WK		TOPIC	DETAILS	SUGGESTED FLIPPED LEARNING ELEMENT	RESOURCES/ QUESTIONS	PS
1 **SwC test**	**UNIT 1: FOUNDATIONS TO PURE MATHEMATICS**	**Into & Test**	**Lesson 1: Intro Powerpoint inc Completing the Square** **Lesson 2: SwC assessment**		Dice sheet for consolidation **Exam questions (OCR):** • Core 1 Winter 2010 #4 • Core 1 Summer 2015 #3 • Core 1 Summer 2016 #5ii **MyMaths links:** (Indices) https://app.mymaths.co.uk/598-lesson/indices-part-3 (Surds; section 2 – "Matching pairs") https://app.mymaths.co.uk/5861-lesson/surds-part-3 **Integral resources:** (Algebraic Indices Tarsia Puzzle) https://2017.integralmaths.org/pluginfile.php/16530/mod_book/chapter/614/Indices3HexJigSol.pdf (Surds Dominoes) https://2017.integralmaths.org/pluginfile.php/16518/mod_book/chapter/612/Surds_Dominoes.pdf (Solutions) https://2017.integralmaths.org/pluginfile.php/16518/mod_book/chapter/612/Surds_Dominoes_Soln.pdf **Underground Maths resource** (Indices): Index Issues **Underground Maths resource** (Surds): Scary Sum **Underground Maths resource** (Surds): Nested Surds	1
		Indices	**Understand and use the laws of indices for all rational exponents.** Rewriting in the form $\alpha x^m + \beta x^n$ using sliding and the 'V' Rewriting indices given a condition (such as in the form 4^p) Solving index equations.	Index rules		
		Surds	**Manipulate and simplify algebraic surds** Rationalising the denominator Use of surds in contexts and using Pythagoras, right-angle trigonometry.	Basic surd laws & rationalising the denominator (SwC vids)		
2		**Sim. Eqns.**	**Solve simultaneous equations in two variables by elimination and by substitution, including one linear and one quadratic equation.**	Standard methods	Chase the Ace	
		Quadratics	**Solution of quadratic equations (by factorising, formula, calculator, completing sq).** Solving quadratics in context (which may include evaluating the use of quadratics & lines as modelling tools). **Quadratic equations in a function of the unknown (Hidden Quadratics)** Hidden quadratics within indices, trigonometric expressions etc. **Completing the square** Sketching inc. vertex/turning point, roots.	Standard solving methods for quadratics Completing the square with non-integer numbers	Prove the quadratic formula using $ax^2 + bx + c$ and completing the square **Hidden quadratics exam questions (OCR):** • Core 1 Winter 2012 #5 • Core 1 Winter 2008 #4 **Hidden quadratics worksheet** **Integral resource:** (Matching quadratic graphs) (Solutions)	

			Working backwards from sketch to equation. Completing the square with non-integer numbers (i.e. context)	Sketching quadratics from the completed square form.	**Underground Maths resource:** (linked to quadratic graphs) https://undergroundmathematics.org/quadratics/which-quadratic	
			The discriminant of a quadratic function, including the conditions for real and repeated roots. Know where the discriminant comes from, Solving given unknowns, situations (e.g. an unknown such that one function is tangent to another)	Basics of the discriminant – where it comes from.	**MyMaths link** (sections 8 and 9): https://app.mymaths.co.uk/587-lesson/quadratic-graphs-2 **Risp resource:** (second Venn Diagram activity) http://www.s253053503.websitehome.co.uk/risps/risp10.html **Underground Maths resource** (Quadratics): Discriminating At the end of this topic, the following Kahoot could be used: https://create.kahoot.it/details/duplicate-of-c1-algebra-and-quadratics/72b2a01a-0477-4067-98c8-7ace17d9e472	
3		**Inequalities**	**Solve linear and quadratic inequalities in a single variable and interpret such inequalities graphically** Solving standard expressions: $ax + b > cx + d, px^2 + qx + r \geq 0$ Solving expressions such as $px^2 + qx + r < ax + b$ and recognising this as the range of x for which the curve $y = px^2 + qx + r$ is below the equation $y = ax + b$ Including inequalities with brackets and fractions $\left(e.g. \frac{4}{y} > 3\right)$ **Express inequalities through the correct use of 'and' and 'or' or through set notation.** Appropriate uses for ∪ and ∩, $\{x: x > a\}, x \in \mathbb{R}$ etc. Be able to simplify set notation expressions into single sets. **Be able to represent, and interpret, inequalities graphically.** Shading and use of dotted and solid line convention is required.	Inequalities solving – the basics. Basic set notation Basic inequality sketching	**Exam questions (OCR):** • Core 1 Summer 2016 #9 • Core 1 Summer 2015 #8 • Core 1 Winter 2012 #9 **MyMaths link:** (Quadratic inequalities; exam question in section 9) https://app.mymaths.co.uk/566-lesson/quadratic-inequalities (Linear and Quadratic inequalities on graphs; sections 4 and 9) https://app.mymaths.co.uk/5862-lesson/linear-and-quadratic-inequalities **Integral resources:** (Venn Diagrams task linked to quadratic inequalities) https://mei.org.uk/files/sow/03-equations-and-inequalities-res.pdf (Quadratic inequalities triangular jigsaw) https://2017.integralmaths.org/pluginfile.php/16577/mod_book/chapter/622/QuadinequalTriangleJigSol.pdf	2
4 **TEST 1**		**Algebra 1**	**Manipulate polynomials algebraically, including expanding brackets and collecting like terms.** **Factorisation and simple algebraic division** Four operations on algebraic fractions Simplify rational expressions, including by factorising and cancelling. Linear or quadratic denominators of rational expressions	Basic operations on fractions	**Algebraic simplification exam questions (OCR):** • Core 4 Winter 2009 #1 • Core 4 Summer 2012 #1 • Core 4 Summer 2014 #1 • Core 4 Summer 2011 #1 (good large whiteboards activity, tackling these four)	3

			Factorise expressions such $x^3 + 3x^2 - 4$ and $6x^3 + 11x^2 - x - 6$ **Use of the factor theorem and algebraic division** Algebraic division by linear expressions only. As applied to cubics (sketching cubics)	Factorising cubics	**Factor Theorem / algebraic division exam questions (OCR):** • Core 2 Summer 2009 #7 • Core 2 Winter 2010 #6 **Integral resource:** (true or false activity linked to factor theorem and cubic graphs) https://2017.integralmaths.org/pluginfile.php/16660/mod_book/chapter/639/Poly_TrueFalse.pdf Converted into a MS Forms you could duplicate using this link. **Underground Maths resource:** (linked to cubic graphs) https://undergroundmathematics.org/polynomials/can-you-find-cubic-edition	
		Graph \Sketching	**Understand and use graphs of functions, sketch curves defined by simple equations** Sketch graphs of $y = \frac{a}{x}$, $y = \frac{a}{x^2}$, $y = a^x$, $y = \sqrt{x}$, quadratics, cubics, quartics Including asymptotes (and equations of), intercepting points with coordinate axes. Strategies for sketching unfamiliar graphs. Intercepts, asymptotes, as *x* increases… **Interpret algebraic solution of equations graphically; use intersection points of graphs to solve equations.** **Understand and use proportional relationships and their graphs** Sketching from a context/modelling a situation given information (e.g. the circumference of a circle is proportional to its diameter)	**This content could be taught 'flipped'**	**MyMaths links:** (matching activity in section 6) https://app.mymaths.co.uk/583-lesson/sketching-graphs (matching activity in section 9) https://app.mymaths.co.uk/584-lesson/square-root-and-reciprocal-graphs **Underground Maths resource:** (useful teaching / learning points linked to asymptotes) https://undergroundmathematics.org/thinking-about-functions/approaching-asymptotes	
5		**Graphs Transformations**	**Understand the effect of simple transformations on the graph of $y = f(x)$, including sketching associated graphs** The effect of f(ax), af(x), f(x+a) and f(x) + a on graphs Describe the transformation given the equation (including multi-ways) State the resulting coordinates of a specified point and transformation Describe the transformation given the graphs	How to sketch the graphs	**Exploring transformations: Desmos Classroom Activity** **MyMaths link:** (linked to translations; section 9) https://app.mymaths.co.uk/585-lesson/transforming-graphs-part-1 **Integral resources:** (linked to transformations of $y = x^2$) https://2017.integralmaths.org/pluginfile.php/16677/mod_book/chapter/643/QuadraticGraphs_Trans.pdf (Transformations team challenge) https://2017.integralmaths.org/pluginfile.php/16677/mod_book/chapter/643/Trans.pdf (Solutions) https://2017.integralmaths.org/pluginfile.php/16677/mod_book/chapter/643/Trans_Soln.pdf	4

					(linked to transformations of a 'non-standard' function) https://mei.org.uk/files/sow/07-graphs-and-transformations-res.pdf **Exam question (OCR):** • Core 1 Summer 2017 #4 At the end of the topic, or in the next few weeks, the following Kahoot could be used: **"C1 Transformations"** https://create.kahoot.it/details/c1-transformations/6afa2df4-b29b-4f65-9ef5-c55edc9e5bad	
6		**Coordinate Geometry** PR teachers	**Understand and use the equation of a straight line, including the forms** $y - y_1 = m(x - x_1)$ **and** $ax + by + c = 0$ Be able to use the above construction form and information in a variety of forms to create the equation of a line (e.g. given two points, given gradient and point) Equation of perpendicular bisector **Gradient conditions for two straight lines to be parallel or perpendicular.** **Be able to use straight line models in a variety of contexts.**	Early aspects of this to be drip-fed into early homeworks e.g. finding midpoints, lengths of lines, parallel and perpendicular lines.	**Coordinate Geometry Skills check form (revision?)** **Exam questions (OCR):** • Core 1 Summer 2013 #8 • Core 1 Winter 2013 #6 • Core 1 Summer 2015 #5 • Core 1 Winter 2012 #8 **Integral Resources:** (matching equations activity) https://2017.integralmaths.org/pluginfile.php/16589/mod_book/chapter/624/Teach_Lines_MatchEqns1.pdf (solutions) https://2017.integralmaths.org/pluginfile.php/16589/mod_book/chapter/624/Teach_Lines_MatchEqns1_soln.pdf (another matching equations activity) https://2017.integralmaths.org/pluginfile.php/16589/mod_book/chapter/624/Teach_Lines_MatchEqns2.pdf (solutions) https://2017.integralmaths.org/pluginfile.php/16589/mod_book/chapter/624/Teach_Lines_MatchEqns2_soln.pdf (Section test; a good team challenge. Solutions included at the end.) https://2017.integralmaths.org/pluginfile.php/19016/mod_resource/content/3/edexcelasc1qw37.pdf	5
		Circle geometry	**Understand and use the coordinate geometry of the circle including using the equation of a circle in the form** $(x - a)^2 + (y - b)^2 = r^2$ **Complete the square to find the centre and radius of a circle**		**Exam questions (OCR):** • Core 1 Summer 2015 #10 • Core 1 Summer 2012 #10 • Core 1 Winter 2011 #9 (good large whiteboards activity, tackling these three)	

			Use the following properties: The angle in a semicircle is a right angle, The perpendicular from the centre to a chord bisects the chord, The radius of a circle at a given point on its circumference is perpendicular to the tangent to the circle at that point. Use the above to find the circumcircle of a triangle with given vertices. **Other geometric problems** The distance from a point to the circumference of a circle The length of a line from a point outside of the circle to a point on the circle.		**MyMaths links:** (could use sections 4 and 9) https://app.mymaths.co.uk/581-lesson/equations-of-circles (exam question in section 7) https://app.mymaths.co.uk/582-lesson/circle-geometry **Integral Resources:** (matching equations of circles to graphs) https://2017.integralmaths.org/pluginfile.php/16605/mod_book/chapter/628/Teach_Circles_Equations.pdf (solutions) https://2017.integralmaths.org/pluginfile.php/16605/mod_book/chapter/628/Teach_Circles_Equations_solns.pdf (finding equations of circles to meet set criteria) https://2017.integralmaths.org/pluginfile.php/16605/mod_book/chapter/628/Teach_Circles_Grid.pdf **Underground Maths resource:** ('Teddy Bear') https://undergroundmathematics.org/circles/teddy-bear	
HT		Understand and use key terminology (consensus, population, sample, statistics) Know the pros and cons of sampling vs consensus Be able to select and use different sampling techniques and know that they give differing results. Be able to clean data: dealing with missing data, errors, outliers.			**Integral Resource:** https://2017.integralmaths.org/pluginfile.php/16838/mod_book/chapter/670/Sampling_match.pdf	
7	UNIT 2: INTRO TO APPLIED MATHS	**suvat & vt graphs**	**Understand and use fundamental quantities and units in the S.I. system: length, time** **Understand and use derived quantities and units: velocity, acceleration,** May be required to convert between units (e.g. km h^{-1} to m s^{-1}) **Understand and use the language of kinematics**: position; displacement; distance travelled; velocity; speed; acceleration. **Understand, use and interpret graphs in kinematics for motion in a straight line:** displacement against time and interpretation of gradient; velocity against time and interpretation of gradient and area under the graph.		**MyMaths links:** (Kinematics formulae. Three questions in section 4.) https://app.mymaths.co.uk/870-lesson/kinematics-formulae (Motion in a vertical plane. Two questions in section 4.) https://app.mymaths.co.uk/871-lesson/motion-in-a-vertical-plane **Integral resources:** (Velocity-time graph activity; good for a team challenge) https://2017.integralmaths.org/pluginfile.php/16942/mod_book/chapter/692/Teach_Motion_labelgraph.pdf (SUVAT; creating worded problems from given information.) https://2017.integralmaths.org/pluginfile.php/16956/mod_book/chapter/695/ConstaccCreating.pdf	6

			May require solving for unknowns (e.g. time or velocity), and comparing multiple particles on different journeys **Understand & derive the formulae for constant acceleration for motion in a straight line.** Use a velocity-time graph to derive the 5 'suvat' equations. These are given in the formula book and do no need to be memorised.		**Underground Maths resource:** (addressing the difference between speed and velocity) https://undergroundmathematics.org/introducing-calculus/speed-vs-velocity	
8 **TEST 2**		**Descriptive Statistics I** Wed PM -> no lessons OPEN EVENINGS/ Progress Review Days	Be able to draw and interpret histograms, frequency polygons, box and whisker plots (with outliers) and cumulative frequency diagrams. **(N.B. outlier formula will be specified in question)** Interpret diagrams for single variable data – draw simple inferences, give interpretations to diagrams Calculate measures of central tendency (mean, median, mode) and variation (variance, standard deviation, range, interpercentile ranges) including linear interpolation **Introduce the large data set.** Give each student a copy of double-sided JDH resource.		**Kahoots:** (following up work on sampling) • **"Sampling Methods"** https://create.kahoot.it/details/sampling-methods/19de27fc-2a43-415b-aaa6-0de9e196c8f4 • **"AS Maths Sampling"** https://create.kahoot.it/details/as-maths-sampling/29801d97-cba5-4d16-bce6-87497b58201f • **Desmos sampling task to experience effect of different sampling techniques** https://teacher.desmos.com/activitybuilder/custom/6447dfe1e5af8114e853c5fe?collections=6447db4a76449e478195d07d **Exam questions (OCR):** • Stats 1 Summer 2018 #5 • Stats 1 Summer 2017 #5 • Stats 1 Summer 2015 #2 • Stats 1 Summer 2014 #1 • Stats 1 Summer 2012 #3 • Stats 1 Winter 2011#1 • Stats 1 Summer 2010 #6 **Integral Resources linked to the large data set:** (Histograms / Cumulative Frequency matching activity) https://2017.integralmaths.org/pluginfile.php/28903/mod_book/chapter/2625/Edexcel_GroupedData_Matching.pdf (Answers) https://2017.integralmaths.org/pluginfile.php/28903/mod_book/chapter/2625/Edexcel_GroupedData_Matching_answers.pdf	7
9 **RW**		**Descriptive Statistics II**	Give interpretations to measures of central tendency and variation for discrete, continuous, grouped and ungrouped data. Look at the effect of adding or removing data on the mean/median etc.		**Exam questions (OCR)** • Stats 1 Summer 2016 #3 • Stats 1 Summer 2013 #4 • Stats 1 Summer 2012 #2	8

		No lessons Monday (pastoral day)	Evaluated which measure is appropriate to use Understand and use coding and its effects on measures. Be aware of skew (**N.B. skew is not explicitly mentioned in the spec but is suggested in mark schemes as a tool for comparing data)** **Histograms** Scaling problems (e.g. actual height/width) Assumptions regarding the distribution of data within the bars.		• Stats 1 Winter 2012 #5 • Stats 1 Summer 2011 #4 **Integral Resource** (Histograms) https://mei.org.uk/files/sow/14-data-processing-presentation-interpretation-res.pdf	
10		**Radian measure & TOOLS** Parents Eve Tuesday	**Radian measure** **TOOLS (to be completed as an independent learning project)** **Work with radian measure, including use for arc length and area of sector in problems.** Use area of triangle formula $A = \frac{1}{2}ab\sin C$ (T) Use area of sector formula $A = \frac{1}{2}r^2\theta$ (O) Use arc length formula $l = r\theta$ (O) Use cosine rule (L) and sine rule (S) **Explore the ambiguous case of the sine rule**.		**Maths links:** 'hat is a radian?' - section 1) s://app.mymaths.co.uk/662-lesson/radians-arcs-areas am question linked to area of sector – section 9) s://app.mymaths.co.uk/662-lesson/radians-arcs-areas **egral Resources:** dians and degrees matching) s://2017.integralmaths.org/pluginfile.php/35664/mod_book/chapter/968/Radians_RadDeg.pdf cs and Sectors" (ideal for a paired / team challenge) s://mei.org.uk/files/sow/22-trigonometry-res.pdf **am questions (OCR)** • Core 2 Summer 2014 #1 and #3 • Core 2 Summer 2018 #6 • Core 2 Summer 2017 #5 • Core 2 Summer 2015 #3 • Core 2 Summer 2013 #5 **p resource:** ://www.s253053503.websitehome.co.uk/risps/risp23.html	9
11		**Probability** INSET - Tues	Tree diagrams, Sample spaces, Venn diagrams Independent/dependent, mutually exclusive events. Be able to know and use probability notation including understanding and using the conditional probability formula		**Integral Resources** (Venn Diagram matching activity) https://2017.integralmaths.org/pluginfile.php/16871/mod_book/chapter/680/VennMatch.pdf (Answers) https://2017.integralmaths.org/pluginfile.php/16871/mod_book/chapter/680/VennMatchSol.pdf (Conditional probability activity) https://2017.integralmaths.org/pluginfile.php/110588/mod_book/chapter/1593/ConditionalProb.pdf (Answers)	10

					https://2017.integralmaths.org/pluginfile.php/110588/mod_book/chapter/1593/ConditionalProb_soln.pdf (Tarsia puzzle on probability; ideal for a team challenge) https://2017.integralmaths.org/pluginfile.php/110588/mod_book/chapter/1593/ProbabilityHexJig_Soln.pdf **Risp resources:** (all three are linked to independent events) http://www.s253053503.websitehome.co.uk/msv/msv-25.html http://www.s253053503.websitehome.co.uk/msv/msv-32.html http://www.s253053503.websitehome.co.uk/msv/msv-25.html **MyMaths link:** (three good questions linked to conditional probability, in sections 4, 5 and 6) https://app.mymaths.co.uk/831-lesson/conditional-probability **Exam questions (OCR)** • Stats 1 Summer 2017 #2 • Stats 1 Summer 2014 #7 • Stats 1 Summer 2013 #8 • Stats 1 Winter 2011 #4	
	UNIT 3: BIG CORE TOPICS	**Calculus I**	calculus from first principles, gradient at a limit, interpret as rate of change Be able to differentiate polynomials Sketch the gradient function and use gradient function to sketch original function	Basics of differentiation	**MyMaths links:** (sections 1 to 3; differentiation from first principles) https://app.mymaths.co.uk/606-lesson/gradient-of-a-tangent (good activity in section 6, linked to the shape of the curve of the gradient function) https://app.mymaths.co.uk/5875-lesson/sketching-the-gradient-function **Integral Resources** (differentiation dominoes) https://2017.integralmaths.org/pluginfile.php/16696/mod_book/chapter/648/DifferentiationDominoes.pdf (answers) https://2017.integralmaths.org/pluginfile.php/16696/mod_book/chapter/648/DifferentiationDominoesSol.pdf (exploring the shape of the curve of the gradient function on a graphical calculator) https://2017.integralmaths.org/pluginfile.php/16696/mod_book/chapter/648/casio-as-gradcurve.pdf **Underground Maths resource**	

					(matching activity linked to the shape of the curve of the gradient function) https://undergroundmathematics.org/introducing-calculus/gradient-match	
12 **TEST 3**		**Calculus II**	Gradient at a point, Equations of tangent/normal Increasing and decreasing functions The second derivative, stationary points. Links graphically Optimisation problems		**MyMaths link:** (good optimisation problem in section 9) https://app.mymaths.co.uk/5876-lesson/maxima-and-minima **Integral Resources** (matching activity) https://2017.integralmaths.org/pluginfile.php/16708/mod_book/chapter/650/Diff_Gradients.pdf (answers) https://2017.integralmaths.org/pluginfile.php/16708/mod_book/chapter/650/Diff_Gradients_soln.pdf (Differentiation of Rational Functions matching activity) https://2017.integralmaths.org/pluginfile.php/16718/mod_book/chapter/652/Diff_Rational.pdf (answers) https://2017.integralmaths.org/pluginfile.php/16718/mod_book/chapter/652/Diff_Rational_Soln.pdf (matching activity linked to stationary points; potential paired / team challenge) https://2017.integralmaths.org/pluginfile.php/16727/mod_book/chapter/654/Diff_Stationary.pdf (answers) https://2017.integralmaths.org/pluginfile.php/16727/mod_book/chapter/654/Diff_Stationary_solns.pdf **Underground Maths resource:** (a range of activities linked to tangents and normals) https://undergroundmathematics.org/calculus-of-powers/tangent-or-normal **Exam questions (OCR)** • Core 1 Summer 2012 #6 • Core 1 Winter 2011 #8 • Core 1 Summer 2018 #10 • Core 1 Summer 2016 #11	11
13		**Trig I** Teacher's PR	Their graphs (derived from the circle), symmetry and periodicity. The effect of graph transformations on these functions & the links between them.		**MyMaths links:** (questions relating to the sine and cosine graphs, in section 7 and transformations of these, in section 10) https://app.mymaths.co.uk/657-lesson/sine-and-cosine-graphs	12

		Term ends on Thurs	Solving simple trig problems in given range Up to e.g. $\sin\left(2x-\frac{\pi}{6}\right)=\frac{1}{2}$ RECAP special triangles exact value problems Context such as tides/hours of sunlight Derivation and use of identities ($\sin^2 x+\cos^2 x\equiv 1$ and $\frac{\sin x}{\cos x}=\tan x$)		(questions relating to transformations of the tan graph, in section 7) https://app.mymaths.co.uk/658-lesson/tangent-graphs **Integral Resources** (trig equations true or false) https://2017.integralmaths.org/pluginfile.php/16629/mod_book/chapter/633/TrigEq_TrueFalse.pdf (answers) https://2017.integralmaths.org/pluginfile.php/16629/mod_book/chapter/633/TrigEq_TrueFalse_Soln.pdf (matching activity linked to trig equations) https://2017.integralmaths.org/pluginfile.php/16629/mod_book/chapter/633/TrigEq_Match.pdf (answers) https://2017.integralmaths.org/pluginfile.php/16629/mod_book/chapter/633/TrigEq_Match_Soln.pdf (find the errors in solving trig equations) https://2017.integralmaths.org/pluginfile.php/16629/mod_book/chapter/633/TrigEq_Errors.pdf **Exam questions (OCR)** • Core 2 Winter 2008 #9 • Core 2 Summer 2013 #2 • Core 2 Winter 2011 #7 • Core 2 Winter 2013 #5 • Core 2 Summer 2014 #4 • Core 2 Summer 2017 #9 At the end of this topic, the following Kahoot could be used: (16 questions – Pure revision) https://create.kahoot.it/details/first-year-pure-revision/cffe5302-3e43-4d9b-bdc3-d9eed00375f1	
XH		**MECHANICS CHRISTMAS PACK**				

14		**Mop Up** Term starts on Tues				13
15	UNIT 4: FORCE DIAGRAMS & LOGS	**Force Diagrams** PR Day Weds Parents evening	**Understand and use fundamental quantities and units in the S.I. system: mass, gravity** **Understand and use derived quantities and units: velocity, acceleration, force, weight, acceleration due to gravity.** Understand the limitations of models. List the assumptions made when modelling (particle – centre of mass is in the centre of the object), air resistance is negligible, resistive forces are constant. Understand that while g is assumed constant (9.8 m s^{-2}) it is not a universal constant but depends on location. **Understand the concept of a force: normal reaction, tension, thrust or compression, resistance** Understand and use Newton's first law. Understand and use Newton's second law for motion in a straight line with constant acceleration and forces acting parallel and/or perpendicular to the motion. Extend to situations where the forces need to first be resolved. Understand and use Newton's third law and use to solve problems in equilibrium. **Understand and use the F ≤ μ R model for friction;** Be able to calculate the coefficient of friction and use within a question Recognise that the motion of a body on a rough surface will imply friction Know what limiting friction is and when to apply it Use frictional forces within statics questions. (e.g. F = μ R when moving, F ≤ μ R when in equilibrium		**Useful videos from Hannah's web-site:** https://mathsroots.weebly.com/m-modelling--force-diagrams.html **MyMaths links:** (sections 1 and 2 good in supporting explanation of Newton's first law) https://app.mymaths.co.uk/874-lesson/newton-s-first-law (sections 1 and 2 good in supporting explanation of Newton's second law) https://app.mymaths.co.uk/875-lesson/newton-s-second-law (good questions linked to friction, in sections 3, 4, 5 and 6) https://app.mymaths.co.uk/885-lesson/limiting-friction **Integral resources:** (Solutions linked to questions on Newton's second law; spot the errors) https://2017.integralmaths.org/pluginfile.php/39828/mod_book/chapter/1214/N2L_2D_spottheerror.pdf (activity linked to friction; draw force diagrams, given equations.) https://2017.integralmaths.org/pluginfile.php/39863/mod_book/chapter/1222/Friction_diagram.pdf	14
16 **TEST 4 MYE**		**Force Diagrams** Parents Evening				15
17		**Logs & exponentials** 2A Midyears	**The function a^x and it's graph, for a>0** Understand the difference in shape between $a < 1$ and $a > 1$ Solve equations of the form $a^x = b$ **Log rules**		**MyMaths links:** (matching pairs game in section 9, using log laws) https://app.mymaths.co.uk/669-lesson/rules-of-logs (good example of a real-life question requiring use of logs to solve, in section 1) https://app.mymaths.co.uk/670-lesson/log-equations	16

			$\log_a x + \log_a y = \log_a xy$ $\log_a x - \log_a y = \log_a \frac{x}{y}$ $k \log_a x = \log_a x^k$ **Know and use the definition of $log_a x$ as the inverse of a^x, where a is positive and $x \geq 0$.** Know and use the function $\ln x$ and its graph Know and use $\ln x$ as the inverse function of e^x. Solutions of equations of the form $e^{ax+b} = p$ and $\ln(ax + b) = q$		(matching pairs activity in section 5, relating to natural logs and exponentials and equations to solve in sections 6 and 8) https://app.mymaths.co.uk/674-lesson/the-natural-log **Integral Resources:** (Tarsia Puzzle linked to log laws; solutions at the end) https://2017.integralmaths.org/pluginfile.php/16770/mod_book/chapter/664/LogarithmsHexJigSol.pdf (logs 'odd one out') https://2017.integralmaths.org/pluginfile.php/16770/mod_book/chapter/664/Logs_Odd.pdf (logs 'true or false') https://2017.integralmaths.org/pluginfile.php/16770/mod_book/chapter/664/Logs_TrueFalse.pdf **Exam questions (OCR)** • Core 2 Summer 2010 #8 • Core 2 Winter 2012 #8 • Core 2 Winter 2009 #8 • Core 2 Summer 2016 #4 • Core 2 Summer 2015 #8 • Core 2 Summer 2017 #7 • Core 2 Winter 2013 #8	
18		**e & ln**	**Know and use the function e^x and its graph** Including $y = e^{ax+b} + c$ Know that the gradient of e^{kx} is equal to ke^{kt} and hence understand why the exponential model is suitable in many applications. **Modelling exponential growth** E.g. use of e in continuous compound interest, radioactive decay, population growth Be able to find constants in models. Understand terms such as 'initial' meaning t = 0 Consideration of the limitations of refinements of the models including considering a second improved model. Explore behaviour for large values of *t* or to consider whether the range of values predicted is appropriate		**MyMaths link:** (matching activity in section 5, relating to graphs of exponential functions) https://app.mymaths.co.uk/673-lesson/exponential-function (good explanation of exponential growth and decay in sections 1 and 2, followed by real-life questions in sections 3 and 4) https://app.mymaths.co.uk/676-lesson/growth-and-decay **Exam questions (OCR)** • Core 3 Winter 2013 #4 • Core 3 Summer 2007 #5 • Core 3 Summer 2008 #7 • Core 3 Winter 2009 #5 • Core 3 Summer 2014 #5 • Core 3 Winter 2012 #7	17

			Consideration of limitations and refinement of exponential models. Be able to use within context e.g. continuous compound interest, radioactive decay, population growth.			
19		**Connected Particles**	**Understand and use fundamental quantities and units in the S.I. system: mass** **Understand and use derived quantities and units: acceleration, force, weight,** Newton's second and Newton's third laws may be extended to problems involving smooth pulleys and connected problems. Further problems could involve contact problems (e.g. lift problems). All cases could include where forces need to be resolved (e.g. at least one of the particles is moving on an inclined plane.) **Understand and use addition of forces; resultant forces; dynamics for motion in a plane.** May be required to resolve a vector into two components or use a vector diagram May be required to use triangles (and sine/cosine rules) Problems may involve two or more forces. Forces may be given in magnitude – direction form.		**MyMaths links:** (good examples, to use with the whole class, in sections 5 and 6, linked to pulleys, and in section 2, linked to lifts.) https://app.mymaths.co.uk/876-lesson/connected-bodies Dea's connected particles practice activities **Integral resources:** (good questions throughout this exercise) https://2017.integralmaths.org/pluginfile.php/18268/mod_resource/content/0/edexcelasmf3ax_level1.pdf (answers) https://2017.integralmaths.org/pluginfile.php/18299/mod_resource/content/0/edexcelasmf3axw_level1.pdf (also, good questions in this exercise, including applying SUVAT within connected particles questions) https://2017.integralmaths.org/pluginfile.php/18269/mod_resource/content/1/edexcelasmf3ax_level2.pdf (answers) https://2017.integralmaths.org/pluginfile.php/18301/mod_resource/content/0/edexcelasmf3axw_level2.pdf	18
HT						20
20 **TEST 5**	**UNIT 6: RANDOM TOPICS**	**Binomial Expansion**	**Understand and use the binomial expansion of $(a + bx)^n$ for any value of n** $(a + bx)^n$ for positive integer n. **Be able to manipulate and use notations n! and ^nC_r** Use in problems where n is unknown Understand ^nC_r and n! as linked to binomial probabilities. **Approximations**		**Underground Maths Resources:** https://undergroundmathematics.org/counting-and-binomials/r6503 https://undergroundmathematics.org/counting-and-binomials/r7477 **Exam questions (OCR)** • Core 2 Summer 2017 #3 • Core 2 Summer 2016 #3 • Core 2 Summer 2010 #3 • Core 2 Winter 2010 #3 • Core 2 Winter 2009 #7	19
21		**DRVs**	One lesson on DRVs and uniform distributions		**MyMaths link:** (Drvs)	21

		Binomial Distribution	Calculate probabilities, mean and variance of binomial distribution Model real world & appropriateness of the model.		(two good exam questions, in sections 7 and 8, and a good activity relating to a spinner, in section 9) https://app.mymaths.co.uk/845-lesson/probability-distributions **Integral Resources:** (Drvs) (card sort) https://2017.integralmaths.org/pluginfile.php/16883/mod_book/chapter/682/DRV_match.pdf **MyMaths link:** (Binomial Distribution) (good question in section 9) https://app.mymaths.co.uk/839-lesson/binomial-distribution (good question in section 7) https://app.mymaths.co.uk/840-lesson/cumulative-probabilities **Integral Rescources:** (Binomial Distribution) (matching activity; potential team challenge) https://2017.integralmaths.org/pluginfile.php/16894/mod_book/chapter/684/BinProb_events.pdf (answers) https://2017.integralmaths.org/pluginfile.php/16894/mod_book/chapter/684/BinProb_eventsSoln.pdf (Tarsia Puzzle) https://2017.integralmaths.org/pluginfile.php/16894/mod_book/chapter/684/BinomialProbHexJigSol.pdf **Exam questions (OCR)** • Stats 1 Summer 2017 #8 • Stats 1 Winter 2011 #5 • Stats 1 Summer 2015 #7 • Stats 1 Summer 2007 #7 (All of these four questions include a binomial arising from within the original binomial.)	
22		**Calculus III**	Know and use the fundamental theorem of Calculus. Understand and use integration as the limit of a sum i.e. $\int_a^b f(x)\,dx = \lim_{\delta x \to 0} \sum_{x=a}^{b} f(x)\delta x$ Integration of $ax^n, n \neq -1$. Indefinite and with limits Find areas under curves		Introducing area under curve: Approximating areas (Underground maths) Consolidating integration with limits: Integral Chasing (Underground maths)	

23		**Non-constant acceleration**				
24 **TEST 6**		**Hypothesis Testing** PR teachers	Understand and apply the language of statistical hypothesis testing through the binomial distribution (H_o, H_1, significance level, test statistics, 1 & 2 tailed test, critical values & regions, accepted value, p-value).			
25		**Vectors** Parents eve	**Use vectors in two dimensions** Students should be familiar with column vectors and with the use of i and j unit vectors in two dimensions **Calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form.** Students should be able to find a unit vector in the direction of a, and be familiar with the notation |a|. **Add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations.** The triangle and parallelogram laws of addition. Parallel vectors. **Understand and use position vectors; calculate the distance between two points represented by position vectors.** $\overrightarrow{OB} - \overrightarrow{OA} = \overrightarrow{AB} = b - a$ The distance d between two points (x_1, y_1) and (x_2, y_2) is given by $d^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$ **Use vectors to solve problems in pure mathematics** For example, finding position vector of the fourth corner of a shape (e.g. parallelogram) ABCD with three given position vectors for the corners A, B and C. Or use of ratio theorem to find position vector of a point C dividing AB in a given ratio.		Fluency exercise: Hit the spot (Underground maths)	
(26)			**Revision**			
EH						
27 **TEST 7**		FULL WEEK	**Revision**			

28			**Revision**			
29		Bank Holiday Friday	**Revision**			
(30)			**TRANSFER EXAM: Single Maths** **TRANSFER EXAM: Double Maths 1**			
(31)			**TRANSFER EXAM: Double Maths 2**			
HT						
(32)			**FUNCTIONS INDEPENDENT LEARNING PACK**			
33			**Functions** - Mapping, Domain and Range - Composite Functions - Inverse Functions - Modulus Functions			
34			**Functions** - Modulus Functions - Successive Transformations - Partial fractions inc. where degree of the numerator > degree of the denominator, repeated factors.			
35			**Differentiation** - Chain rule - Connected rates of change			
36			**Differentiation** Product rule Quotient rule			
37						