thechalkface.net/resources/bounds.pdf	pdf	Worksheet	Three questions involving upper and lower bounds. It is necessary to interpret the problem to ensure the appropriate combination of bounds for the right solution. Involves volume of a cylinder. Full solutions attached.	GCSE	22/06/13	47
Number	Gravity Bounds**	http://www.thechalkface.net/resources/gravity_bounds.pdf	pdf	Worksheet	Calculating upper and lower bounds for the value of g (acceleration due to gravity) using approximate values for mass of the earth, etc. Finally using bounds to choose a suitable level of precision to use for the final answer. A good application of upper and lower bounds. Full solutions attached.	GCSE	25/05/15	48
Number	Introducing Ratio	http://www.thechalkface.net/resources/introducing_ratio.ppt	ppt	Presentation	Using photographs to introduce the concept of ratio and proportion.	KS3	03/12/08	49
Number	Ratio Recipes	http://www.thechalkface.net/resources/ratio_recipes.xls	xls	Spreadsheet	Four recipes with varying ingredients to be shared out in the same ratio for varying numbers of people. Includes additional questions.	KS3	11/10/11	50
Number	Gears	http://www.thechalkface.net/resources/gears.ppt	ppt	Presentation	Using ratio to investigate the gearing of Warwick Castle mill. For full functionality, also download the embedded video.	GCSE	28/05/10	51
Number	Gears embedded video	http://www.thechalkface.net/resources/mill.mpg	mpg	Embedded element	To go with gears presentation.	GCSE	07/04/10	52
Number	Gears question sheet	http://www.thechalkface.net/resources/mill_questions.pdf	pdf	Worksheet	To go with gears presentation.	GCSE	25/05/10	53
Number	Gears answer sheet	http://www.thechalkface.net/resources/mill_answers.pdf	pdf	Worksheet	To go with gears presentaiton.	GCSE	25/05/10	54
Number	Factors, Multiples and Primes	http://www.thechalkface.net/resources/factors_multiples_primes.pdf	pdf	Fact Cards	Definitions and helpful explanations of factors, multiples and prime numbers. Compares multiples to multipacks, and factors to factories to aid memory.	KS3	09/05/12	55
Number	Combining Calculations	http://www.thechalkface.net/resources/Combining_Calculations.pdf	pdf	Worksheet	A series of calculations (some to be done mentally, some with a calculator) that require the use of BODMAS (or BIDMAS) to get the correct order of operations.	KS3	07/03/16	56
Number	Divisibility Tricks	http://www.thechalkface.net/resources/Divisibility_Tricks.pdf	pdf	Fact Cards	Primarily for speeding up the process of factorising numbers, but useful in general for division. This sheet gives a brief summary of checking for divisibility by 10, 5, 2 and 3.	KS3	07/03/16	57
Number	Division And Fractions	http://www.thechalkface.net/resources/Division_and_Fractions.pdf	pdf	Worksheet	An introduction to fractions that begins with division. Some division questions have whole number answers. For those that don't, we just cheat and leave the division sign in place. It hinges on using fraction notation for normal whole number division, then being happy leaving our answer as a fraction if it won't give an integer. A nice way to understand equivalent fractions, too, before losing sight of whole numbers. 12 over 6 is equivalent to 18 over 9.	KS3	07/03/16	58
Number	Division Problems	http://www.thechalkface.net/resources/Division_Problems.pdf	pdf	Worksheet	A few questions which all require division, but - crucially - require a firm grasp of context to give a sensible answer. For some, leave a remainder, for others, write as a rounded decimal or a fraction, or round your answer up, or down, or even more complicated. Solutions included.	KS3	07/03/16	59
Number	Fdp Numberline	http://www.thechalkface.net/resources/FDP_Numberline.pdf	pdf	Worksheet	A list of numbers in either fraction, decimal or percentage form to be placed in their correct position on the number line below. Full solutions included.	KS3	07/03/16	60
Number	Fractions Match Up	http://www.thechalkface.net/resources/fractions_match_up.pdf	pdf	Worksheet	Fractional numbers written in a wide variety of ways, in a grid of match-up cards. Top-heavy, mixed numbers, divisions, number lines, sharing problems, additions, decimals, percentages.	KS3	07/03/16	61
Number	Learning Times Tables	http://www.thechalkface.net/resources/Learning_Times_Tables.pdf	pdf	Worksheet	Designed to help students who struggle with their tables to break it down into a more manageable task by considering the symmetry of the multiplication table and key results like the square numbers.	KS3	07/03/16	62
Number	Long Multiplication	http://www.thechalkface.net/resources/Long_Multiplication.pdf	pdf	Worksheet	A few questions involving 2 or 3 digit multiplication, some involving decimals and a number of word problems with context. Solutions included.	KS3	07/03/16	63
Number	Prime Factor Grids**	http://www.thechalkface.net/resources/Prime_Factor_Grids.pdf	pdf	Fact Cards	Some beautiful colourful grids of the numbers from 1 to 100... in prime factor form. Colour-coded by total number of factors, primes stand out, and make the rest easy to identify by position, too. Excellent for HCF and LCM work as a cheat sheet for students. Also a nice way to check answers for 2 digit prime factorisation problems.	KS3	07/03/16	64
Number	Prime Factorisation Simple	http://www.thechalkface.net/resources/Prime_Factorisation_Simple.pdf	pdf	Worksheet	Beginning with the concept of factors and primes, then calculating the prime factorisation of the first 20 integers.	KS3	07/03/16	65
Number	Prime Sieve	http://www.thechalkface.net/resources/Prime_Sieve.xlsx	xlsx	Spreadsheet	Interactively demonstrate Eratosthenes' sieve for the first 10,000 numbers.	KS3	07/03/16	66
Number	Reciprocals**	http://www.thechalkface.net/resources/Reciprocals.pdf	pdf	Worksheet	Finding reciprocals of a variety of numbers in different forms, plus a graph to sketch of the function $y=1/x$.	GCSE	07/03/16	67

Number	Understanding Negatives**	http://www.thechalkface.net/resources/Understanding_Negatives.pdf	pdf	Worksheet	Adding, subtracting, multiplying with negative numbers. Includes full solutions as well as examples.	KS3	07/03/16	68
Number	Using Bounds Shipping Container**	http://www.thechalkface.net/resources/Using_Bounds_Shipping_Container.pdf	pdf	Worksheet	Calculations involving a large shipping container requiring not only use of bounds within calculations, but interpretation of results to solve related problems. Full solutions included.	GCSE	07/03/16	69
Number	Adding Fractions	http://www.thechalkface.net/resources/adding_fractions.ppt	ppt	Worksheet	Simple starter aimed at understanding why adding and subtracting fractions works the way it does (adding like objects analogy, leading on to why we change denominators if they are different).	KS3	07/03/16	70
Algebra	Trial and Improvement Big Things**	http://www.thechalkface.net/resources/Trial_and_Improvement_Big_Things.pptx	pptx	Quiz	To build the concept of bisection, this quiz goes a step further than 'guess again' - each team gets 3 guesses which they are told are either too high or too low before they submit a final answer. Regardless of their sense of the size of the thing (from largest ship to fastest animal), those who can best narrow down their range will do best in general.	KS3	16/02/15	71
Number	Splitting the Number**	http://www.thechalkface.net/resources/splitting_the_number.ppt	ppt	Presentation	Prime factorisation introduction. Explanation of factors and primes and demonstration of method.	KS3	15/09/11	72
Number	Prime Finder**	http://www.thechalkface.net/resources/prime_finder.xls	xls	Spreadsheet	A 1 to 100 grid where you can colour all the multiples of any given digit from 2 to 9 at the click of a button, revealing patterns and prime numbers. Includes a common factors facility, and a print-out for students to do a similar activity, filtering out the prime numbers.	KS3	09/02/12	73
Number	Prime Factor Decomposition	http://www.thechalkface.net/resources/prime_factor_decomposition.pdf	pdf	Worksheet	A simple worksheet with an example and half a dozen numbers for students to break down into their prime factors. Includes reminders of divisibility rules and the first few prime numbers.	KS3	11/02/12	74
Number	Prime Venn diagram**	http://www.thechalkface.net/resources/primevenn.xlsm	xlsm	Spreadsheet	This elegant device calculates the prime factors of a number (up to the seemingly arbitrary limit of 15838) and displays the results of two different decompositions in Venn diagram form, in order to identify common factors and multiples. Also gives HCF and LCM.	KS3	15/03/11	75
Number	Prime Factorisation**	http://www.thechalkface.net/resources/primes.xlsx	xlsx	Spreadsheet	A tool for finding the prime factor decomposition of a number (up to 100,000). It has facilities for HCF and LCM calculation, and a searchable database of the numbers within its range, for observing patterns within, for instance, numbers with an odd number of factors.	KS3	11/09/12	76
Number	HCF and LCM	http://www.thechalkface.net/resources/hcf_and_lcm.pdf	pdf	Fact Cards	A thorough comparison of the two main methods for finding the highest common factor and lowest common multiple, indicating the value of the prime factor method for large numbers.	GCSE	30/09/14	77
Number	Primes True or False**	http://www.thechalkface.net/resources/primes_true_or_false.pptx	pptx	Presentation	A few statements about primes for students to consider or research. Includes solutions: often 'true-ish', or 'unknown' but with additional background information such as the proof of infinite primes and possible formulas for the nth prime number.	GCSE	08/09/14	78
Number	Factors Investigation**	http://www.thechalkface.net/resources/Factors_Investigation.pdf	pdf	Investigation	Open-ended extension investigation into the link between the prime decomposition of a number and the total number of its factors. The link involves the powers of the prime factors, and this document includes tips for problem solving, specific starting point options and some extension questions. Solutions included.	GCSE	08/09/14	79
Number	Tables Patterns**	http://www.thechalkface.net/resources/tables_patterns.xls	xls	Interactive demonstration	An interesting concept, producing patterns of dots out of numbers. Alter the base number, and the invisible multiplication table will alter its shading pattern based on its factors. See distinctive patterns emerge for primes, squares, cubes, etc.	KS3	07/09/11	80
Number	Tables Patterns**	http://www.thechalkface.net/resources/tables_patterns.pdf	pdf	Hand-out	An accompanying hand-out for students to study for the numbers 1 to 32 for the above spreadsheet.	KS3	01/09/11	81
Number	Wheat Grains**	http://www.thechalkface.net/resources/wheat_grains.pdf	pdf	Activity	How many grains of wheat are there in a field? This activity (worksheet followed by instructions for teacher) requires problem solving skills, and the use of a series of facts to find the solution.	KS3	29/03/12	82
Number	Estimation	http://www.thechalkface.net/resources/estimation.xls	xls	Spreadsheet	A step-by-step spreadsheet demonstration of a method for finding estimates for common exam-style calculations.	GCSE	21/06/11	83
Number	How Many Bottles	http://www.thechalkface.net/resources/how_many_bottles.ppt	ppt	Activity	Can be used as an introduction to trial and improvement, photos of lots of bottles - you have to guess how many. Giving "too high" or "too low" each time usually narrows it down within half a dozen guesses.	KS3	22/07/10	84
Number	Trial and Improvement	http://www.thechalkface.net/resources/Trial_improvement.xls	xls	Interactive Demonstration	Allows the user to specify square or cube roots, to pick a number and to fill in a trial & improvement table. Values (and 'too high' or 'too low') are automatically calculated, and a graph shows the progress towards the solution.	GCSE	06/11/12	85
Algebra	Trial and Improvement Method	http://www.thechalkface.net/resources/trial_and_improvement.pdf	pdf	Worksheet	A complete description of the method required for GCSE trial and improvement questions, including a worked example (plus 'My thinking...' notes), and examples of GCSE questions to try.	GCSE	27/10/14	86
Number	Post-its	http://www.thechalkface.net/resources/post-its.ppt	ppt	Problem	A short head-scratcher designed to highlight the concept of percentage decrease followed by percentage increase.	GCSE	27/12/10	87
Number	Best Buy**	http://www.thechalkface.net/resources/Best_Buy.pdf	pdf	Worksheet	Three good ways to compare value: make the quantity the same, make the price the same or calculate the cost per item. A series of carefully created questions that lend themselves to these three methods follow (with full solutions) to develop a clearer sense of this fundamental multiplicative relationship.	KS3	29/08/16	88
Number	Fair Shares	http://www.thechalkface.net/resources/Fair_Shares.pdf	pdf	Worksheet	A nice quick starter / introduction to sharing in a ratio. How should these two brothers share £600 if one worked 2	KS3	29/08/16	89

Number	Fractions Topic Test	http://www.thechalkface.net/resources/Fractions_Topic_Test.pdf	pdf	Test	A short test of a few key elements of early fractions work, beginning with finding half of a number and working	KS3	29/08/16	90
Number	Nursery Ratios	http://www.thechalkface.net/resources/Nursery_Ratios.pdf	pdf	Worksheet	Using the government regulations on ratios of adults to children in nurseries, a range of questions to answer, with full solutions included.	KS3	29/08/16	91
Number	Times Square**	http://www.thechalkface.net/resources/Times_Square.pdf	pdf	Activity	A neat idea where students need to multiply by 2 to work out the next number along, and by 5 to work out the next number up. This avoids the danger of multiplication tables where students are simply adding, but also gives a range of routes to fill in missing values. Going diagonally up? Just Finding equivalent fractions with a given denominator	KS3	29/08/16	92
Number	Using Common Denominators	http://www.thechalkface.net/resources/Using_Common_Denominators.pdf	pdf	Worksheet	(integer multiple of given fraction), comparing fractions using common denominators, then adding or subtracting. Three short sections, each of which relies on the use of common denominators.	KS3	29/08/16	93
Number	Light and Sound**	http://www.thechalkface.net/resources/light_sound.pdf	pdf	Problem	Can light get half-way around the world while sound is still getting its boots on? Similar to Wheat Grains, this is an	GCSE	24/04/12	94
Number	Light and Sound**	http://www.thechalkface.net/resources/light_sound.ppt	ppt	Problem	Accompanying presentation - gives illustration and solutions for the activity above.	GCSE	18/04/12	95
Number	100 Lockers	http://www.thechalkface.net/resources/100_lockers.ppt	ppt	Problem	A question that requires an understanding of factors and multiples, and the nature of square numbers.	GCSE	27/12/10	96
Number	Price of chess	http://www.thechalkface.net/resources/price_of_chess.pdf	pdf	Worksheet	The inventor of chess is said to have asked for one grain of rice for the first square, two for the second, four for the third and so on. This little fact sheet uses powers of 2 to investigate just how much rice this would represent (and how much it would be worth).	KS3	26/03/14	97
Number	Continued Fractions	http://www.thechalkface.net/resources/continued_fractions.pdf	pdf	Investigation	An introduction to continued fractions. Students follow an example with a method for turning any fraction into a continued fraction, including the common linear notation. A good prop for an open-ended investigation into this topic.	Other	27/10/14	98
Algebra	Simultaneous Equations Problem	http://www.thechalkface.net/resources/Simultaneous_Equations_Problem.pdf	pdf	Problem	The New York Times ran an article which complained of a lack of sufficient information to deduce the number of sales and the number of rentals of a movie when they knew the cost of each, the total revenue and the total number of transactions. Enter: simultaneous equations.	GCSE	16/02/15	99
Algebra	2-step Function Machines	http://www.thechalkface.net/resources/2step.pdf	pdf	Worksheet	Solving equations by means of function machine notation and reversing operations.	KS3	29/01/10	100
Algebra	Guess the Rule	http://www.thechalkface.net/resources/guess_the_rule.xls	xls	Spreadsheet	With a choice of either a 1 or 2 step function machine, this generates random rules linking an input and output for learners to guess.	KS3	06/10/11	101
Algebra	Nim**	http://www.thechalkface.net/resources/nim.xls	xls	Game	A simple version of the classic pick-up game, Nim. You play against the computer at 3 levels of difficulty with a customisable number of starting objects, and the aim is to	KS3	28/09/11	102
Algebra	Number Square Algebra	http://www.thechalkface.net/resources/Number_Square_Algebra.pdf	pdf	Worksheet	Designed to ease students into the use of algebra to describe rules - grids of numbers inherently contain patterns (adding 8 as you go down diagonally to the right, etc) depending on the way they are generated. This worksheet requires students to identify these rules, spot patterns and apply	KS3	06/05/13	103
Algebra	nth term rules**	http://www.thechalkface.net/resources/nth_term_rules.pdf	pdf	Worksheet	Designed to bridge between describing sequences term by term and generating a general term. Useful for a group	KS3	27/10/14	104
Algebra	Mobile Phone Contracts Formula Version	http://www.thechalkface.net/resources/Mobile_Phone_Contracts_Formula_Version.pdf	pdf	Worksheet	An alternative version of the investigation into mobile phone contracts - with a given up-front charge and a certain amount per month, which contract gives the best deal for a particular phone? Incorporates formulae to derive and use. Full solutions attached.	KS3	16/02/15	105
Algebra	Algebra Basics**	http://www.thechalkface.net/resources/algebra_basics.pdf	pdf	Booklet	A mind-map of Foundation GCSE algebra topics followed by a selection of questions on each of the topic areas. Full solutions included.	GCSE	08/04/15	106
Algebra	Simple Quadratics**	http://www.thechalkface.net/resources/quadratics_simple.pdf	pdf	Worksheet	Starting with a fill-in-the-blanks table of square numbers, and moving on to quadratics with no x term (all with whole	GCSE	11/11/14	107
Algebra	Tile Patterns**	http://www.thechalkface.net/resources/Tile_Patterns.pdf	pdf	Investigation	A sequences and nth term investigation based on square tile patterns. Involves a linear and a (simple) quadratic sequence.	KS3	08/02/14	108
Algebra	Painted Cubes**	http://www.thechalkface.net/resources/Painted_Cubes.pdf	pdf	Investigation	The next level up from Tile Patterns, this investigation looks into the number of small cubes in a larger one which have 3 faces showing, 2, 1 or none. Involves sequences and nth term, a linear, quadratic and cubic sequence.	GCSE	08/02/14	109
Algebra	Quadratic Sequence**	http://www.thechalkface.net/resources/quadratic_sequence.ppt	ppt	Presentation	A fully worked method for finding the nth term of a quadratic sequence.	KS3	14/09/10	110
Algebra	Pascal Triangle Investigation**	http://www.thechalkface.net/resources/pascal_triangle_investigation.pdf	pdf	Investigation	An open-ended investigation into the number sequences found within Pascal's triangle. Designed to be used by a group who can make conjectures, test and prove them with minimal input from the teacher. Includes a large Pascal's triangle to enable students to easily investigate patterns such as Sierpinski's triangle.	Other	27/10/14	111

Algebra	Chess Squares	http://www.thechalkface.net/resources/chess_squares.ppt	ppt	Problem	The problem is very simple - how many squares are there on a chessboard? however, this includes 2 by 2 squares, 3 by 3, etc.	KS3	22/07/10	112
Algebra	Coins and Cups Algebra	http://www.thechalkface.net/resources/coins_and_cups_algebra.ppt	ppt	Presentation	Demonstrating the principles of removing the same thing from both sides using a coins in cups analogy.	KS3	16/12/08	113
Algebra	Matchbox Maths	http://www.thechalkface.net/resources/matchbox_maths.pdf	pdf	Worksheet	Using the analogy of matches and matchboxes, this worksheet uses diagrams to reinforce the concept to allow	KS3	24/11/12	114
Algebra	Budget Builder**	http://www.thechalkface.net/resources/budget.xls	xls	Spreadsheet	Designed for students to work on with a laptop, to develop a rudimentary understanding of some key Excel formulas at	KS3	08/02/14	115
Algebra	Excel Algebra**	http://www.thechalkface.net/resources/excel_algebra.pdf	pdf	Worksheet	Designed to come at the concept of algebra from a more intuitive direction. Using Excel formulas, students effectively perform substitution, interpreting cell references	KS3	30/12/14	116
Algebra	Algebra Scales**	http://www.thechalkface.net/resources/algebrascales.xls	xls	Interactive demonstration	Allows the user to construct an equation with x on both sides to be displayed in the form of balancing scales. Boxes	KS3	16/05/12	117
Algebra	Equations	http://www.thechalkface.net/resources/equations_worksheet.xls	xls	Worksheet	A customisable worksheet where you can input your own coefficients and preferred solutions and both a question and answer sheet will be generated automatically.	KS3	07/05/09	118
Algebra	Linear Equations Generator**	http://www.thechalkface.net/resources/linear_equations.xls	xls	Spreadsheet	Completely customisable random equation generator. Click for a new equation, then click to go through the stages of solving, including explanations.	KS3	07/12/09	119
Algebra	Changing the Subject 1	http://www.thechalkface.net/resources/formulae.ppt	ppt	Presentation	Demonstration of changing the subject of a formula. To be used with Changing the Subject worksheet	GCSE	26/03/09	120
Algebra	Changing the Subject 2	http://www.thechalkface.net/resources/changing_the_subject.pdf	pdf	Worksheet	Examples of formulae to rearrange, making each term the subject. Includes solutions.	GCSE	31/05/12	121
Algebra	Sphere-Cone formula	http://www.thechalkface.net/resources/spherecone_formulae.pdf	pdf	Worksheet	Combining volume formulae to find a formula for the volume of a newly created 3D shape.	GCSE	31/05/12	122
Algebra	Gunshot formula manipulation**	http://www.thechalkface.net/resources/gun_formulae.pdf	pdf	Worksheet	Using constant acceleration suvat equations to prove results about firing a gun into the air.	GCSE	31/05/12	123
Algebra	Simpson's Rule formula manipulation**	http://www.thechalkface.net/resources/simpson_formulae.pdf	pdf	Worksheet	Proving that the volume of certain shapes can be found exactly using simpson's rule.	GCSE	31/05/12	124
Algebra	Quadratic Generator**	http://www.thechalkface.net/resources/quadratic_generator.xls	xls	Spreadsheet	Generates a completely customisable series of double brackets and quadratics (toggle view either one or both) for printing or on-screen use.	GCSE	06/06/11	125
Algebra	Factorising Quadratics Intro**	http://www.thechalkface.net/resources/Factorising_Quadratics_Intro.pdf	pdf	Fact Cards	Notes on how to quickly and easily factorise a range of different quadratic expressions (with a single x squared term), including questions as well as notes. Full solutions included.	GCSE	16/02/15	126
Algebra	Dealing with Quadratics**	http://www.thechalkface.net/resources/dealing_with_quadratics.pdf	pdf	Booklet	A summary of the main competencies required by the higher GCSE involving quadratics - forming, solving, completing the square to find max/min, graphing and rational expressions. Includes examples.	GCSE	08/09/14	127
Algebra	Applied Quadratic	http://www.thechalkface.net/resources/applied_quadratic.ppt	ppt	Problem	Worked example question with a given quadratic describing ballistic motion.	GCSE	15/09/10	128
Algebra	Area Algebra	http://www.thechalkface.net/resources/area_algebra.xls	xls	Spreadsheet	Combining area and algebra by providing simple algebraic expressions as side lengths for rectangles whose area and perimeter are to be calculated in terms of x.	KS3	24/04/09	129
Algebra	Morse Code**	http://www.thechalkface.net/resources/morse_code.xls	xls	Spreadsheet	Type in a hidden message to have the morse code version appear on the screen. Decoder by the side to help solve the	KS3	31/05/10	130
Algebra	Fenceposts	http://www.thechalkface.net/resources/fenceposts.ppt	ppt	Problem	This requires some careful thought and the application of algebra (only linear equations, but the element of problem solving makes it quite a tricky one).	GCSE	12/01/10	131
Algebra	Quadratic Powers Problem	http://www.thechalkface.net/resources/quadratic_powers_problem.pdf	pdf	Problem	A problem involving a quadratic expression to the power of another. Only requires knowledge of solving quadratics by factorising and rules of indices, but is a bit sneaky. Comprehensive solutions included, as well as an	KS4	16/07/14	132
Algebra	Difference Of Two Squares	http://www.thechalkface.net/resources/Difference_of_two_squares.pdf	pdf	Worksheet	A numerical introduction to the concept of the difference of two squares, using a trick the author spotted back when he was trying to learn his times tables as a kid. Also shows the geometric connection (the actual squares) and leads on to a	GCSE	07/03/16	133
Algebra	Factorising Quadratics With Extension	http://www.thechalkface.net/resources/Factorising_Quadratics_With_Extension.pdf	pdf	Worksheet	A series of increasingly complex questions on solving quadratics by factorising. Starting with taking out a single term, then double brackets with no negatives, then mixed, then disguised quadratics (that is, compound functions such as even powered quartics). Full solutions included.	GCSE	07/03/16	134
Algebra	Nim	http://www.thechalkface.net/resources/Nim.pptx	pptx	Game	Set up to work from the powerpoint, this simple game requires players to remove either 1 or 2 objects in turn, with the last player to remove an object losing. The winning strategy (which is relatively easy to work out) leads nicely into a study of linear sequences.	KS3	07/03/16	135
Algebra	Quadratic Sequence	http://www.thechalkface.net/resources/Quadratic_Sequence.ppt	ppt	Presentation	Worked example of finding the nth term of a quadratic sequence.	GCSE	07/03/16	136

Algebra	Quadratics Overview**	http://www.thechalkface.net/resources/Quadratics_Overview.pdf	pdf	Hand-out	Covers key terminology, common forms (eg factorised, completed square) and a couple of examples of applications.	GCSE	07/03/16	137
Algebra	Sequences	http://www.thechalkface.net/resources/Sequences.pdf	pdf	Worksheet	A variety of questions on sequences, building up from continuing a linear sequence to spotting term to term rules to finding and using nth terms. Includes full solutions.	KS3	07/03/16	138
Algebra	Algebraic Fractions	http://www.thechalkface.net/resources/Algebraic_Fractions.pdf	pdf	Worksheet	Simplifying, adding, subtracting, multiplying and dividing algebraic fractions. Includes examples, comparisons with common numerical techniques and full solutions.	GCSE	07/03/16	139
Algebra	Balancing Equations**	http://www.thechalkface.net/resources/Balancing_Equations.pdf	pdf	Worksheet	Carefully laid out structure with boxes to fill in, designed to reinforce the use of the balancing method. ("What happened between lines 2 and 3 to this equation?") Goes from 1 step all the way to x on both sides problems. Varying	KS3	07/03/16	140
Algebra	Completing the Square**	http://www.thechalkface.net/resources/Completing_the_Square.pdf	pdf	Worksheet	Examples and questions including using completed square quadratics to solve equations and to find maximum or minimum values.	GCSE	29/08/16	141
Algebra	Inequality with three sides	http://www.thechalkface.net/resources/inequality_with_three_sides.pdf	pdf	Worksheet	Extension work on linear inequalities requiring students to consider how to break a three part inequality into parts.	GCSE	29/08/16	142
Geometry	Metric Units Match-up**	http://www.thechalkface.net/resources/metric_units_matchup.pdf	pdf	Activity	Six different photos (a mini, a lava-flow, a box, a water-tower, a high-jumper and the oval office) need to be cut out and matched first with the appropriate units (eg	KS3	29/12/11	143
Geometry	Unit Converter	http://www.thechalkface.net/resources/unit_converter.xls	xls	Interactive demonstration	A basic unit conversion calculator, illustrating the link between centi-, milli- and kilo- for litres, metres and grams.	KS3	26/09/11	144
Geometry	Metric Units Table	http://www.thechalkface.net/resources/metric_units_table.pdf	pdf	Worksheet	A table of the common metric units of distance, weight and capacity. Blank columns for students to fill in common conversions (eg 10mm=1cm) and examples of things which would be measured in these units.	KS3	05/01/12	145
Geometry	Metric Units**	http://www.thechalkface.net/resources/metric_units_fill_the_blanks.pdf	pdf	Worksheet	Values are given for various common quantities (thickness of an iphone, weight of a cow) but the unit names need to be chosen by the student. All units are metric. Solutions included.	KS3	21/01/13	146
Geometry	Metric and Imperial Units**	http://www.thechalkface.net/resources/metric_imperial.pdf	pdf	Worksheet	Gives a brief overview of both the metric and the imperial system of measurements, some examples of when we still use imperial in the UK, then details of conversions with some simple questions.	KS3	23/01/12	147
Geometry	Unit Conversion**	http://www.thechalkface.net/resources/Unit_Conversion.pdf	pdf	Worksheet	A number of conversions between metric and imperial length measurements. Conversions are included on the	KS3	08/02/14	148
Geometry	Quadrilaterals	http://www.thechalkface.net/resources/quadrilaterals.ppt	ppt	Presentation	Illustrations of parallel and perpendicular lines followed by line and angle properties of common quadrilaterals.	KS3	16/11/11	149
Geometry	Quadrilaterals Fact Cards	http://www.thechalkface.net/resources/quadrilaterals_fact_cards.pdf	pdf	Fact Cards	Fact cards from the powerpoint above. Can be used in conjunction with the flow-chart activity below.	KS3	16/11/11	150
Geometry	Flow Chart	http://www.thechalkface.net/resources/flowchart.pdf	pdf	Hand-out	Examples of flowcharts, designed to be used as an introduction to classifying shapes (such as the quadrilaterals, using fact cards above).	KS3	17/11/11	151
Geometry	Guess The Quadrilateral**	http://www.thechalkface.net/resources/Guess_The_Quadrilateral.xls	xls	Spreadsheet	A series of questions in message box form to be answered with a Yes or No, done by means of a simple macro. Includes a diagram of the program used, in flow-chart form. For teaching flow charts and/or quadrilaterals.	KS3	31/12/12	152
Geometry	Quadrilaterals Interactive	http://www.thechalkface.net/resources/quadrilaterals.htm	htm	Interactive demonstration	Designed in Geogebra, and embedded as an applet in a web page, you can move each of the 6 quadrilaterals around by	KS3	17/11/11	153
Geometry	Enlargement	http://www.thechalkface.net/resources/enlargement.ggb	ggb	Interactive demonstration	A customisable triangle with ray lines through each vertex to a moveable point of enlargement, and its image, enlarged by a customisable scale factor. Uses GeoGebra (free:	KS3	07/03/11	154
Geometry	Enlargement**	http://www.thechalkface.net/resources/enlargement.pdf	pdf	Worksheet	A grid with a shape to enlarge by scale factor -0.5. Note that this is more challenging than a positive integer enlargement, and is intended as an extension piece. Full	GCSE	25/05/15	155
Geometry	Translate the Square	http://www.thechalkface.net/resources/translate_the_square.xls	xls	Spreadsheet	Input the correct 2d translation vector to move the blue square to the position of the red square.	KS3	22/04/10	156
Geometry	Congruent and Translation Puzzle**	http://www.thechalkface.net/resources/Congruent_and_Similar_Shapes.pdf	pdf	Worksheet	A simple introduction to similar and congruent triangles.	KS3	08/04/15	157
Geometry		http://www.thechalkface.net/resources/Translation_Puzzle.pdf	pdf	Worksheet	Four shapes to translate using vectors (including negatives) to represent horizontal and vertical motion. Drawn on a grid, and incorporating an extension section (asking about	KS3	16/02/15	158
Geometry	Vectors Intro**	http://www.thechalkface.net/resources/Vectors_Intro.ppt	ppt	Presentation	An introduction to the concept of a vector describing a set of directions. Students draw out a path following instructions,	KS3	16/02/15	159
Geometry	Reflection	http://www.thechalkface.net/resources/reflection.ggb	ggb	Interactive Demonstration	Allows the user to move an object's corners and observe the effect of a reflection. Can move the object through the line, etc. Uses GeoGebra (free: geogebra.com).	KS3	28/04/11	160
Geometry	Rotational Symmetry	http://www.thechalkface.net/resources/rotational_symmetry.ppt	ppt	Presentation	Brief introduction to rotational symmetry with pictures of car manufacturer's badges.	KS3	07/12/13	161
Geometry	Rotation	http://www.thechalkface.net/resources/rotation.ggb	ggb	Interactive demonstration	A customisable shape which may be rotated about a variable point by a variable angle. Uses GeoGebra (free:	KS3	10/03/10	162
Geometry	Rotation booklet	http://www.thechalkface.net/resources/rotation.pdf	pdf	Worksheet	A dozen or so pages covering the fundamentals of point and direction of rotation for multiples of 90 degrees on co-ordinate grids.	KS3	10/05/09	163
Geometry	Pythagoras Notes	http://www.thechalkface.net/resources/Pythagoras_Notes.pdf	pdf	Fact Cards	A summary of the key methods to follow when applying Pythagoras' theorem, including when to use it and common errors.	GCSE	16/02/15	164

Geometry	Tessellation	http://www.thechalkface.net/resources/tessellation.ppt	ppt	Presentation	A few slides with examples of escher tessellation.	KS3	16/06/09	165
Geometry	Tessellation of quadrilaterals**	http://www.thechalkface.net/resources/tessellation.htm	htm	Interactive demonstration	With angles clearly marked and labelled, this tessellation neatly demonstrates how any quadrilateral can be tessellated.	KS3	05/07/12	166
Geometry	Sun, Moon and Coin	http://www.thechalkface.net/resources/sun_moon_coin.ppt	ppt	Problem	Why do the sun and moon look the same size? A couple of problems involving similar triangles.	GCSE	12/02/10	167
Geometry	Guess the Angle	http://www.thechalkface.net/resources/guesstheangle.ggb	ggb	Interactive demonstration	Pupils attempt to accurately make a particular angle on the board, or guess the angle given. Click to show the angle	KS3	04/09/09	168
Geometry	Angles Intro**	http://www.thechalkface.net/resources/angles_intro.ppt	ppt	Presentation	This is a thorough introduction and proof of all the key angle rules. Starting with why we split a full turn into 360 pieces, and working through basic rules and parallel lines to finally prove results about triangles.	KS3	24/11/12	169
Geometry	Angle Rules	http://www.thechalkface.net/resources/angle_rules.ppt	ppt	Presentation	The 5 most common angle rules, and an introduction to angles in a polygon by splitting into triangles.	KS3	27/10/12	170
Geometry	Triangle angles	http://www.thechalkface.net/resources/triangle.ggb	ggb	Interactive demonstration	Demonstrates the angle properties of triangles. Uses GeoGebra (free: geogebra.com).	KS3	17/03/09	171
Geometry	Angles in a Triangle	http://www.thechalkface.net/resources/triangle_angles.pdf	pdf	Worksheet	A collection of triangles where missing angles must be found using sum of angles in a triangle and isosceles and equilateral properties.	KS3	27/04/09	172
Geometry	Parallel lines	http://www.thechalkface.net/resources/paralel.ggb	ggb	Interactive demonstration	Demonstrates the angle properties of parallel lines. Uses GeoGebra (free: geogebra.com).	KS3	27/04/09	173
Geometry	Polygons	http://www.thechalkface.net/resources/polygons.pdf	pdf	Worksheet	Just pictures of some regular and irregular polygons for use when investigating interior and exterior angles by measuring.	KS3	17/07/13	174
Geometry	Angles in Polygons	http://www.thechalkface.net/resources/angles_in_polygons.pdf	pdf	Worksheet	A series of questions on interior and exterior angles of regular and irregular polygons. Solutions included.	GCSE	12/03/12	175
Geometry	Angles in Polygons Rules	http://www.thechalkface.net/angles_in_polygons_rules.pdf	pdf	Fact Cards	3 to a page rules of interior, exterior and centre angles for regular and irregular polygons.	GCSE	07/03/16	176
Geometry	Bearings**	http://www.thechalkface.net/resources/bearings.pptx	pptx	Presentation	Presentation describing how to measure bearings from one point to another, reverse bearings and how to pinpoint a	KS3	24/11/12	177
Geometry	Bearings	http://www.thechalkface.net/resources/bearings.pdf	pdf	Worksheet	A range of worksheets, including introductory work, homework sheets and investigative work involving maps, as well as how to pinpoint a location from two bearings. See accompanying powerpoint above.	KS3	18/09/12	178
Geometry	Finding Bearings	http://www.thechalkface.net/resources/finding_bearings.pdf	pdf	Worksheet	Four points with bearings to measure between them. Useful for getting lots of practice with acute, obtuse and reflex bearings, and a good starting point for explaining why	KS3	08/02/14	179
Geometry	Bearings Course Plotter**	http://www.thechalkface.net/resources/Bearings_Course_Plotter.pdf	pdf	Worksheet	Students plot a course on the map linking points A and B, then use the scale and accurate angle measurements to write descriptions of each leg of the journey. Using	GCSE	30/09/14	180
Geometry	Bearings Vectors Conversion	http://www.thechalkface.net/resources/Bearings_vectors_conversion.xls	xls	Spreadsheet	Bearings Vectors Conversion spreadsheet these can then be compared to the actual displacement of B from A to give an To accompany Bearings Course Plotter (but can be used for a variety of bearings or vectors calculations). Takes as input the magnitude and direction of a vector and gives North and East components. This allows calculation of, for instance, the relative error of a set of instructions when compared to the overall displacement.	GCSE	30/09/14	181
Geometry	Bearings Moving Ship	http://www.thechalkface.net/resources/Bearings_moving_ship.pdf	pdf	Problem	A word problem requiring accurate interpretation and plotting of positions using bearings. The situation involves taking readings of a moving ship from a moving ship, triangulating with a lighthouse and predicting the course of the vessel you're observing. Full solutions and diagrams	GCSE	30/09/14	182
Geometry	Sine Rule**	http://www.thechalkface.net/resources/sine_rule.xlsm	xlsm	Spreadsheet	An on-screen triangle all-in-one calculator, which allows you to input values and then apply formulae such as the sine rule and the cosine rule to calculate missing measurements.	GCSE	27/12/10	183
Geometry	Photo Trigonometry	http://www.thechalkface.net/resources/photo_trig.ppt	ppt	Problem	Estimate the number of people in a large group photo by using right-angle trigonometry to calculate the area of the (roughly) triangular space.	GCSE	28/05/10	184
Geometry	Rectangle Rest	http://www.thechalkface.net/resources/rectangle_rest.pptx	pptx	Problem	A pair of problems involving angles and the properties of a rectangle and an equilateral triangle.	GCSE	14/01/12	185
Geometry	Horizon**	http://www.thechalkface.net/resources/horizon.xls	xls	Investigation	Calculates the distance to the horizon based on height above the surface of the planet (includes standard results for known planets and the moon, as well as the option for custom radii). Uses Pythagoras, and includes a worksheet	GCSE	15/04/11	186

Geometry	Horizon**	http://www.thechalkface.net/resources/horizon.ppt	ppt	Presentation	Accompanying presentation illustrating the method for finding the distance to the horizon, using Pythagoras' Theorem. To be used with Horizon.xls	GCSE	15/04/11	187
Geometry	Double Sunset**	http://www.thechalkface.net/resources/Double_Sunset.pdf	pdf	Worksheet	Currently the tallest building in the world, the Burj Khalifa, has the interesting property that, due to its height and the	GCSE	31/10/13	188
Geometry	Midpoints**	http://www.thechalkface.net/resources/midpoints.pdf	pdf	Worksheet	A gradual introduction to midpoints of line segments. Involves plotting some coordinates, finding midpoints from the graph then discovering the method. Final section uses the result that joining the midpoints of the sides of any quadrilateral always gives a parallelogram. Includes solutions.	KS3	12/06/14	189
Geometry	Line Segments**	http://www.thechalkface.net/resources/line_segments.pdf	pdf	Worksheet	Questions on finding midpoints and lengths of line segments, followed by an introduction to an investigation. Joining the midpoints of any quadrilateral (as shown in the worksheet) forms a parallelogram.	GCSE	07/12/13	190
Geometry	Trigonometry Intro	http://www.thechalkface.net/resources/trigonometry_intro.pdf	pdf	Investigation	For use when first encountering right-angled trigonometry. Using the sine ratio, triangles with 30, 45 and 60 degree angles for investigating the ratio.	GCSE	18/07/13	191
Geometry	Golden Gate Trig**	http://www.thechalkface.net/resources/Golden_Gate_Trig.pdf	pdf	Worksheet	A short task which makes a good early trigonometry question, only requiring the sine ratio to calculate the hypotenuse of a triangle, and Pythagoras' theorem. The problem involves estimating the length of cable on the Golden Gate bridge.	GCSE	12/04/14	192
Geometry	Solving Trig Problems**	http://www.thechalkface.net/resources/solving_trig.pdf	pdf	Fact Cards	Full colour detailed examples of the three different variations of a simple right-angled trigonometry problem (finding the 'easy' side, the other side or the angle).	GCSE	18/07/13	193
Geometry	Trig Triangle**	http://www.thechalkface.net/resources/trig.xls	xls	Interactive	Right-angled trigonometry. Allows the user to dynamically	GCSE	16/06/12	194
Geometry	Trigonometry Trees**	http://www.thechalkface.net/resources/trigonometry_trees.pdf	pdf	Worksheet	To be used in conjunction with an inclinometer (angle measurer) and trundle wheel. Walks students through the steps of using right angled trigonometry to estimate the height of objects such as trees or buildings.	GCSE	12/05/14	195
Geometry	Ladder Trigonometry	http://www.thechalkface.net/resources/ladder_trig.ppt	ppt	Presentation	Investigation questions involving the 4:1 rule of ladder safety.	GCSE	23/01/10	196
Geometry	Polygon Pi**	http://www.thechalkface.net/resources/polygon_pi.pdf	pdf	Worksheet	Gives a brief description of Archimedes' method for approximating pi, and provides a method for doing a similar thing (but with right-angled trigonometry). Students follow	GCSE	22/04/14	197
Geometry	Pythagoras**	http://www.thechalkface.net/resources/pythagoras.xls	xls	Teacher Tool	This handy tool allows the teacher to generate Pythagoras questions quickly and easily. A click on the shape generates a new problem; a couple of toggle buttons allow you to	GCSE	16/06/12	198
Geometry	Pythagorean Triples**	http://www.thechalkface.net/resources/pythagorean_triples.pdf	pdf	Investigation	Explanation of one method for generating Pythagorean triples, written in the form of an independent investigation. Useful for extension of Pythagoras' Theorem.	GCSE	17/07/13	199
Geometry	Pythagoras Problems**	http://www.thechalkface.net/resources/Pythagoras_Problems.pdf	pdf	Worksheet	A series of problems which involve Pythagoras' Theorem. Ranging from a hiker to picture frames, area of a kite and what you could fit in a pringles tube, and including full	GCSE	31/10/13	200
Geometry	Triangles Info**	http://www.thechalkface.net/resources/Triangles_Info.pdf	pdf	Fact Cards	Details of when and how to use each of the various techniques required for the GCSE. Pythagoras, right angled trigonometry, non-right angled trigonometry (including	GCSE	08/02/14	201
Geometry	Introducing Loci	http://www.thechalkface.net/resources/introducing_loci.pdf	pdf	Hand-out	A revision-style sheet outlining the fundamental loci.	KS3	30/04/09	202
Geometry	Loci and Construction**	http://www.thechalkface.net/resources/loci.pptx	pptx	Presentation	A large presentation, intended to span a number of lessons, covering a given distance from a fixed point and from a line, equidistance between 2 points or lines, and introducing an investigation involving a rope around a corner.	KS3	24/11/12	203
Geometry	Loci Challenges booklet	http://www.thechalkface.net/resources/loci_challenges_booklet.pdf	pdf	Worksheet	A series of problems for learners to solve by obeying the constraints and observing the resultant shapes.	KS3	17/11/08	204
Geometry	Perpendicular bisector	http://www.thechalkface.net/resources/perpendicularbisector.ggb	ggb	Interactive demonstration	Demonstrates how a pair of equal circles produces an exact perpendicular bisector. Uses GeoGebra (free: geogebra.com).	KS3	17/05/12	205
Geometry	Angle bisector	http://www.thechalkface.net/resources/anglebisector.ggb	ggb	Interactive demonstration	Demonstrate how a pair of equal circles exactly bisects an angle. Uses GeoGebra (free: geogebra.com).	KS3	10/05/09	206
Geometry	Loci Construction	http://www.thechalkface.net/resources/loci_construction.pdf	pdf	Worksheet	A series of questions, with extension parts, requiring the application of construction techniques and loci knowledge.	KS3	16/11/08	207
Geometry	Counting Squares**	http://www.thechalkface.net/resources/counting_squares.xls	xls	Spreadsheet	This spreadsheet provides randomly generated rectangles or irregular shapes made from squares, and displays the area and perimeter on demand.	KS3	22/01/10	208
Geometry	Area and Perimeter Calculator**	http://www.thechalkface.net/resources/area_and_perimeter_calculator.xls	xls	Spreadsheet	Create your own shapes, and have excel automatically calculate the area and perimeter (toggle button to show/hide).	KS3	22/01/10	209
Geometry	Loci Investigations	http://www.thechalkface.net/resources/loci_investigations.pdf	pdf	Booklet	A wide selection of interesting problems and investigations requiring the use of loci. Some are more straight-forward,	GCSE	24/11/12	210
Geometry	Rectangle Investigation**	http://www.thechalkface.net/resources/rectangle_investigation.xls	xls	Investigation	Investigates the relationship between the perimeter and the area of a rectangle. One sheet allows the user to fix the perimeter while varying the side lengths, and the other sheet	KS3	11/10/11	211
Geometry	Area of a Triangle	http://www.thechalkface.net/resources/triangle.wmv	wmv	Demonstration	A 20-second clip demonstrating where the formula for the area of a triangle comes from using cardboard.	KS3	11/03/09	212
Geometry	Area of a Trapezium	http://www.thechalkface.net/resources/trapezium.wmv	wmv	Demonstration	A more complicated formula, but can still be demonstrated with a bit of cardboard and some cutting and moving.	KS3	11/03/09	213

Geometry	Area of a Parallelogram	http://www.thechalkface.net/resources/parallelogram.wmv	wmv	Demonstration	A similar idea to the triangle video- cut a piece off one side and stick it on the other to make a rectangle.	KS3	12/03/09	214
Geometry	Area of Common Shapes Formulae	http://www.thechalkface.net/resources/areaofcommonshapes.pdf	pdf	Fact Cards	Diagrams and formulae for the area of a rectangle, triangle, parallelogram and trapezium. (3 to a page)	KS3	17/01/12	215
Geometry	UK Area	http://www.thechalkface.net/resources/UK_Area.doc	doc	Worksheet	A square grid overlaying a map of the british isles, this is designed to be used as an area estimation activity to come up with a ballpark figure for the size of the country.	KS3	24/11/12	216
Geometry	Shack Area**	http://www.thechalkface.net/resources/shack.pdf	pdf	Worksheet	Designed for group work for younger learners, this is an extended task which requires the application of compound	KS3	06/10/11	217
Geometry	Shack Area**	http://www.thechalkface.net/resources/shack.ppt	ppt	Presentation	Accompanying presentation for Shack worksheet - gives dimensions and details of how to calculate area.	KS3	29/05/12	218
Geometry	Area of Common Shapes	http://www.thechalkface.net/resources/area_of_common_shapes.xls	xls	Spreadsheet	New dimensions are given to the displayed shape at the click of a button, and the answer (and working) displayed as required.	KS3	22/01/10	219
Geometry	Sector Segment Problems	http://www.thechalkface.net/resources/Sector_Segment_Problems.pptx	pptx	Problem	Some examples (plus solutions) for more complicated applications of sector and segment rules.	GCSE	16/02/15	220
Geometry	Area	http://www.thechalkface.net/resources/area_worksheet.pdf	pdf	Worksheet	A series of questions (with attached answer sheet) testing area calculations for a variety of compound shapes.	KS3	02/10/12	221
Geometry	Triangle Overlap activity	http://www.thechalkface.net/resources/triangle_overlap.ppt	ppt	Activity	Can you work out the area of the overlap between these two identical equilateral triangles? 3 different variations.	KS3	05/06/09	222
Geometry	Surface Area Volume Homework**	http://www.thechalkface.net/resources/surface_area_volume_homework.xls	xls	Homework	A computer-based homework. Students record the dimensions of a cuboid from home, then calculate the surface area and volume. As soon as they enter these values into the appropriate boxes the computer will tell them if	KS3	11/10/12	223
Geometry	Cuboid Surface Area 1**	http://www.thechalkface.net/resources/cuboid_surface_area.xls	xls	Spreadsheet	Generates random integer side-lengths for a cuboid and give step-by-step working for surface area calculations.	KS3	21/02/11	224
Geometry	Cuboid Surface Area 2**	http://www.thechalkface.net/resources/surface_area.ppt	ppt	Presentation	An accompanying presentation illustrating the method for calculating surface area.	KS3	11/11/10	225
Geometry	Cuboid Investigation**	http://www.thechalkface.net/resources/Cuboid_Investigation.pdf	pdf	Investigation	An investigation into optimal surface area for cuboids with a fixed volume. Full solutions (including all whole number results for the cuboid of volume 900 cubic centimetres) are	KS3	16/02/15	226
Geometry	Cornflakes	http://www.thechalkface.net/resources/cornflakes.pdf	pdf	Worksheet	Designed to accompany 3 different sizes of Kelloggs Corn Flakes boxes, this worksheet (including solutions) requires students to find volume and surface area by measurement and calculation, then use their figures to compare both value for money and cardboard-use efficiency.	KS3	08/10/12	227
Geometry	Square Area	http://www.thechalkface.net/resources/square_area.ppt	ppt	Problem	This rather tricky problem requires only Pythagoras' theorem and some basic algebra to solve. All is explained in the presentation.	GCSE	23/01/10	228
Geometry	Area Problems	http://www.thechalkface.net/resources/area_problems.ppt	ppt	Problem	Two problems involving compound area, including circles. With worked solutions included.	GCSE	24/11/12	229
Geometry	Triangle Trickery activity	http://www.thechalkface.net/resources/triangle_trickery.ppt	ppt	Activity	Instructions explain how to produce what appear to be two identical triangles from the same set of cut-out shapes, but one has a greater area than the other.	KS3	12/03/09	230
Geometry	The Impossible Triangle**	http://www.thechalkface.net/resources/impossible_triangle.pptx	pptx	Problem	Known as Curry's paradox, this simple collection of shapes seemingly goes together to form two identical triangles... with different areas! For full functionality, also download	GCSE	24/11/12	231
Geometry	The Impossible Triangle embedded video**	http://www.thechalkface.net/resources/curryparadox.wmv	wmv	Embedded element	Curry's paradox - embedded video for presentation.	GCSE	08/04/10	232
Geometry	Penrose Triangle	http://www.thechalkface.net/resources/penrose_triangle.ppt	ppt	Demonstration	The Penrose triangle (aka the impossible triangle - not to be confused with Curry's paradox) is a 2D drawing of an impossible 3D shape. This presentation includes a photograph of a 3D model which, from one angle, resembles	KS3	27/04/12	233
Geometry	Snow Area	http://www.thechalkface.net/resources/snow_area.ppt	ppt	Problem	Use the density of new-fallen snow and of snowball snow to calculate the size of the field needed to make this snowball.	GCSE	23/01/10	234
Geometry	Area and Perimeter**	http://www.thechalkface.net/resources/AreaPerimeter_Investigation.xls	xls	Investigation	A standalone spreadsheet which can be used directly by the student. It calculates the area of a polygon for a given perimeter and vice versa, allowing you to change the	KS3	16/07/12	235

Geometry	Painting Bounds**	http://www.thechalkface.net/resources/painting_bounds.pdf	pdf	Worksheet	A series of questions involving upper and lower bounds for a room which is to be painted. Use the upper bound of the area to find out how much paint to buy, then the lower bound to find out how much you might have left over. Includes solutions.	GCSE	09/03/13	236
Geometry	The Silver Rectangle**	http://www.thechalkface.net/resources/silver_rectangle.pdf	pdf	Worksheet	A guided investigation into the A4 (ISO 216) paper system. Students measure paper, look for patterns between A5, A4, A3, etc and discover the root 2 ratio between the sides. An additional part goes into detail on how the A0 paper size	KS3	04/06/14	237
Geometry	Circle Area Estimation**	http://www.thechalkface.net/resources/Circle_Area_Estimation.pdf	pdf	Worksheet	Pre-drawn circles on a (roughly) centimetre-square grid. Students estimate the area of the circles by counting the squares within. This can then be compared to the result	KS3	31/10/13	238
Geometry	Area of a Circle	http://www.thechalkface.net/resources/Area_of_a_Circle.pdf	pdf	Worksheet	Estimate the area of a circle by counting squares, then answer the questions below to come up with an estimate for pi, and the formula for the area of a circle.	KS3	08/04/15	239
Geometry	Circle Construction	http://www.thechalkface.net/resources/circle_construction.ppt	ppt	Presentation	Introducing the fundamentals of compass construction - drawing a circumscribed shape by following instructions.	KS3	17/05/12	240
Geometry	Circle Circumference**	http://www.thechalkface.net/resources/circle_circumference.pdf	pdf	Worksheet	Full colour key points and questions on circles. All questions involve finding the circumference from either a radius or diameter, of objects from a 2p coin to Stonehenge. Includes full solutions.	KS3	23/05/14	241
Geometry	Planet Circle Circumference	http://www.thechalkface.net/resources/planet_circle_circumference.pdf	pdf	Worksheet	A fill-the-blanks worksheet where students need to work out the two missing elements from radius, diameter and circumference (and guess which planet names might be	KS3	07/03/16	242
Geometry	Circle Area Concept	http://www.thechalkface.net/resources/circle_area_concept.ppt	ppt	Presentation	An illustration of the derivation of the circle area formula, using increasingly small slices of a circle formed into an approximate rectangle.	KS3	03/09/11	243
Geometry	Tolstoy and Circles**	http://www.thechalkface.net/resources/pahom.pdf	pdf	Hand-out	Using Tolstoy's story of a man who was promised the area of land he could walk around in a day, this sheet is a slightly more interesting way of presenting the basics of circle area and circumference. Includes questions.	KS3	24/11/12	244
Geometry	Penny Farthing**	http://www.thechalkface.net/resources/penny_farthing.pdf	pdf	Worksheet	Requires knowledge of the circumference of circles. Uses the dimensions of a penny-farthing's wheels and the radius	KS3	06/01/11	245
Geometry	Crop Circles**	http://www.thechalkface.net/resources/circle_crops.ppt	ppt	Problem	Aerial photo of Colorado showing circular irrigation. Includes questions on the effect of increasing the length of the boom (radius) on the area covered.	KS3	07/02/11	246
Geometry	Area of combined circles	http://www.thechalkface.net/resources/combined_circles.ppt	ppt	Presentation	Taking semicircular bites out of a larger semicircle, testing application of circle area calculations, but also including an algebraic aspect at the end for advanced gcse level - must be able to sketch quadratics for this bit.	GCSE	27/12/10	247
Geometry	Area of Pacman	http://www.thechalkface.net/resources/pacman_area.ppt	ppt	Problem	A couple of circle area problems introducing the idea of fractions of a circle in the form of sectors.	GCSE	03/12/09	248
Geometry	Circle Gap	http://www.thechalkface.net/resources/circlegap.xlsx	xlsx	Spreadsheet	This spreadsheet calculates the area enclosed by three circles of variable radius. The values can be altered, and the resulting calculation - as well as the formula derived for the	Other	24/11/12	249
Geometry	Common Volumes	http://www.thechalkface.net/resources/common_volumes_quiz.ppt	ppt	Quiz	A handful of questions to test estimation skills and build an appreciation of cubic centimetres. Objects ranging from a teaspoon to a bathtub.	KS3	01/05/12	250
Geometry	Volume of Buildings	http://www.thechalkface.net/resources/volume_of_buildings.ppt	ppt	Presentation	Various cuboid buildings with given dimensions to find the volume, culminating in the elephant building as an extension.	KS3	11/02/10	251
Geometry	Fuel Tank**	http://www.thechalkface.net/resources/fuel_tank.pdf	pdf	Problem	A practical application for volume and surface area calculations - a fuel tank in the shape of compound cuboids is being built. How much will it cost? Includes scale drawing examples.	KS3	16/06/12	252
Geometry	Volume of a Hula Hoop	http://www.thechalkface.net/resources/hulahoop_volume.ppt	ppt	Problem	Uses volume of a cylinder knowledge to calculate the volume of a hula hoop crisp.	GCSE	12/02/10	253
Geometry	Dugout Volume	http://www.thechalkface.net/resources/dugout_volume.pdf	pdf	Worksheet	Giving details of Native American dugout canoe dimensions, this worksheet requires the student to calculate the volume of half a hollow cylinder. The extension question gives the	GCSE	28/09/13	254
Geometry	Density Ordering**	http://www.thechalkface.net/resources/density_ordering.pdf	pdf	Activity	Three different sets of 6 cards each - one metals, one other construction materials and one other stuff - for students to arrange in order of density. Did you know that glass is about as dense as granite? Or that butter floats, but only	GCSE	19/11/12	255
Geometry	A Pint of Snow	http://www.thechalkface.net/videos/pintofsnow.wmv	wmv	Video	A short experiment, carried out in non-laboratory conditions, to determine how much snow you would need to melt for a pint of water. Can be used as an introduction	Other	15/01/10	256
Geometry	Snow Weight	http://www.thechalkface.net/resources/snow_weight.ppt	ppt	Problem	Using information on the density of snow and the formula for the volume of a sphere, we can work out how much this massive snowball weighs.	GCSE	04/01/10	257
Geometry	Snow Density	http://www.thechalkface.net/resources/Snow_Density.ppt	ppt	Problem	A short starter problem on density. Gives the density of packed snow, the diameter of the snowball pictured and the volume of a sphere and asks for the weight of the snowball.	GCSE	15/12/12	258
Geometry	Melting the Eiffel Tower**	http://www.thechalkface.net/resources/melting_the_eiffel_tower.pdf	pdf	Worksheet	Using the density of wrought iron and a few key facts and figures about the Eiffel Tower, we calculate exactly how high the resulting cuboid would be if the entire metal	GCSE	24/11/12	259
Geometry	All the Gold**	http://www.thechalkface.net/resources/all_the_gold.pdf	pdf	Worksheet	Given the density, price and current world reserves of gold, students are required to calculate various things using the density formula. Involves cube rooting to find the side-length of a cube of known volume.	GCSE	24/11/12	260

Geometry	Golden Balls**	http://www.thechalkface.net/resources/golden_balls.pdf	pdf	Worksheet	A slightly more complex version of All the Gold - this alternative requires the student to calculate the radius of a sphere from its volume (formula given). How big would a	GCSE	21/11/12	261
Geometry	T-bar Volume Density**	http://www.thechalkface.net/resources/T_bar_Volume_Density.pdf	pdf	Worksheet	A compound problem involving some percentage change as well as calculating the volume of a prism and using density to calculate mass.	GCSE	12/04/14	262
Geometry	Pyramid**	http://www.thechalkface.net/resources/pyramid.pdf	pdf	Worksheet	A worksheet involving calculations surrounding the Great Pyramid of Giza. Partly to do with volume (of a pyramid)	GCSE	21/06/11	263
Geometry	Pyramid	http://www.thechalkface.net/resources/pyramid.ppt	ppt	Problem	To accompany pyramid.pdf, this gives solutions and answers for the problems on the Pyramid sheet. Requires use of volume and density formulae.	GCSE	29/03/12	264
Geometry	Pencil Raft	http://www.thechalkface.net/resources/pencil_raft.ppt	ppt	Problem	Using density, weight and volume calculations, these figures should enable to estimate the number of pencils required to keep one person afloat. Turns out it's cheaper to buy a jet-ski.	GCSE	27/12/10	265
Geometry	Baby Surface Area	http://www.thechalkface.net/resources/baby_surface_area.pdf	pdf	Worksheet	A worksheet using the concepts of volume and area scale factors to draw conclusions about temperature regulation in babies. Calculates surface area to weight ratio.	GCSE	07/12/13	266
Geometry	Volume Area Investigation	http://www.thechalkface.net/resources/Volume_Area_Investigation.pdf	pdf	Worksheet	Investigation of surface area and volume scale factors. A good introduction to non-linear scale factors by experiment with different cuboids.	GCSE	05/03/14	267
Geometry	Fake Bricks	http://www.thechalkface.net/resources/Fake_Bricks.xls	xls	Homework	A self-checking homework task. Enter answers and the spreadsheet tells you if they are correct. This homework	GCSE	05/03/14	268
Geometry	Model Boats	http://www.thechalkface.net/resources/Model_Boats.pdf	pdf	Worksheet	Photos of a full-size canoe and a 1/4 scale model, along with questions involving length (linear), area and volume scale factors.	GCSE	06/05/13	269
Geometry	Paris Las Vegas	http://www.thechalkface.net/resources/paris_las_vegas.pdf	pdf	Worksheet	A short worksheet on non-linear scale factors linking the Eiffel Tower with the Las Vegas replica. The replica is half the size, therefore uses a quarter of the paint and weighs an eighth of the real thing. Includes solutions.	GCSE	26/03/14	270
Geometry	Non-linear scale factors	http://www.thechalkface.net/resources/non_linear_scale_factors.ppt	ppt	Presentation	A couple of questions on converting between volume and area scale factors in order to solve problems.	GCSE	09/03/13	271
Geometry	Mountain**	http://www.thechalkface.net/resources/mountain.pdf	pdf	Worksheet	This is a Similar Shapes problem taken from the film "The Englishman Who Went Up A Hill But Came Down A Mountain", requiring the calculation of the volume of a cone	GCSE	30/08/12	272
Geometry	Conic Sands	http://www.thechalkface.net/resources/Conic_Sands.xls	xls	Teacher Tool	The volume of a cone formula can be used in conjunction with trigonometry to calculate either the weight of a pile of sand (or grain, etc) from the dimensions or the dimensions of the cone given the quantity and the angle of repose. This	GCSE	15/09/12	273
Geometry	Eureka**	http://www.thechalkface.net/resources/eureka.pdf	pdf	Worksheet	An in-depth worksheet requiring the use and understanding of density as it relates to the story of Archimedes and the golden crown.	GCSE	28/02/12	274
Geometry	Speed**	http://www.thechalkface.net/resources/speed.pdf	pdf	Worksheet	From racing snails to Voyager 1, details of distances and times are given, and speed must be calculated. This only	GCSE	24/11/12	275
Geometry	Sphere, Cone, Cylinder Volume**	http://www.thechalkface.net/resources/sphere/index.htm	htm	Demonstration	Animated web page demonstrating the link between the formulae for volume of these three shapes.	GCSE	01/05/10	276
Geometry	Circle Theorems Presentation**	http://www.thechalkface.net/resources/circle_theorems.ppt	ppt	Presentation	A comprehensive presentation of the major circle facts and theorems, beginning with naming the parts of a circle and ending with geometric proofs of the theorems.	GCSE	28/05/10	277
Geometry	GeoGebra Circle Theorems**	http://www.thechalkface.net/resources/geogebra_circle_theorems.pdf	pdf	Investigation	Students may use this as a guide for discovering or verifying the circle theorems. Uses free software GeoGebra and the sheet describes the key tools they will require.	GCSE	11/11/14	278
Geometry	Circle Theorems Investigation**	http://www.thechalkface.net/resources/circletheorems.htm	htm	Investigation	A webpage containing a geometry applet allowing the user to play around with circles in order to get to grips with the main circle theorems.	GCSE	20/01/11	279
Geometry	Circle Theorems Blank	http://www.thechalkface.net/resources/circletheoremsblank.pdf	pdf	Worksheet	Worded descriptions of the circle theorems with space below to draw the relevant diagram onto a circle.	GCSE	25/03/11	280
Geometry	T-puzzle activity	http://www.thechalkface.net/resources/t-puzzle.xls	xls	Game	On the surface a simple rearrange the pieces activity, but putting these shapes together to make a T shape is surprisingly challenging. This file includes a print-out sheet and on-screen shapes to move and rotate.	KS3	07/05/09	281
Geometry	Vectors**	http://www.thechalkface.net/resources/vectors.pdf	pdf	Worksheet	Problem involving vectors which works towards proving why the midpoints of the sides of any quadrilateral join to make a parallelogram.	GCSE	07/12/13	282
Geometry	Cube Origami	http://www.thechalkface.net/resources/Cube_Origami.ppt	ppt	Presentation	An accompaniment to an origami cube activity - photographs of each stage, set on a loop.	KS3	05/06/09	283
Geometry	Shapes of Constant Width**	http://www.thechalkface.net/resources/shapes_of_constant_width.pdf	pdf	Booklet	An introduction to the Reuleaux Triangle, instructions on how to construct that and other regular shapes of constant width using compasses, extension questions involving perimeter and diameter (comparing to circles) and a description of how to construct irregular versions.	Other	09/07/14	284

Geometry	Arc Length Sector Area**	http://www.thechalkface.net/resources/Arc_Length_Sector_Area.pdf	pdf	Worksheet	Clear descriptions and examples, including explanation of the formulae in terms of a fraction of the area or the circumference, followed by a range of questions and full solutions.	GCSE	07/03/16	285
Geometry	Circle Theorems Notes And Questions	http://www.thechalkface.net/resources/Circle_Theorems_Notes_and_Questions.pdf	pdf	Worksheet	Key circle facts and theorems written out, with diagrams, followed by a number of past GCSE questions along with hints (which theorems might be useful) and solutions.	GCSE	07/03/16	286
Geometry	Cone Surface Area	http://www.thechalkface.net/resources/Cone_Surface_Area.pdf	pdf	Worksheet	This worksheet is more of a guided proof, for students who might be curious about where the cone surface area formula comes from. It's nice how the formula drops out by a brick barbecue, the Eiffel tower and a shipping container full of gold. Three classic density problems with nice illustrations and full solutions.	GCSE	07/03/16	287
Geometry	Density Problems**	http://www.thechalkface.net/resources/Density_Problems.pdf	pdf	Worksheet	By sandwiching a circle between an inscribed and circumscribed hexagon, then using some Pythagoras and right angled trigonometry, it is possible to put upper and lower bounds on the value of pi. Gives pi as between 3 and 4.	GCSE	07/03/16	288
Geometry	Finding Pi With Trig	http://www.thechalkface.net/resources/finding_pi_with_trig.pdf	pdf	Worksheet	Calculating the length of the Indy 500 racetrack using the circle circumference formula, then using this information to find the volume of a cylinder.	GCSE	07/03/16	289
Geometry	Indy 500 Speed	http://www.thechalkface.net/resources/Indy_500_Speed.pdf	pdf	Worksheet	Based around isometric drawing, but includes questions on volume and surface area.	GCSE	07/03/16	290
Geometry	Investigating Cuboids**	http://www.thechalkface.net/resources/Investigating_Cuboids.pdf	pdf	Worksheet	A self-differentiated worksheet making use of the monopoly board format to present a few questions on the three main types of quadrilaterals, identify their properties, use a flow chart and decide which ones qualify as more than rectangles.	GCSE	07/03/16	291
Geometry	Parallel Line Angles Monopoly**	http://www.thechalkface.net/resources/Parallel_Line_Angles_Monopoly.pdf	pdf	Worksheet	Name the common quadrilaterals, identify their properties, use a flow chart and decide which ones qualify as more than rectangles.	GCSE	07/03/16	292
Geometry	Quadrilaterals Investigation**	http://www.thechalkface.net/resources/Quadrilaterals_Investigation.pdf	pdf	Investigation	Extension work on surface area and volume - what happens to the surface area to volume ratio of a shape such as a cube when you change its dimensions?	KS3	07/03/16	293
Geometry	Slicing Shapes**	http://www.thechalkface.net/resources/Slicing_Shapes.pdf	pdf	Worksheet	Introduction to the concept and units of measurement for volume followed by questions involving the volume of real compound shapes such as buildings.	GCSE	07/03/16	294
Geometry	Volume Intro	http://www.thechalkface.net/resources/Volume_intro.pdf	pdf	Worksheet	Calculating the area of the Adidas logo stripes using the formula for the area of a trapezium, followed by some questions on area.	KS3	07/03/16	295
Geometry	Adidas Area	http://www.thechalkface.net/resources/Adidas_Area.pdf	pdf	Worksheet	Describes the concept of area as a 2-D measure, gives some examples of common units and key techniques for a range of shapes.	KS3	07/03/16	296
Geometry	Area Intro	http://www.thechalkface.net/resources/Area_Intro.pdf	pdf	Worksheet	A detailed presentation on the main 3D shapes including formulae for surface area and volume, and nets.	GCSE	29/08/16	298
Geometry	3D Shapes**	http://www.thechalkface.net/resources/3D_Shapes.pptx	pptx	Presentation	Calculating the area of a polygon using trigonometry.	GCSE	29/08/16	299
Geometry	Area of a Polygon	http://www.thechalkface.net/resources/Area_of_a_Polygon.pdf	pdf	Worksheet	A comprehensive booklet of key construction techniques complete with clear illustrations, true measurement diagrams and questions for students. Includes full solutions.	KS3	29/08/16	300
Geometry	Construction**	http://www.thechalkface.net/resources/Construction.pdf	pdf	Booklet	Finding the volume and surface area of cornflakes boxes using real measurements, then using this information to solve problems.	KS3	29/08/16	301
Geometry	Cornflakes Simpler	http://www.thechalkface.net/resources/Cornflakes_Simpler.pdf	pdf	Worksheet	A collection of problems that require the use of cosine rule, along with full solutions.	GCSE	29/08/16	302
Geometry	Cosine Rule Questions	http://www.thechalkface.net/resources/Cosine_Rule_Questions.pdf	pdf	Worksheet	A detailed worksheet that leads students through the process of measuring a cuboid of their own, then calculating both the volume and the surface area.	KS3	29/08/16	303
Geometry	Cuboid Calculations**	http://www.thechalkface.net/resources/Cuboid_Calculations.pdf	pdf	Homework	A nice introduction to the concept of density, using common or well known objects and giving plenty of practice calculating density from a given volume and mass. Solutions included. Lots of pictures.	GCSE	29/08/16	304
Geometry	Density Calculation**	http://www.thechalkface.net/resources/Density_Calculation.pdf	pdf	Worksheet	Loads of questions on enlargement, carefully scaffolded and building up throughout the booklet to lead students from making shapes bigger to using points of enlargement, fractional scale factors and even considering area scale factors.	KS3	29/08/16	305
Geometry	Enlargement Booklet**	http://www.thechalkface.net/resources/Enlargement_Booklet.pdf	pdf	Booklet	A nice application of speed distance time to thunderstorms. Using the speed of sound (and the assumption that light is crazy fast), students gradually work through the questions to find a method for predicting how far away a lightning strike is.	KS3	29/08/16	306
Geometry	Lightning Fast**	http://www.thechalkface.net/resources/Lightning_Fast.pdf	pdf	Worksheet	Lots of questions involving loci, starting with straightforward concepts and gradually building up from there. Written in the form of successive mini investigations punctuated with key ideas, this covers the locus of points a given distance from a point, a line or a circle.	KS3	29/08/16	307
Geometry	Loci Activities**	http://www.thechalkface.net/resources/Loci_Activities.pdf	pdf	Booklet	A quick introduction to the Reuleaux triangle - the simplest regular shape of constant width. This shape shares many properties with a circle, but somehow manages 3 corners at the same time. Nice and easy to construct (the intersection of three equal circles), calculating area or perimeter requires use of segment area and arc length.	KS3	29/08/16	308
Geometry	Reuleaux Triangle**	http://www.thechalkface.net/resources/Reuleaux_Triangle.pptx	pptx	Presentation	Beginning with rotating a single vertical or horizontal arrow from the origin by a multiple of 90 degrees, and progressing to rotation of 2D shapes from any point on the plane, this booklet gradually builds in difficulty. Complete	KS3	29/08/16	309
Geometry	Rotation Booklet**	http://www.thechalkface.net/resources/Rotation_Booklet.pdf	pdf	Booklet				

Geometry	Surface Area of a Cereal Box	http://www.thechalkface.net/resources/Surface_Area_of_a_Cereal_Box.pdf	pdf	Worksheet	A clear colourful introduction to surface area of cuboids using a cereal box. Students calculate the area of each face on the diagram (3D image and net both given), then find the total surface area. Solutions included.	KS3	29/08/16	310
Geometry	Surface Area of a Cuboid**	http://www.thechalkface.net/resources/Surface_Area_of_a_Cuboid.pdf	pdf	Worksheet	Detailed explanation of surface area including examples, then a number of questions with clear diagrams, some with squares showing and some without. Full solutions included.	KS3	29/08/16	311
Geometry	Understanding Sine Rule**	http://www.thechalkface.net/resources/Understanding_Sine_Rule.pdf	pdf	Fact Cards	A proof of sine rule based on the area formula for a triangle, followed by examples and explanation, and a section on the ambiguous case.	GCSE	29/08/16	312
Geometry	Volume Area Investigation Advanced**	http://www.thechalkface.net/resources/Volume_Area_Investigation_Advanced.pdf	pdf	Investigation	Formulae given for various common 3D shapes, then an explanation of an open investigation for students to complete involving finding a common household object,	GCSE	29/08/16	313
Geometry	Volume of a Cuboid**	http://www.thechalkface.net/resources/Volume_of_a_Cuboid.pdf	pdf	Worksheet	Detailed explanation of volume for cuboids including examples, then a number of questions with clear diagrams, some with squares showing and some without. Full solutions included.	KS3	29/08/16	314
Graphs	Battleships game	http://www.thechalkface.net/resources/battleships.xls	xls	Game	Place your ships, then input co-ordinates (1st quadrant) to select a square.	KS3	07/05/09	315
Graphs	The Simpsons Logic Puzzle	http://www.thechalkface.net/resources/logic_puzzle_simpsons.wmv	wmv	Problem	In addition to the logic puzzle within this clip, it can be used with the Distance-Time graphs presentation to link with that topic.	KS3	20/03/09	316
Graphs	The Simpsons Logic Puzzle	http://www.thechalkface.net/resources/Simpsons_puzzle.pdf	pdf	Game	Cut-outs to use when solving the Simpsons Logic Puzzle (see related video).	KS3	25/05/15	317
Graphs	Distance-Time Graphs 1	http://www.thechalkface.net/resources/distance-time_worksheet.pdf	pdf	Worksheet	A description of a journey is to be converted to graph form.	KS3	24/11/12	318
Graphs	Distance-Time Graphs 2	http://www.thechalkface.net/resources/distance-time_graphs.ppt	ppt	Presentation	To accompany the Distance-Time graphs worksheet.	KS3	23/03/09	319
Graphs	Sweden activity 1	http://www.thechalkface.net/resources/sweden.pdf	pdf	Worksheet	A real-life distance-time graph of a journey into Sweden, travelling on foot, by train, by ferry, by bus and hitch-hiking.	GCSE	22/03/09	320
Graphs	Sweden activity 2	http://www.thechalkface.net/resources/sweden.ppt	ppt	Presentation	To accompany the worksheet, this includes the same distance-time graph.	GCSE	11/03/10	321
Graphs	Conversion Graphs	http://www.thechalkface.net/resources/conversion_graphs.pdf	pdf	Worksheet	This spreadsheet is intended to demonstrate the links between $y=mx+c$ graphs and everyday situations.	KS3	05/02/11	322
Graphs	Pocket Money	http://www.thechalkface.net/resources/pocket_money.ppt	ppt	Presentation	A sequences problem requiring the use of a graph (see accompanying worksheet). Is it better to have your pocket money increase by £2 a week, £5 a week or to double every week?	KS3	28/02/12	323
Graphs	Pocket Money	http://www.thechalkface.net/resources/pocket_money.pdf	pdf	Worksheet	Accompanying worksheet - includes graph for students to fill in to determine when the doubling sequence overtakes the other two.	KS3	10/03/12	324
Graphs	Mobile Phone Contracts**	http://www.thechalkface.net/resources/mobile_phone_contracts.pdf	pdf	Worksheet	An investigation into mobile phone contracts - with a given up-front charge and a certain amount per month, which contract gives the best deal for a particular phone? Includes an introduction to $y=mx+c$ form, recognising lines, drawing lines with or without a table of values. Introduces the idea of parallel line gradients. Can be used in conjunction with	KS3	22/06/13	325
Graphs	Straight Line Graphs**	http://www.thechalkface.net/resources/straight_line_graphs.pptx	pptx	Presentation	An introduction to $y=mx+c$ form, recognising lines, drawing lines with or without a table of values. Introduces the idea of parallel line gradients. Can be used in conjunction with	KS3	14/02/13	326
Graphs	Grapher**	http://www.thechalkface.net/resources/grapher.xls	xls	Spreadsheet	An comprehensive easy-to-use interface allows the user to change the equations of two straight lines, set them to be perpendicular or parallel, find any points of intersection, and more.	GCSE	06/03/12	327
Graphs	Grapher Worksheet**	http://www.thechalkface.net/resources/grapher_worksheet.pdf	pdf	Worksheet	Accompanying worksheet - shows the lines from the above spreadsheet along with questions. Students need to write down the equations of the lines, identify highest and lowest	GCSE	23/02/12	328
Graphs	Straight Line Graphs Checklist	http://www.thechalkface.net/resources/straight_line_graphs_checklist.pdf	pdf	Checklist	A list of the key skills required to master straight line graphs up to GCSE level. Includes GCSE grades and shows progression through drawing a straight line from an	GCSE	14/02/13	329
Graphs	Quadratic Graphs**	http://www.thechalkface.net/resources/quadratic_graphs.ppt	ppt	Presentation	Examples of use of the parabola, how to draw a quadratic graph (including finding max or min from completing the square) and an introduction to the concept of a focus.	GCSE	24/11/12	330
Graphs	Quadratic Graph	http://www.thechalkface.net/resources/quadratic_graph.xls	xls	Interactive demonstration	Allows the user to change the variables of a quadratic (either in standard polynomial form or in completed square form), and generate its graph. The range of x values to be graphed is also customisable.	GCSE	12/04/12	331
Graphs	Solving Quadratics Graphically	http://www.thechalkface.net/resources/solving_quadratics_graphically.pdf	pdf	Fact Cards	Colour-coded examples and method for solving quadratic equations using graphical methods. Involves drawing a quadratic graph and linear graphs and reading off points.	GCSE	07/09/13	332
Graphs	FlightPath**	http://www.thechalkface.net/resources/flightpath.xls	xls	Investigation	A standalone spreadsheet task for pupil use - it allows the user to edit the speed and direction of a projectile and graphs the resulting parabola, also giving values for the	KS3	05/05/11	333

Graphs	Cubic Graphs Investigation**	http://www.thechalkface.net/resources/Cubic_Graphs_Investigation.pdf	pdf	Investigation	Relies on knowledge of a graphing program such as GeoGebra, and simply leads students through an open investigation into the types of graphs possible from a cubic function.	GCSE	08/04/15	334
Graphs	Trig Graphs	http://www.thechalkface.net/resources/Trig_Graphs.pdf	pdf	Worksheet	Examples of the three main trigonometric functions as graphs (for students to label axes) along with some	GCSE	08/04/15	335
Graphs	Exponential Growth Graph**	http://www.thechalkface.net/resources/Exponential_Growth_Graph.pdf	pdf	Worksheet	An introduction to the exponential curve. Students fill in a table of values, then sketch a graph representing compound interest at 20%. The graph is then used to answer questions specifically related to the value of the loan.	GCSE	07/03/16	336
Graphs	Midpoints Questions	http://www.thechalkface.net/resources/Midpoints_Questions.pdf	pdf	Worksheet	A set of questions on finding the midpoint of two coordinates. Uses diagrams and scaffolding questions.	GCSE	07/03/16	337
Graphs	Projectile Motion**	http://www.thechalkface.net/resources/Projectile_Motion.pdf	pdf	Worksheet	Sketch the graph of a parabolic trajectory from a given equation and table of values, then answer questions related to the application.	GCSE	07/03/16	338
Graphs	Simultaneous Line And Curve	http://www.thechalkface.net/resources/Simultaneous_Line_and_Curve.pdf	pdf	Worksheet	Examples and questions on solving simultaneous equations involving one linear and one quadratic function (including circles). Full solutions included.	GCSE	07/03/16	339
Graphs	Sketching Quadratics**	http://www.thechalkface.net/resources/Sketching_Quadratics.pdf	pdf	Worksheet	Examples, questions and full solutions - sketching quadratics from nicely factorable expressions.	GCSE	07/03/16	340
Statistics	Mean Average	http://www.thechalkface.net/resources/mean_average.xls	xls	Teacher Tool	Interactive demonstration of the idea behind the mean average - four buckets contain varying numbers of bricks. By removing bricks from one and adding to another, we can	KS3	07/11/11	341
Statistics	Averages	http://www.thechalkface.net/resources/averages.ppt	ppt	Presentation	An introduction to the three averages, using limericks and investigating word length.	KS3	23/11/11	342
Statistics	Averages from Frequency Tables	http://www.thechalkface.net/resources/frequency_averages.ppt	ppt	Presentation	A presentation - best accompanied by print-outs of the slide with the limericks on - which helps to teach the basics of	GCSE	13/06/11	343
Statistics	Averages Basics	http://www.thechalkface.net/resources/averages_basics.pdf	pdf	Fact Cards	Details of how to calculate the mean, median and mode for a list of numbers.	KS3	24/05/12	344
Statistics	Deal or no deal	http://www.thechalkface.net/resources/deal_or_no_deal.xls	xls	Game	Based on the popular TV show, this works best if you have envelopes containing monopoly money (sheets available to	KS3	31/12/12	345
Statistics	Averages for a frequency table	http://www.thechalkface.net/resources/averages_from_frequency_tables.pdf	pdf	Fact Cards	How to calculate the mean, median and mode from frequency tables (does not include grouped frequency).	GCSE	25/05/12	346
Statistics	Averages Challenges	http://www.thechalkface.net/resources/averages_challenge_questions.pdf	pdf	Worksheet	Questions that require some careful thinking (algebra comes in handy but is not necessarily essential), involving averages. In particular, interpreting changes in the mean average when members are added or removed from the population. Full solutions included.	GCSE	25/05/15	347
Statistics	Bank Notes Frequency Table**	http://www.thechalkface.net/resources/bank_notes_frequency_table.pdf	pdf	Worksheet	Based on the number of £5, £10, £20 and £50 notes in circulation in the UK, this uses mean, median and mode from a frequency table. Incorporates a sheet with hints, and another sheet with full solutions.	GCSE	25/05/15	348
Statistics	President Height Frequency Table**	http://www.thechalkface.net/resources/president_height_frequency_table.pdf	pdf	Worksheet	A frequency table detailing the heights of all 43 US presidents. Question involving estimating the mean from a frequency table. Full colour-coded solutions included.	GCSE	25/05/15	349
Statistics	Baby Quartiles**	http://www.thechalkface.net/resources/baby_quartiles.pdf	pdf	Worksheet	Using a baby growth chart to answer questions involving percentiles. Includes some information on definitions of median, quartiles and percentiles.	KS3	26/03/14	350
Statistics	Quartiles Interpretation	http://www.thechalkface.net/resources/quartiles_interpretation.pdf	pdf	Worksheet	A few short questions using data on income to interpret quartiles and percentiles. Includes some open ended questions and solutions.	KS3	26/03/14	351
Statistics	Common Mistakes Survey	http://www.thechalkface.net/resources/common_mistakes_survey.pdf	pdf	Worksheet	A questionnaire with errors hidden in every question (some more important / obvious than others, some questions have more than one problem). Designed to draw attention to frequently encountered errors with questions.	KS3	24/11/12	352
Statistics	Common Mistakes Survey	http://www.thechalkface.net/resources/common_mistakes_survey.ppt	ppt	Presentation	Accompanying presentation giving descriptions of common problems with the survey worksheet and key points to remember.	KS3	12/03/10	353
Statistics	Types of Data	http://www.thechalkface.net/resources/types_of_data.ppt	ppt	Presentation	Outlines the basics of data. Includes details of qualitative and quantitative, and continuous and discrete data.	KS3	23/05/12	354
Statistics	Types of Data	http://www.thechalkface.net/resources/types_of_data.pdf	pdf	Worksheet	To accompany Types of Data presentation. A fill-in-the-blanks sheet along with an additional task with a variety of examples of data collection. You are required to say what kind of data it represents.	KS3	17/05/13	355

Statistics	Data Key Terms	http://www.thechalkface.net/resources/Data_Key_Terms.pdf	pdf	Worksheet	A sheet for students to complete as part of a discussion of key terms required for the statistics element of a Maths GCSE. Includes types of data, types of data collection and forms of sampling. Includes full solutions.	GCSE	08/04/15	356
Statistics	Maths Survey**	http://www.thechalkface.net/resources/maths_survey.xls	xls	Teacher Tool	This is a survey that can be completed in the classroom, on a laptop. Results are automatically collated and displayed both as results tables and as bar graphs on separate sheets.	KS3	12/01/12	357
Statistics	Creating Surveys**	http://www.thechalkface.net/resources/creating_surveys.ppt	ppt	Presentation	Gives tips of what to watch out for when producing survey questions, then some introductory tasks (with timers) to build skills.	KS3	06/05/11	358
Statistics	6 Steps of Data Collection 1**	http://www.thechalkface.net/resources/6steps.ppt	ppt	Presentation	A summary of the data collection cycle, from predictions through questioning, collecting data, collating results, presenting data and drawing conclusions.	KS3	15/03/10	359
Statistics	6 Steps of Data Collection 2**	http://www.thechalkface.net/resources/6steps.pdf	pdf	Hand-out	To accompany data collection cycle presentation.	KS3	19/06/12	360
Statistics	Pie Chart	http://www.thechalkface.net/resources/pie_chart.xls	xls	Spreadsheet	Including a print-out version for students to use, this produces a pie chart based on values you can easily enter during a lesson. Categories easily customisable, numbers may be typed in or edited using a spinner.	KS3	27/02/12	361
Statistics	Venn and Carroll Diagrams	http://www.thechalkface.net/resources/venn.ppt	ppt	Presentation	An introduction to venn and carroll diagrams.	KS3	29/04/09	362
Statistics	Venn Diagrams**	http://www.thechalkface.net/resources/venn_diagrams.xls	xls	Spreadsheet	Using input data, a 2-set venn diagram is displayed, along with a selection of questions on the relative frequencies involved. 3-set venn diagram work in progress included.	KS3	31/01/11	363
Statistics	Types of Graph	http://www.thechalkface.net/resources/types_of_graph.ppt	ppt	Presentation	Describes some of the most common types of graphs for representing data, along with some of their advantages and disadvantages.	KS3	13/10/11	364
Statistics	Scattergraphs	http://www.thechalkface.net/resources/scattergraphs.ppt	ppt	Presentation	Description of the basics of scattergraphs, including correlation and lines of best fit.	GCSE	06/06/11	365
Statistics	Scattergraphs	http://www.thechalkface.net/resources/scattergraphs.xls	xls	Interactive Demonstration	For drawing a scattergraph in Excel. Includes match-up cards for printing out to go with scattergraphs.ppt.	GCSE	21/06/11	366
Statistics	AutoTrader Scattergraphs**	http://www.thechalkface.net/resources/autotrader_scattergraphs.pdf	pdf	Worksheet	An all-in-one worksheet on scattergraphs including graph paper comparing the asking price and mileage of a fair selection of a specific car from AutoTrader. Includes questions on line of best fit, interpolation and extrapolation.	KS3	17/07/13	367
Statistics	Misleading Graphs	http://www.thechalkface.net/resources/misleading_graphs.ppt	ppt	Presentation	Examples from newspapers of artistic graphs which distort the true data by one means or another.	KS3	13/01/12	368
Statistics	Memory	http://www.thechalkface.net/resources/memory.xls	xls	Spreadsheet	A list of creatures to memorise, with built-in timer. Designed to provide a fun talking tool and to use a graph to compare results and discuss reasons. Laws of primary and recency, etc.	KS3	13/02/10	369
Statistics	Memory Pictures	http://www.thechalkface.net/resources/memory_pics.ppt	ppt	Presentation	Pictures to go along with the list in memory.xls. May be used before or after, for comparison.	KS3	31/01/10	370
Statistics	Probability	http://www.thechalkface.net/resources/probability.pdf	pdf	Worksheet	Introducing the probability line, basic probability notation (fractions) and the basis for an experimental probability activity with sweets.	KS3	24/11/12	371
Statistics	Dice Knock-out	http://www.thechalkface.net/resources/dice_knockout.xls	xls	Game	Using either one or two dice, the game involves making predictions about the outcome of the roll. Screen shows	KS3	20/06/12	372
Statistics	Dice Race**	http://www.thechalkface.net/resources/dice_race.xls	xls	Game	Kids can bet on the outcome of this pseudo-horserace. Each of the numbers from 1 to 12 are runners in this race, where a horse gets to move forward if its number is the sum of two	KS3	24/11/12	373
Statistics	Fruit Machine	http://www.thechalkface.net/resources/fruit_machine.xls	xls	Game	A simple version of a fruit machine - click the button and see what colours show up. Useful for an interactive probability demonstration. Includes graphics of tree diagrams to show	KS3	20/06/11	374
Statistics	Lose the Counters**	http://www.thechalkface.net/resources/lose_counters.xls	xls	Game	A number of counters must be distributed across the numbers 1 to 12, and a counter is removed when its	KS3	24/11/12	375
Statistics	Probability Simulation	http://www.thechalkface.net/resources/probability_simulation.xls	xls	Interactive demonstration	Demonstrates the nature of large samples for a probability distribution. Originally set up with the probabilities for the sum of two 6-sided dice, the outcomes and probabilities are	KS3	13/11/12	376
Statistics	Probability investigation**	http://www.thechalkface.net/resources/probability_investigation.pdf	pdf	Worksheet	A homework task requiring students to throw a pair of dice thirty times (or use random.org to do it for them). The investigation is intended to alert students to the fact that	KS3	25/05/15	377
Statistics	Random Grid**	http://www.thechalkface.net/resources/random_grid.xlsx	xlsx	Teacher Tool	A visual representation of randomness. A simple application of conditional formatting to show up in a grid (either a 10 by 10 or a 50 by 100 grid) the outcome of any	KS3	25/05/15	378
Statistics	Counting Fish**	http://www.thechalkface.net/resources/Counting_Fish.pdf	pdf	Worksheet	An introduction to the Lincoln Peterson index method for estimating populations. Fish are caught, tagged and	GCSE	31/10/13	379

Statistics	Counting Fish**	http://www.thechalkface.net/resources/Counting_Fish.xlsm	xlsm	Investigation	Can be used in conjunction with Counting Fish worksheet. Allows the user to choose how many fish to tag and how large the sample taken subsequently should be, and awards payment based on the accuracy of predictions. Uses macros.	GCSE	31/10/13	380
Statistics	Relative Frequency Homework**	http://www.thechalkface.net/resources/Relative_Frequency_Homework.xls	xls	Homework	Questions on relative frequency, as an indicator of probability. Includes the idea of expected values.	GCSE	31/10/13	381
Statistics	Tree Diagram**	http://www.thechalkface.net/resources/Tree_Diagram.pdf	pdf	Worksheet	Tree diagram for three consecutive biased coin tosses. Students can add the probabilities and use them to answer questions given.	GCSE	08/02/14	382
Statistics	Scrabble Probability	http://www.thechalkface.net/resources/scrabble_probability.pdf	pdf	Worksheet	Probability calculations using Scrabble tiles. With and without replacement questions, including 'and' and 'or' probabilities.	GCSE	07/12/13	383
Statistics	Hi-Lo game	http://www.thechalkface.net/resources/hilo.xls	xls	Game	A simple card game based on probabilities - the player has to guess whether the next card will be higher or lower (5 cards altogether, from a 13 card suit). Optional computer calculation to give probabilities.	KS3	31/05/10	384
Statistics	Piggy Sixes	http://www.thechalkface.net/resources/piggy_sixes.xls	xls	Game	Roll a die as much as you like, to rack up a score of 100. Roll a 6 before you bank for your turn, however, and you forfeit that turn's accumulated points. Available as a 1- or 2-player	KS3	20/06/11	385
Statistics	Monty Hall Problem 1**	http://www.thechalkface.net/resources/monty_hall.xls	xls	Spreadsheet	This classic probability problem goes against intuitive thinking. The first step is to convince the audience that switching doors is a good idea (use the interactive spreadsheet to play the game). The second step is to explain	GCSE	28/06/12	386
Statistics	Monty Hall Problem 2**	http://www.thechalkface.net/resources/monty_hall.ppt	ppt	Presentation	To accompany Monty Hall presentation.	GCSE	24/03/10	387
Statistics	Take it or leave it**	http://www.thechalkface.net/resources/take_it_or_leave_it.xls	xls	Game	Ever tried to choose the biggest dessert at a restaurant, when they come out one by one? The theory of algorithms for choosing the best of a set of items when you only have the option to choose one at a time is an interesting one to investigate. Uses macros.	GCSE	31/12/12	388
Statistics	False Positive**	http://www.thechalkface.net/resources/False_Positive.pdf	pdf	Worksheet	Using conditional probability and talking through all the steps, investigating false positive and false negative rates and what they really mean for medical tests. Uses tree diagrams and Carroll diagrams.	GCSE	31/10/13	389
Statistics	False Positive Venn	http://www.thechalkface.net/resources/False_Positive_Venn.pdf	pdf	Worksheet	A Venn diagram version of the False Positive worksheet, using the diagram to interpret false positive results and determine the chance of being sick given a positive test result rather than the other way around. A notoriously confusing concept, made easier by considering frequencies	KS3	07/03/16	390
Statistics	Coin Toss Challenge	http://www.thechalkface.net/resources/coin_toss_challenge.pptx	pptx	Presentation	Toss a coin 20 times and record the results (HTT...), but first, cheat - write a series of Hs and Ts that seem random, and see if your teacher can guess which was the coin and which was you. Based on the fact that true randomness	KS3	07/03/16	391
Statistics	Flag Venn Diagrams	http://www.thechalkface.net/resources/Flag_Venn_Diagrams.pdf	pdf	Worksheet	Introducing the concept of Venn diagrams for categorising various flags. Includes questions on probability which the diagrams help you to answer. Full solutions included.	KS3	07/03/16	392
Statistics	Introduction To Probability**	http://www.thechalkface.net/resources/Introduction_to_Probability.pptx	pptx	Presentation	An excellent introduction to some of the history and usefulness of a rigorous approach to chance and uncertainty.	KS3	07/03/16	393
Statistics	Probability Investigation**	http://www.thechalkface.net/resources/Probability_Investigation.pdf	pdf	Investigation	For students to complete, investigating the distribution of scores when adding the total of two dice. While one individual's results may not be too convincing, average a whole class's results and it'll be remarkably close to the theoretical distribution.	KS3	07/03/16	394
Statistics	Probability Investigation Coins**	http://www.thechalkface.net/resources/Probability_Investigation_Coins.pdf	pdf	Investigation	Like the dice version, this requires students to count the number of tails when 6 coins are tossed. Yields a binomial distribution.	KS3	07/03/16	395
Statistics	Probability Simulation**	http://www.thechalkface.net/resources/Probability_Simulation.xls	xls	Spreadsheet	Interactive demonstration of probability - set up your own distribution to generate random samples or use a basic binomial calculator to tell you how many of your results you would expect to lie between various numbers.	KS3	07/03/16	396
Statistics	Probability Table	http://www.thechalkface.net/resources/Probability_Table.pdf	pdf	Worksheet	A few questions taking information from a table, involving conditional probability.	KS3	07/03/16	397
Statistics	Scrabble Probability	http://www.thechalkface.net/resources/Scrabble_Probability.pdf	pdf	Worksheet	Mutually exclusive, and independent, events. Practice combining probabilities using scrabble tile frequencies.	KS3	07/03/16	398
Statistics	Venn Diagram Blanks	http://www.thechalkface.net/resources/Venn_Diagram_Blanks.pdf	pdf	Hand-out	Blanks for Venn diagram questions - two to a page, one sheet with 2-set Venn diagrams, one with 3-set diagrams.	KS3	07/03/16	399
Statistics	Venn Diagram Problems	http://www.thechalkface.net/resources/Venn_Diagram_Problems.pdf	pdf	Worksheet	Involved problems requiring Venn diagrams to solve, including hints pages and full solutions.	KS3	07/03/16	400

Statistics	Venn Diagrams Intro	http://www.thechalkface.net/resources/Venn_Diagrams_Intro.pptx	pptx	Presentation	Introduction to the concept of categorizing using Venn diagrams with a few non-numerical examples, then one involving primes and factors.	KS3	07/03/16	401
Statistics	Snail Race	http://www.thechalkface.net/resources/snail_race.pdf	pdf	Activity	A bit of fun based on the idea of random walks. Students generate a random direction (up/down/left/right) and race to see whose path leaves the square first. Designed for work in pairs, no dice needed. Can lead into investigations involving relative frequency and the laws of large numbers.	Other	30/09/14	402
Statistics	Conditional Probability	http://www.thechalkface.net/resources/Conditional_Probability.pdf	pdf	Worksheet	A few questions on the topic of musical and mathematical ability to explain conditional probability. Full solutions included.	GCSE	29/08/16	403
Statistics	Exploding Stars	http://www.thechalkface.net/resources/Exploding_Stars_Conditional_Probability.pdf	pdf	Worksheet	A mathematical analysis of that popular XKCD cartoon on statistics. Uses conditional probability to determine	GCSE	29/08/16	404
Statistics	Using Tree Diagrams	http://www.thechalkface.net/resources/Using_Tree_Diagrams.pdf	pdf	Worksheet	Uses frequencies rather than probabilities to develop a good conceptual basis for tree diagrams.	KS3	29/08/16	405
C1	Optimisation	http://www.thechalkface.net/resources/optimisation.ppt	ppt	Problem	A simple optimisation problem based on a quadratic (so it can be solved by sketching a curve or completing the square).	A-Level	08/06/10	406
C1	Jupiter's Moons 1	http://www.thechalkface.net/resources/jupiter.xls	xls	Activity	Pupils have to produce a simplified astronomical model of the order of jupiter's moons and their equations of motion - requires circle equations.	A-Level	02/03/09	407
C1	Jupiter's Moons 2	http://www.thechalkface.net/resources/jupiter.ppt	ppt	Presentation	To accompany the above activity - gives the solution equations.	A-Level	02/03/09	408
C1	Surds Investigation**	http://www.thechalkface.net/resources/A4_Surds.pdf	pdf	Worksheet	Beginning by proving why the ratio of an A4 sheet approximates to $1:\sqrt{2}$, and moving on to a simple folding exercise which leads to a problem involving surds. Includes multiplying brackets such as $(1+\sqrt{2})$ together.	A-Level	24/04/12	409
C1	Surds Investigation**	http://www.thechalkface.net/resources/A4_Surds.ppt	ppt	Activity	Accompanying PowerPoint - proving some results based on the ratio of A4 sheets.	A-Level	16/09/11	410
C1	Focus and Directrix	http://www.thechalkface.net/resources/focus_and_directrix.xls	xls	Spreadsheet	Shows a graph (and the equation) of the quadratic generated by a focus and directrix. The focus and directrix can be altered and the graph of the parabola is automatically updated.	A-Level	03/02/11	411
C1	Introduction to Calculus**	http://www.thechalkface.net/resources/calculus/index.htm	htm	Interactive demonstration	For use when introducing calculus - using the intuitive understanding of differentiation as the gradient of a line. Uses an embedded GeoGebra applet to allow modification.	A-Level	01/10/13	412
C1	Calculus Intro**	http://www.thechalkface.net/resources/Calculus_Intro.pdf	pdf	Worksheet	Beginning with gradient, a clear colour-coded sheet walking students through estimating the gradient of the standard quadratic graph, then looking for a pattern or rule. A good way to understand the concept of the slope of a curve.	A-Level	07/03/16	413
C1	Introduction To Integration**	http://www.thechalkface.net/resources/Introduction_to_Integration.pdf	pdf	Booklet	Thorough introduction to integration including exercises, exam questions and examples of applications. Includes full solutions.	A-Level	07/03/16	414
C1	Investigating Integration	http://www.thechalkface.net/resources/investigating_Integration.pdf	pdf	Worksheet	A neat introduction to integration using the concept of reversing differentiation: students have to reverse-engineer an original expression and try to derive a general rule for polynomials.	A-Level	07/03/16	415
C1	C1 Not-Formula Book**	http://www.thechalkface.net/resources/notformulabooks/C1_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Core 1 exam, but not provided in the formula book. Valuable for revision or as an additional resource during teaching of the module.	A-Level	05/04/13	416
C1	C1 Essentials**	http://www.thechalkface.net/resources/C1_Essentials.pdf	pdf	Fact Cards	Designed to fit on a single side of A4 (still readable when shrunk to A6 size as a pocket-sized revision card), this summarises all the key results, facts and formulae from the AQA Core 1 Mathematics module. For more in-depth	A-Level	04/06/14	417
C2	Graph Transformations**	http://www.thechalkface.net/resources/graph_transformations.pdf	pdf	Investigation	Designed for students to use at home, taking advantage of the graphical calculator function of Google search, to investigate the effect of various changes to a function. Includes the four main transformations; translations and stretches in the x and y direction, with extension questions on reflections.	A-Level	08/02/14	418
C2	Money Matters	http://www.thechalkface.net/resources/money_matters.pdf	pdf	Worksheet	A problem involving arithmetic series. One person's starting salary is lower but increases faster than that of another. Calculate how long it will be till one salary overtakes the other, and - crucially - how long until total	A-Level	08/03/14	419
C2	Zeno's Paradoxes	http://www.thechalkface.net/resources/zeno.pdf	pdf	Worksheet	A description of the three main paradoxes of Zeno, by way of an introduction to infinite sums. Can be used when beginning geometric series, and asks the student to refute the arguments.	A-Level	22/02/13	420

C2	Geometric Series**	http://www.thechalkface.net/resources/geometric_series.pdf	pdf	Worksheet	Introduction to the idea of summing to infinity using geometric series, with screenprints from Buffer (see below), followed by three examples of shapes created by an infinite iteration but with finite area and perimeter, to be found by applying geometric series formulae. Also includes ball bouncing problem.	A-Level	05/04/13	421
C2	Buffer**	http://www.thechalkface.net/resources/buffer.xls	xls	Interactive demonstration	This is designed to illustrate the link between video buffering and geometric progressions. An infinite sum can be more easily visualised in the context of a common phenomenon - customisable times and buffer delays.	A-Level	29/09/11	422
C2	Currency**	http://www.thechalkface.net/resources/currency.pdf	pdf	Worksheet	A look at currency conversion rates and how geometric series can be used to examine the effect of repeated buying and selling. Uses the n th term formula and logarithms, but no knowledge of the sum or infinite sum formulae is required.	A-Level	05/04/13	423
C2	Geometric Management	http://www.thechalkface.net/resources/geometric_management.pdf	pdf	Worksheet	Somewhat far-fetched problem based around the combination of percentage increases and decreases, producing a maths problem requiring use of Geometric Series formulae as well as logarithms. Includes solutions.	A-Level	24/04/12	424
C2	Gender Balance	http://www.thechalkface.net/resources/gender_balance.pdf	pdf	Worksheet	Using the concept of geometric series to solve a theoretical problem about gender bias. If families keep having kids until they have a son, then stop, what will the eventual proportions of boys and girls be?	A-Level	26/03/14	425
C2	Superman Bleep Test	http://www.thechalkface.net/resources/superman_bleep_test.pdf	pdf	Hand-out	Not an activity, just some musings into what it would be like if an unlimited athlete took a (suitably modified) bleep test. Involves geometric series calculations and lots of	A-Level	07/09/13	426
C2	Baked Beans	http://www.thechalkface.net/resources/baked_beans.ppt	ppt	Problem	Why is a baked bean can that shape? Assuming a cylindrical form is best, what dimensions are optimal for the best surface area to volume ratio? This requires some basic	A-Level	20/01/10	427
C2	Optimisation**	http://www.thechalkface.net/resources/optimisation.pdf	pdf	Worksheet	Similar to the Baked Bean presentation, this is a worksheet that goes through the process of optimising the surface area to volume ratio for a cylinder. Includes fully worked solutions.	A-Level	05/04/13	428
C2	Oil Drum Optimisation**	http://www.thechalkface.net/resources/oil_drum_optimisation.pdf	pdf	Worksheet	Using different values for the curved and flat surfaces of an oil drum, this worksheet calculates the optimal dimensions	A-Level	07/12/13	429
C2	Binomial Expansion**	http://www.thechalkface.net/resources/binomial_expansion.xlsm	xlsm	Spreadsheet	For expansions of the form $(a + b)^c$ this will give the expansion to the x^{10} term. Deals with negative and fractional powers, too. This is made in Excel 2007, and contains macros.	A-Level	28/09/12	430
C2	Logarithms Intro	http://www.thechalkface.net/resources/Logarithms_Intro.pdf	pdf	Problem	A short question asking for missing values in a compound interest scenario. Some can be found simply by applying powers, or by rooting, but to reverse exponentiation it is necessary to use trial and error (until logarithms are introduced). Good starter activity.	A-Level	16/02/15	431
C2	Logarithms Concept**	http://www.thechalkface.net/resources/Logarithms.pdf	pdf	Worksheet	An early introduction to logarithms, designed to demonstrate how they build upon the concept of multiplicative counting, and includes a range of carefully crafted questions which test the understanding, primarily, of index rules. Ideal for extension GCSE, or to tackle before getting onto the rules of logarithms.	A-Level	08/04/15	432
C2	Log Rules	http://www.thechalkface.net/resources/log_rules.pdf	pdf	Hand-out	Revision-style sheet covering the basics of logarithms and their associated rules.	A-Level	01/12/11	433
C2	Intro To Logarithms**	http://www.thechalkface.net/resources/intro_to_Logarithms.pptx	pptx	Presentation	To accompany Introducing Logarithms booklet.	A-Level	07/03/16	434
C2	Introducing Logarithms**	http://www.thechalkface.net/resources/introducing_Logarithms.pdf	pdf	Booklet	Intuitive introduction to logarithms and the logarithmic scale, full of examples and mini thought-experiments to help students grasp the value of using logarithms. Includes questions and solutions.	A-Level	07/03/16	435
C2	Working With Logarithms**	http://www.thechalkface.net/resources/Working_with_Logarithms.pdf	pdf	Booklet	Booklet aimed at developing a deeper understanding of logarithms, including how they are used to solve specific problems, what the most commonly used bases are and why, a neat example involving working out the number of	A-Level	07/03/16	436
C2	C2 Checklist**	http://www.thechalkface.net/resources/C2_Checklist.pdf	pdf	Checklist	A 2-page summary of the key skills required by the Core 2 module. Listed under chapter headings, with space for students to indicate their level of understanding. For use when revising and identifying areas of weakness.	A-Level	14/04/14	437
C2	Core 2 Challenge Questions	http://www.thechalkface.net/resources/c2_challenge_questions.pdf	pdf	Test	A collection of some of the trickier past paper questions from AQA MPC2. Approximately 2 hours' worth (around 100 marks), with one version that includes hints as well as mark schemes included at the end.	A-Level	25/05/15	438
C2	C2 Not-Formula Book**	http://www.thechalkface.net/resources/notformulabooks/C2_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Core 2 exam, but not provided in the formula book. Valuable for revision or as an additional resource during teaching of the module.	A-Level	05/04/13	439
C2	C2 Essentials**	http://www.thechalkface.net/resources/C2_Essentials.pdf	pdf	Fact Cards	Designed to fit on a single side of A4 (still readable when shrunk to A6 size as a pocket-sized revision card), this summarises all the key results, facts and formulae from the AQA Core 2 Mathematics module. For more in-depth revision, see the C2 Not-Formula Book.	A-Level	04/06/14	440

C3	Compound Interest	http://www.thechalkface.net/resources/Compound_Interest.pdf	pdf	Worksheet	A step-by-step worksheet which leads you through the derivation of e (Euler's number) as the limit of a series. Based on the concept of compound interest paid yearly, monthly, weekly, daily, etc, the number e gives a limit the overall income cannot exceed.	A-Level	27/06/14	441
C3	Trigonometry Circle**	http://www.thechalkface.net/resources/trigcircle.htm	htm	Interactive demonstration	A GeoGebra generated applet embedded in a web page - by changing the angle of a point on the unit circle, the ratios of \sin , \cos and \tan are generated (and shown on a concurrent graph).	A-Level	22/06/13	442
C3	Trig Transformations	http://www.thechalkface.net/resources/trig_transformations.xls	xls	Spreadsheet	A graph of the trigonometric function $y = \sin(x)$, but with the option to modify elements of it to demonstrate common graph transformations. $y = a \sin(bx + c) + d$.	A-Level	22/06/13	443
C3	Graph Transformation Challenges**	http://www.thechalkface.net/resources/graph_transformation_challenges.pdf	pdf	Booklet	Some increasingly challenging questions involving stretches and translations in the x and y direction, reflections in the axes and then modulus function transformations, including compound transformations. Includes full solutions.	A-Level	25/05/15	444
C3	Trigonometric Equation	http://www.thechalkface.net/resources/trigonometric_equation.pdf	pdf	Problem	A trigonometry problem involving manipulation of \sec \csc \cot functions and solving a (simple) trig quadratic equation (requiring a modified solution range). Good plenary question incorporating skills from trig identities and trig equations topics.	A-Level	28/06/13	445
C3	Integration**	http://www.thechalkface.net/resources/integration.pdf	pdf	Fact Cards	Parts, Substitution, Inspection and Standard Results. Includes examples of each, and a break down of how to use (including parts twice, 'backwards' substitutions, etc).	A-Level	25/04/15	446
C3	Europa**	http://www.thechalkface.net/resources/europa.pdf	pdf	Worksheet	An activity on the C3 topic of volumes of revolution. The task is to calculate the volume of a dome built as a partial sphere. Set on the most likely base of human extra-	A-Level	24/04/12	447
C3	Jodrell Bank**	http://www.thechalkface.net/resources/jodrell_bank.pdf	pdf	Worksheet	Volumes of revolution question, involving some manipulation of functions and an element of problem solving - how much water would the Jodrell Bank satellite dish hold? Includes solutions.	A-Level	24/11/12	448
C3	Dome Sweet Dome	http://www.thechalkface.net/resources/Dome_Sweet_Dome.xls	xls	Teacher Tool	Can be used as an accompaniment for Europa - is a useful calculator which utilizes formulae derived from Volumes of Revolution as well as some simple iterations on a cubic equation to calculate the volume for a given size of sphere-	A-Level	25/09/12	449
C3	Numerical Integration	http://www.thechalkface.net/resources/numerical_integration.xls	xls	Interactive demonstration	Allows the user to input functions and have Excel calculate approximations using the Mid-Ordinate, Trapezium and Simpson's Rule, illustrating the difference between the	A-Level	24/09/12	450
C3	Numerical Integration**	http://www.thechalkface.net/resources/Numerical_Integration.pdf	pdf	Fact Cards	An overview of the three main numerical integration methods described in AQA Core 3: Trapezium rule, Mid-ordinate rule and Simpson's rule. The rules are compared, represented graphically and their respective accuracy / error terms investigated.	A-Level	16/02/15	451
C3	C3 Alternate Paper	http://www.thechalkface.net/resources/C3_Alternate_Paper.pdf	pdf	Exam Paper	An alternate version of the 2014 AQA Core 3 A-level paper, with questions designed to be similar but sufficiently different to work well as a second bite at the cherry for students who have already attempted the real thing. Includes full solutions.	A-Level	16/02/15	452
C3	C3 Not-Formula Book**	http://www.thechalkface.net/resources/notformulabooks/C3_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Core 3 exam, but not provided in the formula book. Valuable for revision or as an additional resource during teaching of the module.	A-Level	11/10/11	453
C3	C3 Essentials**	http://www.thechalkface.net/resources/C3_Essentials.pdf	pdf	Fact Cards	Designed to fit on a single side of A4 (still readable when shrunk to A6 size as a pocket-sized revision card), this summarises all the key results, facts and formulae from the AQA Core 3 Mathematics module. For more in-depth revision, see the C3 Not-Formula Book.	A-Level	04/06/14	454
C4	Compound Angles Proof	http://www.thechalkface.net/resources/compound_angles.xls	xls	Demonstration	A brief illustration of the proof of the compound angle formula for $\cos(A-B)$. A similar idea can be used to prove $\sin(A+B)$, etc.	A-Level	02/02/12	455
C4	Exponential Rabbits	http://www.thechalkface.net/resources/rabbits.pdf	pdf	Worksheet	A series of questions on exponential growth and decay, on the subject of the rabbit population of Australia.	A-Level	09/03/12	456
C4	Carbon Dating**	http://www.thechalkface.net/resources/carbon_dating.pdf	pdf	Worksheet	Based on the Otzi man discovered preserved by a glacier, this worksheet uses the principle of exponential decay to investigate the concept of carbon dating.	A-Level	07/12/13	457
C4	Over The Moon**	http://www.thechalkface.net/resources/over_the_moon.pdf	pdf	Worksheet	A population prediction based on the UK colonizing the Moon, using principles from exponential growth.	A-Level	07/12/13	458

C4	C4 Checklist**	http://www.thechalkface.net/resources/C4_Checklist.pdf	pdf	Checklist	A 2-page summary of the key skills required by the Core 4 module. Listed under chapter headings, with space for students to indicate their level of understanding. For use when revising and identifying areas of weakness.	A-Level	05/03/14	459
C4	C4 Not-Formula Book**	http://www.thechalkface.net/resources/notformulabooks/C4_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Core 4 exam, but not provided in the formula book. Valuable for revision or as an	A-Level	11/06/12	460
C4	C4 Essentials**	http://www.thechalkface.net/resources/C4_Essentials.pdf	pdf	Fact Cards	Designed to fit on a single side of A4 (still readable when shrunk to A6 size as a pocket-sized revision card), this summarises all the key results, facts and formulae from the AQA Core 4 Mathematics module. For more in-depth revision, see the C4 Not-Formula Book.	A-Level	13/06/14	461
M1	Language of Maths**	http://www.thechalkface.net/resources/language_of_maths.ppt	ppt	Quiz	This PowerPoint quiz encourages students to recognise and interpret the specialist vocabulary of the Maths Mechanics classroom. Common phrases and sayings are converted into	A-Level	06/09/12	462
M1	Language of Maths**	http://www.thechalkface.net/resources/language_of_maths.pdf	pdf	Worksheet	Alternative to the above quiz - this is a worksheet that can be used to help students identify Mechanics lingo. Common phrases and sayings need to be matched up with their Mechanics-speak versions.	A-Level	21/06/11	463
M1	Deriving SUVAT	http://www.thechalkface.net/resources/deriving_suvat_equations.pdf	pdf	Fact Cards	Aimed at teachers, but can be used by students. This goes through the process of deriving the kinematics equations we know and love from the basic principles of the definition of average speed under constant acceleration and the definition of constant acceleration.	A-Level	27/10/14	464
M1	SUVAT Equations**	http://www.thechalkface.net/resources/suvat_equations.xls	xls	Spreadsheet	The kinematic equations of motion for constant acceleration. Enter the known quantities for initial and final speed, distance, time and acceleration, and have this calculator work out the rest.	A-Level	27/12/10	465
M1	Stopping Distances**	http://www.thechalkface.net/resources/stopping_distances.pdf	pdf	Worksheet	Using the kinematic (SUVAT) equations, students calculate stopping distances for cars travelling at slightly different speeds, then investigate a scenario involving a motorway crash. Uses the deceleration rate used in calculations by the	A-Level	07/09/13	466
M1	Space Jump**	http://www.thechalkface.net/resources/Space_Jump.pdf	pdf	Worksheet	A series of questions requiring use of kinematics SUVAT equations, number-crunching the Red Bull Stratos space jump by Felix Baumgartner. Includes extension question set on the moon (where parachutes do little good). Full solutions included.	A-Level	18/10/12	467
M1	Slippery Slope**	http://www.thechalkface.net/resources/slippery_slope.pdf	pdf	Worksheet	Based on the story of Touching the Void, this worksheet requires construction of accurate force diagrams, resolving of forces on a slope including friction and tension in a rope.	A-Level	27/10/12	468
M1	Hold On	http://www.thechalkface.net/resources/hold_on.pdf	pdf	Worksheet	An application of SUVAT equations, this task investigates how much you could slow down a falling object that was too heavy to hold, and how much extra time you could buy for yourself. Includes solutions.	A-Level	26/06/12	469
M1	Falling Problem	http://www.thechalkface.net/resources/Falling_Problem.pdf	pdf	Worksheet	A pulleys question involving particles moving vertically. By resolving forces and using $F=ma$, followed by simultaneous equations, the resulting acceleration can be found for the various stages of motion, and SUVAT equations are used to find final velocity and time.	A-Level	15/12/12	470
M1	Breaking Strain	http://www.thechalkface.net/resources/Breaking_Strain.pdf	pdf	Worksheet	One Land Rover pulling another over a peak. A problem involving pulleys and particles on inclined planes requiring resolving of forces and solving simultaneous equations to find out if a cable can take the strain.	A-Level	15/12/12	471
M1	Heave Ho**	http://www.thechalkface.net/resources/heave_ho.pdf	pdf	Worksheet	Applying knowledge of projectile motion using 2D kinematics formulae to heaving lines on board ship. Students are required to calculate horizontal range when starting and finishing height are different.	A-Level	21/01/13	472
M1	Spiderman Projectiles	http://www.thechalkface.net/resources/spiderman.pdf	pdf	Problem	A somewhat complex projectiles problem for Mechanics module M1, involving MJ falling from a balcony and Spiderman jumping after her from a nearby building. We suspect that being caught after such a fall would have an	A-Level	14/11/11	473
M1	Trebuchet Projectiles	http://www.thechalkface.net/resources/trebuchet_projectiles.pdf	pdf	Worksheet	Questions involving the Warwick Castle trebuchet. Find the range given the speed, the speed given the range and finally the angle given both the speed and the range (this last involves the sine double angle formula, but this is included in the question). Includes full solutions.	A-Level	26/04/14	474
M1	Lord Franklin Vectors	http://www.thechalkface.net/resources/Lord_Franklin_Vectors.pdf	pdf	Worksheet	A question involving the two ships of Lord Franklin's famed attempt to chart the Northwest Passage. 2-D vectors, involves minimising a quadratic to find the closest distance between the ships. Includes solutions.	A-Level	24/04/12	475
M1	Zorb	http://www.thechalkface.net/resources/zorb.pdf	pdf	Worksheet	An involved problem which incorporates elements of each of the chapters from the M1 textbook. The theme revolves around Zorbing. Includes solutions.	A-Level	28/04/11	476
M1	Weight and Mass**	http://www.thechalkface.net/resources/Weight_and_Mass.pdf	pdf	Fact Cards	Detailed explanation and clarification on the differences between weight and mass, addressing the common misconceptions held by many as a result of the two being used interchangeably outside the scientific community.	A-Level	06/05/13	477

M1	Paris Gun	http://www.thechalkface.net/resources/Paris_Gun.pdf	pdf	Worksheet	The Paris Gun was one of the largest pieces of artillery ever, designed to fire a shell from Germany to Paris. This worksheet investigates its properties using projectile motion.	A-Level	07/03/16	478
M1	Suvat Telegraph Poles	http://www.thechalkface.net/resources/SUVAT_Telegraph_Poles.pdf	pdf	Problem	A full worked solution for a notoriously tricky SUVAT question from the AQA M1 textbook involving the time it takes a train to pass between 3 telegraph poles.	A-Level	07/03/16	479
M1	M1 Checklist	http://www.thechalkface.net/resources/M1_Checklist.pdf	pdf	Checklist	A 2-page summary of the key skills required by the Mechanics 1 module. Listed under chapter headings, with space for students to indicate their level of understanding. For use when revising and identifying areas of weakness.	A-Level	14/02/13	480
M1	M1 Ideas Test**	http://www.thechalkface.net/resources/M1_Ideas_Test.pdf	pdf	Test	A test with no calculations or working out - these 20 questions (with attached solutions) are designed to make sure students have understood the key concepts, and to make them dig a little deeper into how well they understand the rules and formulae they apply.	A-Level	06/05/13	481
M1	M1 Not-Formula Book**	http://www.thechalkface.net/resources/notformulaebooks/M1_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Mechanics 1 exam, but not provided in the formula book. Valuable for revision or as an additional resource during teaching of the module.	A-Level	08/12/12	482
M1	M1 Essentials**	http://www.thechalkface.net/resources/M1_Essentials.pdf	pdf	Fact Cards	Designed to fit on a single side of A4 (still readable when shrunk to A6 size as a pocket-sized revision card), this summarises all the key results, facts and formulae from the AQA Mechanics 1 Mathematics module. For more in-depth revision, see the M1 Not-Formula Book.	A-Level	27/06/14	483
M2	Sofa Moments	http://www.thechalkface.net/resources/Sofa_Moments.pdf	pdf	Worksheet	When you're carrying a sofa with someone, what do we mean by "I've got the heavy end"? The weight doesn't change, and it's not even a different distance from either end. This worksheet can be used to accompany a teaching point about moments and how we can use them to	A-Level	06/05/13	484
M2	Sleeper Moment**	http://www.thechalkface.net/resources/sleeper_moment.pdf	pdf	Worksheet	Requires the student to annotate a diagram with forces based on a photograph of a real situation, and, using resolving of forces and taking moments, to calculate unknown forces as well as finding the coefficient of friction. Based on building a house out of railway sleepers.	A-Level	07/09/13	485
M2	Centre of Mass	http://www.thechalkface.net/resources/centre_of_mass.xls	xls	Spreadsheet	A useful calculator for compound centre of mass problems. Currently allows the user to calculate the combined centre of mass of a uniform lamina made of up to 10 triangles, or a convex polygon of up to 100 sides.	A-Level	13/10/12	486
M2	All About Energy**	http://www.thechalkface.net/resources/all_about_energy.pdf	pdf	Booklet	This booklet covers all the key ideas about energy from Mechanics 2, from work done to kinetic, gravitational potential and elastic potential. Includes clear explanations of conservation of energy and real-world examples of energy quantities. Full of examples and pictures.	A-Level	27/10/14	487
M2	Space Jump Energy**	http://www.thechalkface.net/resources/space_jump_energy.pdf	pdf	Worksheet	An alternate version of the Space Jump worksheet, examining the Felix Baumgartner jump from 128000 feet using kinetic energy, gravitational potential and work done.	A-Level	05/11/12	488
M2	Nerf Energy**	http://www.thechalkface.net/resources/Nerf_Energy.pdf	pdf	Problem	A problem combining projectile motion and elastic potential energy, based around the popular foam-dart 'Nerf' guns.	A-Level	31/05/12	489
M2	Bungee Calculator**	http://www.thechalkface.net/resources/bungee.xls	xls	Interactive demonstration	Input the natural length and modulus of elasticity for a bungee rope, and the mass of the jumper, and not only does this calculator tell you how far down you would go, but	A-Level	09/03/13	490
M2	Dam Jumpers**	http://www.thechalkface.net/resources/dam_jumpers.pdf	pdf	Worksheet	A worksheet based around the Verzasca dam bungee jump from GoldenEye. Requires the use of elastic potential energy. Includes fully worked solutions.	A-Level	01/10/13	491
M2	Bungee Energy**	http://www.thechalkface.net/resources/bungee_energy.pdf	pdf	Fact Cards	Details of the amount and type of energy a bungee jumper has at different points in the jump. Energy is transferred from gravitational potential to kinetic initially, then to kinetic and elastic potential, then from gravitational and kinetic to elastic. Also includes details of speed and	A-Level	12/04/14	492
M2	Pedal Power**	http://www.thechalkface.net/resources/pedal_power.pdf	pdf	Worksheet	Requires use of the basic $P=Fv$ formula for power, and makes use of real statistics on cyclist power output to calculate maximum speeds on flat ground. Includes a refinement taking air resistance to be proportional to the	A-Level	11/11/14	493
M2	Rolling Projectiles**	http://www.thechalkface.net/resources/rolling_projectiles.pdf	pdf	Problem	A tricky problem beginning with vertical circles and circular motion (a small sphere rolling off a larger one), and extending it to determine, through projectile motion (M1 material, but very algebraic) where the small sphere will eventually land.	A-Level	09/06/12	494
M2	Going Round**	http://www.thechalkface.net/resources/going_round.pdf	pdf	Worksheet	Introduction to circular motion using the idea of angular speed. The Earth travels around the Sun at a faster speed, but at a slower angular speed than the Moon goes around the Earth.	A-Level	07/12/13	495

M2	Geostationary Orbit**	http://www.thechalkface.net/resources/geostationary_orbit.pdf	pdf	Worksheet	Using some basic formulae from the start of horizontal circular motion, we calculate the required altitude for a geostationary orbit. Gravitational force formula provided, so the only requirements are calculating speed, angular speed, and using $F=ma$.	A-Level	21/01/13	496
M2	Round The Bend**	http://www.thechalkface.net/resources/round_the_bend.pdf	pdf	Worksheet	Questions involving horizontal circular motion in the context of banked curves on roads and racetracks, and the part friction plays in maintaining motion in a circle.	A-Level	14/01/13	497
M2	Up The Wall**	http://www.thechalkface.net/resources/up_the_wall.pdf	pdf	Worksheet	A challenging activity on the application of horizontal circles in M2. Based on the concept of the motorcycle daredevil display on a circular vertical wall. Why does the driver not fall down? What is the minimum speed necessary? How does friction affect it?	A-Level	14/01/13	498
M2	Banked Curve Calculator**	http://www.thechalkface.net/resources/banked_curve_calculator.xls	xls	Interactive demonstration	Accompanying spreadsheet to Round The Bend and Up The Wall. To be used either in setting questions or in an interactive investigation. Allows the user to change conditions on banked curves (including wall of death scenarios) and observe the effects on horizontal circular motion, deriving it from first principles to find acceleration and velocity in relation to displacement.	A-Level	14/01/13	499
M2	Mathematics of Circular Motion	http://www.thechalkface.net/resources/Mathematics_of_Circular_Motion.pdf	pdf	Fact Cards	Building on the solution to a kinematics problem, this document goes through the mathematics behind circular motion, deriving it from first principles to find acceleration and velocity in relation to displacement.	A-Level	16/02/15	500
M2	Vertical Circles Info**	http://www.thechalkface.net/resources/vertical_circles.pdf	pdf	Fact Cards	Details of the difference in approach between the three main types of vertical circular motion scenarios - inner circles (ball on string, car in loop-the-loop track), outer circles (car cresting hill, object rolling off a sphere) and fixed circles (bead on a wire, roller-coaster attached to a fill-the-blanks revision sheet for circular motion (constant and variable speed) including a copy with sections filled in. Contains a summary of all key information required for the course.	A-Level	24/05/12	501
M2	Circular Motion Key Points**	http://www.thechalkface.net/resources/circular_motion_key_points.pdf	pdf	Fact Cards	A fill-the-blanks revision sheet for circular motion (constant and variable speed) including a copy with sections filled in. Contains a summary of all key information required for the course.	A-Level	21/04/15	502
M2	Loop the Loop**	http://www.thechalkface.net/resources/loop_the_loop.pdf	pdf	Worksheet	Based on the Fifth Gear / Dunlop loop the loop stunt using a normal car and a 12m diameter loop of track. Asks questions involving minimum speeds and maximum normal reactions - the two main concerns of the stunt team setting up the stunt.	A-Level	12/05/14	503
M2	London Eye	http://www.thechalkface.net/resources/london_eye.pdf	pdf	Worksheet	A tricky set of questions involving the circular motion of the London Eye - a very large Ferris wheel. Made difficult because the circular motion is constant but - because it is	A-Level	25/05/15	504
M2	Deriving Circular Motion	http://www.thechalkface.net/resources/deriving_circular_motion.pdf	pdf	Booklet	An explanation based on differentiation of the circular motion formulae. Not necessary for students to be able to derive, but reinforces understanding.	A-Level	28/10/14	505
M2	Beetle Drop**	http://www.thechalkface.net/resources/beetle_drop.pdf	pdf	Worksheet	Based on the Top Gear race between a VW Beetle and a Porsche 911, where the Beetle starts 1 mile above the finish line, this problem starts with straightforward kinematics and then energy considerations, then introduces differential equations to take into account air resistance.	A-Level	09/03/13	506
M2	M2 Checklist	http://www.thechalkface.net/resources/M2_Checklist.pdf	pdf	Checklist	A 2-page summary of the key skills required by the Mechanics 2 module. Listed under chapter headings, with space for students to indicate their level of understanding. For use when revising and identifying areas of weakness.	A-Level	18/06/13	507
M2	M2 Ideas Test**	http://www.thechalkface.net/resources/M2_Ideas_Test.pdf	pdf	Test	A test with no calculations or working out - these 16 questions (with attached solutions) are designed to make sure students have understood the key concepts, and to	A-Level	18/06/13	508
M2	M2 Not-Formula Book**	http://www.thechalkface.net/resources/notformulabooks/M2_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Mechanics 2 exam, but	A-Level	12/06/12	509
M2	M2 Essentials**	http://www.thechalkface.net/resources/M2_Essentials.pdf	pdf	Fact Cards	Designed to fit on a single side of A4 (still readable when shrunk to A6 size as a pocket-sized revision card), this summarises all the key results, facts and formulae from the AQA Mechanics 2 Mathematics module. For more in-depth revision, see the M2 Not-Formula Book.	A-Level	27/06/14	510
S1	Binomial Calculator	http://www.thechalkface.net/resources/binomial_calculator.xlsx	xlsx	Spreadsheet	Taking advantage of the built-in binomial calculator of Microsoft Excel, this is a useful tool for checking solutions or quickly finding answers when dealing with the binomial distribution. Includes cumulative, avoiding the need for statistical tables.	A-Level	08/02/14	511
S1	Statistical Distribution Calculator**	http://www.thechalkface.net/resources/Statistical_Distribution_Calculator.xls	xls	Spreadsheet	Makes use of Excel's built-in statistical functions to calculate values from the normal and binomial distributions. Gives values as found in the statistical tables as well as more precise values so it can be used to check answers using tables. Includes inverse normal (percentage points) and	A-Level	05/03/14	512
FP1	Trigonometry Advanced Results	http://www.thechalkface.net/resources/Trigonometry_Advanced_Results.pdf	pdf	Fact Cards	Details of the standard results for 30, 45 and 60 degrees along with graphs of the three main trig functions and a description of how the symmetries (rotation and reflection) and the period of the graph can yield all solutions.	A-Level	16/02/15	513
FP1	Inventing Imaginary Numbers**	http://www.thechalkface.net/resources/Inventing_Imaginary_Numbers.pdf	pdf	Fact Cards	A bit of background on the history of different types of number. The answer to 'why do we learn about imaginary numbers if they aren't real?' is, of course, that it never stopped us with any other made up number systems, from	A-Level	16/02/15	514
FP1	Investigating Matrix Transformations**	http://www.thechalkface.net/resources/Investigating_Matrix_Transformations.pdf	pdf	Worksheet	Designed to introduce simple transformation matrices for students who may not have come across matrices at all previously. Involves reflections and rotations, and	A-Level	16/02/15	515

FP1	Limits Investigation**	http://www.thechalkface.net/resources/Limits_Investigation.pdf	pdf	Investigation	An independent investigative task designed to be completed by students at home using Excel or a similar spreadsheet. It builds the concept of a sequence tending towards a limit while also developing confidence in manipulating spreadsheet formulae.	A-Level	16/02/15	516
FP1	iSum**	http://www.thechalkface.net/resources/ism.pdf	pdf	Worksheet	A complex number problem that can be solved using only the most basic definitions, making it suitable for an introduction to i . However, the solution includes content from other topics such as geometric series, allowing a more elegant solution.	A-Level	11/11/14	517
FP1	Linear Laws Damping**	http://www.thechalkface.net/resources/linear_laws_damping.pdf	pdf	Worksheet	Uses real results from a Physics damped oscillation experiment and requires students to convert an exponential curve to a linear function in order to estimate constants involved.	A-Level	16/02/12	518
FP1	Numerical Methods Gun Running**	http://www.thechalkface.net/resources/Numerical_Methods_Gun_Running.pdf	pdf	Fact Cards	Explanation of the three key numerical methods, along with analogies to USA-Mexico gun-runners.	A-Level	21/05/12	519
FP1	Matrix	http://www.thechalkface.net/resources/matrix_transformations.pdf	pdf	Fact Cards	Details of some of the basic 2 by 2 transformation matrices,	A-Level	05/03/14	520
FP1	FP1 Not-Formula Book**	http://www.thechalkface.net/resources/notformulabooks/FP1_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Further Pure 1 exam, but not provided in the formula book. Valuable for revision or as an additional resource during teaching of the module.	A-Level	10/01/12	521
FP2	Fibonacci nth term**	http://www.thechalkface.net/resources/fibonacci_nth_term.pdf	pdf	Worksheet	Applying proof by induction to the n th term of the Fibonacci sequence. Involves square rooting a surd, but walks you through the process. Includes solutions.	A-Level	08/02/14	522
FP2	Complex Number Forms**	http://www.thechalkface.net/resources/Complex_Number_Forms.xls	xls	Teacher Tool	Converts from rectangular ($a+bi$) form to polar and exponential form. Also gives the rectangular form for a given value of the modulus and argument of a complex number. Includes a small Argand diagram to illustrate the	A-Level	15/12/12	523
FP2	Exponential Form**	http://www.thechalkface.net/resources/Exponential_Form.pdf	pdf	Worksheet	An introduction to Euler's Formula and Euler's Identity. Precursors: basic complex number theory and familiarity with the polar form. Maclaurin's series is introduced for the	A-Level	15/12/12	524
FP2	De Moivre Trig	http://www.thechalkface.net/resources/De_Moivre_Trig.pdf	pdf	Fact Cards	Explanation - with key results - of the method behind turning powers of trig functions (sine and cosine) into expressions involving just multiple angles and vice versa.	A-Level	14/02/13	525
FP2	i to i^* **	http://www.thechalkface.net/resources/i_to_i.pdf	pdf	Worksheet	Applying the exponential form of a complex number to the problem of powers involving complex numbers. Includes solutions.	A-Level	08/02/14	526
FP2	FP2 Checklist**	http://www.thechalkface.net/resources/FP2_Checklist.pdf	pdf	Checklist	A 2-page summary of the key skills required by the Further Pure 2 module. Listed under chapter headings, with space	A-Level	15/05/14	527
D1	Prim's Algorithm	http://www.thechalkface.net/resources/prim.xlsx	xlsx	Interactive demonstration	This step-by-step demonstration shows the method for applying Prim's algorithm to a matrix (module D1). By clicking through with the arrow, each stage of the algorithm	A-Level	26/01/12	528
D1	Prim in the UK	http://www.thechalkface.net/resources/primmatrix.pdf	pdf	Worksheet	A (correct) table of driving distances between major English and Welsh cities. Includes a map. Designed to be used with Prim's algorithm for matrices to find a minimum spanning tree.	A-Level	24/04/12	529
D1	Ticket To Ride	http://www.thechalkface.net/resources/ticket_to_ride.pdf	pdf	Worksheet	Based on the excellent board game, Ticket to Ride Europe, this is a worksheet on graph theory, requiring the application of Minimum Spanning Tree algorithms and	A-Level	24/04/12	530
D1	Travelling Salesman England**	http://www.thechalkface.net/resources/Travelling_Salesman_England.pdf	pdf	Worksheet	Some thorough notes on the mathematics behind the Travelling Salesman Problem, and a thorough example / question involving the 8 largest cities in England. By finding	A-Level	08/04/15	531
D1	Super Hero Match Up	http://www.thechalkface.net/resources/Super_Hero_Match_Up.pdf	pdf	Worksheet	Can Thor take on Agent Smith? Is Wolverine a match for Princess Elsa? Use this match-up to introduce the idea of matchings. Students will probably come up with the idea of a bipartite graph on their own, but there is just enough complexity for an adjacency matrix to look useful. Match	A-Level	16/02/15	532
D1	Algorithms	http://www.thechalkface.net/resources/Algorithms.pdf	pdf	Fact Cards	A brief summary of the algorithms encountered in the AQA Decision 1 A-level module, including examples of their purpose and applications.	A-Level	16/02/15	533
D1	Euclid's Algorithm	http://www.thechalkface.net/resources/Euclid.pdf	pdf	Worksheet	Designed as an activity to go alongside the algorithms chapter of Decision 1, this is an application of Euclid's algorithm for finding the highest common factor of two numbers written in Python. Students read the code and have it explained line by line, then implement an optimisation using modular residues.	A-Level	08/04/15	534
D1	Graph Theory**	http://www.thechalkface.net/resources/graph_theory.pdf	pdf	Fact Cards	Notes on the key terminology of graph theory for Decision 1. Includes words like: simple, connected, complete, tree,	A-Level	25/05/15	535
D1	Sorting Algorithms**	http://www.thechalkface.net/resources/Sorting_Algorithms.pdf	pdf	Fact Cards	A set of details for each of the sorting algorithms covered in Decision 1, including an overview of the algorithm, its relative efficiency, a full worked example and full details of the process. Includes bubble, shuttle, shell and quick sort.	A-Level	08/04/15	536
D1	Sorting Challenge**	http://www.thechalkface.net/resources/Sorting_Challenge.pdf	pdf	Activity	A game for three groups designed to encourage efficient manual sorting - three teams compete to put a list of 8 names in order.	A-Level	07/03/16	537
D1	Spanning Trees**	http://www.thechalkface.net/resources/Spanning_Trees.pdf	pdf	Hand-out	An example using the 8 largest cities in England. Find the minimum spanning tree linking them all.	A-Level	07/03/16	538

D1	D1 Not-Formula Book**	http://www.thechalkface.net/resources/notformulabooks/D1_Not_Formula_Book.pdf	pdf	Booklet	A helpful booklet detailing all the main facts, techniques and formulae that are required for the Decision 1 exam, but not provided in the formula book. Valuable for revision or as an additional resource during teaching of the module.	A-Level	10/03/12	539
D1	Pi Algorithm	http://www.thechalkface.net/resources/Pi_Algorithm.pdf	pdf	Fact Cards	This takes a little while to trace compared to standard Decision 1 algorithms, but it is elegantly simple for what it is.	A-Level	29/08/16	540
D2	Critical Path Phone Battery**	http://www.thechalkface.net/resources/Critical_Path_Phone_Battery.pdf	pdf	Worksheet	A slightly silly example introducing critical path analysis, analysing the process of swapping the battery in a phone. What actions should be performed first? Where could time be saved? Where is the bottle-neck? Lots of clear illustrations and full solutions.	A-Level	07/03/16	541
D2	Game Theory Intro**	http://www.thechalkface.net/resources/Game_Theory_Intro.pdf	pdf	Game	What better introduction to game theory and those confusing matrices than actually playing a game? A couple here I made up, which can later be analysed in more detail to determine which player should have consistently come out on top, why certain strategies worked well, and what the best thing to do would have been.	A-Level	29/08/16	542
M5	Polar Coordinates in Mechanics**	http://www.thechalkface.net/resources/polar_coordinates.pdf	pdf	Booklet	A detailed introduction and derivation of the polar coordinates system (using the radial and transverse vectors frame of reference) required for AQA Mechanics 5. Explained as a generalisation of circular motion formulae from Mechanics 2.	A-Level	28/10/14	543
Other	Mechanical Reasoning**	http://www.thechalkface.net/resources/mechanicalreasoning.pdf	pdf	Test	60 questions taken from a graduate psychometric test designed to measure mechanical reasoning, including spatial awareness as well as understanding of some fundamental mechanical laws. These are often linked to the fundamental elements of various types of machinery.	A-Level	21/09/11	544
Other	Mechanical Reasoning Answers**	http://www.thechalkface.net/resources/mechanicalreasoninganswers.pdf	pdf	Test	Solutions to the Mechanical Reasoning test above - Answers to the multiple choice questions as well as explanations (intended to be thorough, but not overly technical).	A-Level	17/09/11	545
Other	Mechanical Reasoning Answers**	http://www.thechalkface.net/resources/mechanicalreasoning.ppt	ppt	Quiz	Identical to the Mechanical Reasoning test above, but as a PowerPoint presentation. For Answers see Mechanical Reasoning Answers.	A-Level	22/09/11	546
Other	Seven Bridges**	http://www.thechalkface.net/resources/seven_bridges.ppt	ppt	Problem	The Seven Bridges of Konigsberg problem is the beginnings of graph theory, but is a good spatial activity, and this version explores the possibility of destroying or building bridges to alter the situation. Use with accompanying	KS3	10/06/10	547
Other	Seven Bridges**	http://www.thechalkface.net/resources/seven_bridges.pdf	pdf	Worksheet	Accompanying worksheet, explaining the Seven Bridges problem - can be used to accompany the PowerPoint or as a standalone activity. Remember, there is no solution (aside from a proof of impossibility) for the original problem, so it	KS3	27/06/11	548
Other	Braille**	http://www.thechalkface.net/resources/Braille.pdf	pdf	Activity	A complete activity pack including teacher notes, scope for extension and worksheets leading students through the invention of Braille. Investigates the number of combinations possible with 6 spaces and concludes with the	KS3	27/06/14	549
Other	Braille Venn 1**	http://www.thechalkface.net/resources/braillevenn.pdf	pdf	Worksheet	A combination of 'Venn That Tune' and Braille, use with the accompanying presentation which includes answers. A code-breaker with a twist. Some intelligent guesswork is required, and once you've cracked the code you're still only	GCSE	22/07/10	550
Other	Braille Venn 2**	http://www.thechalkface.net/resources/braillevenn.ppt	ppt	Presentation	To accompany Braille Venn worksheet.	GCSE	18/06/10	551
Other	Summer Quiz**	http://www.thechalkface.net/resources/summer_quiz.ppt	ppt	Quiz	Questions requiring some form of number answer, but not especially mathematical. Some customising will be necessary - one question requires estimates of sunrise and sunset that day (can be found by googling).	Other	09/07/12	552
Other	Big Things Quiz**	http://www.thechalkface.net/resources/big_things_quiz.ppt	ppt	Quiz	Questions ranging from the height of the Eiffel tower to the weight of the largest ship. Multiple choice, but even the wrong answers have pictures to go with them.	Other	28/03/12	553
Other	Christmas Quiz**	http://www.thechalkface.net/resources/christmas_quiz.ppt	ppt	Quiz	Designed to be nearly impossible to answer, but chock full of interesting facts, these 12 slides of christmas take anything from 30 to 60 minutes depending on how you play it.	Other	17/12/11	554
Other	Lateral Problems**	http://www.thechalkface.net/resources/problems_lateral.ppt	ppt	Quiz	A collection of problems that require calculation, careful deduction or out-of-the-box thinking skills. These are primarily lateral thinking questions.	Other	31/05/10	555
Other	Logical Problems**	http://www.thechalkface.net/resources/problems_logical.ppt	ppt	Quiz	A collection of problems that require calculation, careful deduction or out-of-the-box thinking skills. These are primarily logical questions.	Other	06/06/10	556
Other	Mathematical Problems**	http://www.thechalkface.net/resources/problems_mathematical.ppt	ppt	Quiz	A collection of problems that require calculation, careful deduction or out-of-the-box thinking skills. These are primarily mathematical questions.	Other	31/05/10	557
Other	The Mathematics of Santa Claus**	http://www.thechalkface.net/videos/themathematicsofsantaclaus.wmv	wmv	Video	A 4-minute video presenting the maths behind Santa's Christmas eve exploits.	Other	15/12/09	558

Other	Maths Plus Challenges**	http://www.thechalkface.net/resources/Maths_Plus_Challenges.pdf	pdf	Activity	A list of challenges for students to attempt outside the classroom - extra-curricular investigations, using maths in other contexts, etc.	Other	07/03/16	559
Other	Modular Arithmetic Investigation**	http://www.thechalkface.net/resources/Modular_Arithmetic_Investigation.pdf	pdf	Investigation	An introduction to modular arithmetic for bright students, designed to be used as a more or less independent investigation, discovering some of the properties of congruence with addition, multiplication and	Other	07/03/16	560
Other	Alevel Reading List	http://www.thechalkface.net/resources/Alevel_Reading_List.pptx	pptx	Presentation	Some examples of useful websites and YouTube channels that will enhance the enjoyment of a Mathematics A-level course.	A-Level	07/03/16	561
Other	A-level Week	http://www.thechalkface.net/resources/alevelweek.pdf	pdf	Booklet	Booklet of A-level topics - a taster for pre-A-level students to give them an idea of the material - covers circle geometry, kinematics and binomial theorem.	A-Level	18/03/11	562
Other	Lobster Pot Game	http://www.thechalkface.net/resources/lobster_pot.xls	xls	Game	My version of the game - you buy lobster pots, place them in the bay or out at sea and reap the rewards, calm or storm. This includes a calculator as well as sheets to print off for a class, so you can play alongside without all the tedious	KS3	10/10/12	563
Other	Pirate Battleships	http://www.thechalkface.net/resources/pirates.xlsx	xlsx	Game	Nice end of term variation on battleships - the whole class fills in their 5 by 5 grid (with treasure, 'rob someone', 'scuttle a ship', etc) then as you hit squares in a random order, students carry out their actions, alternately	KS3	08/09/14	564
Other	CodeBreaker	http://www.thechalkface.net/resources/codebreaker.xls	xls	Game	A variant on the popular Mastermind peg game. You can vary the digits allowable in the four digit mystery code. The computer sets a code and you have to guess it in a limited number of attempts. Each guess yields some information	KS3	21/10/11	565
Other	Niagara Falls	http://www.thechalkface.net/resources/niagara_falls.ppt	ppt	Problem	How heavy is Niagara Falls? Exactly how much does the water currently going down the falls weigh?	Other	24/11/12	566
Other	Trader	http://www.thechalkface.net/resources/trader.xls	xls	Spreadsheet	A simplistic simulation of stock market currency trading. You begin with a certain amount of capital, and by observing the fluctuations of the market attempt to make money through buying and selling.	Other	01/11/12	567
Other	Equations of Motion investigation**	http://www.thechalkface.net/resources/Equations_of_motion_investigation.pdf	pdf	Investigation	Designed as extension material beyond GCSE, students use a velocity-time graph to deduce the kinematics equations (or SUVAT equations), then answer questions using them. Designed as a standalone task, and includes full solutions.	Other	30/09/14	568
Other	Gravity Investigation**	http://www.thechalkface.net/resources/gravity_investigation.pdf	pdf	Investigation	Introduces the formula for gravitational force, derives the formula for acceleration due to gravity, and asks students to calculate acceleration due to gravity for a variety of bodies in the solar system. Concludes with three 'paradoxes'	Other	30/09/14	569
Other	GCSE Maths Formulae**	http://www.thechalkface.net/resources/GCSE_Maths_Formulae.pdf	pdf	Fact Cards	Making use of the AQA sheet of formulae to learn for the new GCSE, but adding extra details to enable students to make sense of the various formulae. They will be easier to memorise (and use) if they are understood more fully.	GCSE	29/08/16	570
Other	Reflecting on learning	http://www.thechalkface.net/resources/Reflecting_on_learning.pdf	pdf	Teacher Tool	A self-assessment diagnostic tool for students to use. Could be used part way through a topic or while working on an extended task. Students answer brief questions about how confident they feel, what they have learnt and what they still	Other	29/08/16	571
Other	T-Puzzle	http://www.thechalkface.net/resources/T-Puzzle.pdf	pdf	Game	A deceptively tricky little puzzle, this is a capital T shape which has been cut into 4 pieces using straight cuts, and is surprisingly difficult to put back together due to certain unconscious assumptions we often make.	KS3	29/08/16	572
Other	GCSE Grade Descriptors	http://www.thechalkface.net/resources/gcse_grade_descriptors.pdf	pdf	Teacher Tool	Can be used in planning or for pupil self-assessment. Gives details - and examples - for specific grades.	GCSE	26/01/12	573
Other	How to Answer Exam Questions	http://www.thechalkface.net/resources/how_to_answer_exam_questions.pdf	pdf	Booklet	Covering just a handful of key topics for Higher GCSE, this gives a detailed step-by-step method along with examples, for how to pick up all the marks for Pythagoras, Right-angled Trig, Non-Right-angled Trig and Simultaneous	GCSE	09/11/12	574
Other	Exam Question Analysis Tool**	http://www.thechalkface.net/resources/examquestionanalysistool.xls	xls	Teacher Tool	This spreadsheet is a template you can use to perform a detailed breakdown of a test or exam. Pupils names are entered at the top, the topic of each question, along with the number of marks, is entered down the side, then when	Other	29/06/12	575
Other	Problem Solving	http://www.thechalkface.net/resources/problem_solving.pdf	pdf	Fact Cards	Summary of problem solving techniques. Encourages the user to ask: "What do I know?", "What do I want?" and "What will I need?" along with information about what to do when you get stuck while solving a mathematical	Other	04/05/12	576
Other	The Origins of Maths	http://www.thechalkface.net/resources/origins_of_maths.pptx	pptx	Presentation	Nice starting point for introducing the subject - give students an idea of where our 70,000+ year old subject began, and how cultures all over the world developed the same concepts in order to solve the same problems. Also	KS3	08/09/14	577
Other	The Point of Maths**	http://www.thechalkface.net/resources/the_point_of_maths.pdf	pdf	Booklet	In answer to that oft-asked question, "What's the point of Maths?" This booklet is a brief outline of a few reasons why Maths is important, broken down into: 1) Why maths is a big deal, 2) How maths might be useful to you and 3) The	Other	24/11/12	578
Other	The Point of Maths**	http://www.thechalkface.net/resources/the_point_of_maths_web_version.pdf	pdf	Booklet	In answer to that oft-asked question, "What's the point of Maths?" This booklet is a brief outline of a few reasons why Maths is important, broken down into: 1) Why maths is a big deal, 2) How maths might be useful to you and 3) The	Other	08/07/14	579
Other	Teaching Maths PRET**	http://www.thechalkface.net/resources/teaching_maths_pret.pdf	pdf	Homework	Based on the Practice/Recall/Extend/Think format, this is actually designed for teachers, giving some advice on how a maths teacher can improve their mathematics and their teaching in the classroom.	Other	27/10/14	580