

GCE Mathematics O Level (4017)

Topic	Learning Outcomes:	Suggested Website Resource	Remarks
Numbers	(a) use natural numbers, integers (positive, negative and zero), prime numbers, common factors and common multiples, rational and irrational numbers, real numbers;	http://argyll.epsb.ca/jreed/math9/strand1/1102.htm http://www.bbc.co.uk/schools/ks3bitesize/maths/number/index.shtml	Link to bitesize lessons and interactive applets and quizzes.
	(b) continue given number sequences, recognise patterns within and across different sequences and generalise to simple algebraic statements (including expressions for the nth term) relating to such sequences.	http://www.bbc.co.uk/schools/gcsebitesize/maths/number/sequencesrev1.shtml http://www.bbc.co.uk/schools/gcsebitesize/maths/number/sequenceshrev1.shtml	Link to bitesize lessons and interactive applets and quizzes.
Squares, square roots, cubes and cube roots	(a) calculate squares, square roots, cubes and cube roots of numbers.	http://www.bbc.co.uk/schools/gcsebitesize/maths/number/surdsrev1.shtml http://argyll.epsb.ca/jreed/math9/strand1/1103.htm http://argyll.epsb.ca/jreed/math9/strand1/1104.htm	Link to bitesize lessons and interactive applets and quizzes.
Vulgar and decimal fractions and percentages	(a) use the language and notation of simple vulgar and decimal fractions and percentages in appropriate contexts;	http://nlvm.usu.edu/en/nav/frames_asid_160_g_3_t_1.html?open=activities http://illuminations.nctm.org/ActivityDetail.aspx?id=44 http://www.bbc.co.uk/schools/gcsebitesize/maths/number/fractionsrev5.shtml http://www.bbc.co.uk/schools/ks3bitesize/maths/number/fractions_1_intro.shtml http://www.bbc.co.uk/schools/gcsebitesize/maths/number/percentagesrev2.shtml	Link to bitesize lessons and interactive applets and quizzes.

	(b) recognise equivalence and convert between these forms.	http://www.freewebs.com/weddel/comparing%20fractions.swf http://www.freewebs.com/weddel/Equiv%20Fractions%20Contents.html http://www.bbc.co.uk/schools/gcsebitesize/maths/number/fractionsrev2.shtml	Link to bitesize lessons and interactive applets and quizzes.
Ordering	(a) order quantities by magnitude and demonstrate familiarity with the symbols =, ≠, >, <, , .	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_ordering_numbers/number_ordering_numbers_1_1.swf http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=569 http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/inequalitiesrev1.shtml http://argyll.epsb.ca/jreed/math7/strand1/1107.htm	Link to bitesize lessons and interactive applets and quizzes.
Standard form	(a) use the standard form $A \times 10^n$ where n is a positive or negative integer, and $1 \leq A < 10$.	http://argyll.epsb.ca/jreed/math7/strand1/1103.htm http://www.bbc.co.uk/schools/gcsebitesize/maths/number/powersrev1.shtml	Link to applets.
The four operations	(a) use the four operations for calculations with whole numbers, decimal fractions and vulgar (and mixed) fractions, including correct ordering of operations and use of brackets.	http://argyll.epsb.ca/jreed/math7/strand1/1203.htm http://argyll.epsb.ca/jreed/math9/strand1/1201.htm	Link to applets.
Estimation	(a) make estimates of numbers, quantities and lengths;	http://www.bbc.co.uk/schools/gcsebitesize/maths/number/approximatingandestimatingrev1.shtml	Link to bitesize lessons.

	(b) give approximations to specified numbers of significant figures and decimal places;	http://www.bbc.co.uk/schools/gcsebitesize/maths/number/approximatingandestimatingrev1.shtml	Link to bitesize lessons.
	(c) round off answers to reasonable accuracy in the context of a given problem.	http://www.bbc.co.uk/schools/gcsebitesize/maths/number/approximatingandestimatingrev1.shtml	Link to bitesize lessons.
Ratio, proportion, rate	(a) demonstrate an understanding of the elementary ideas and notation of ratio, direct and inverse proportion and common measures of rate;	http://www.bbc.co.uk/schools/gcsebitesize/maths/number/ratiorev1.shtml	Link to bitesize lessons.
	(b) divide a quantity in a given ratio;	http://www.bbc.co.uk/schools/gcsebitesize/maths/number/ratiorev1.shtml	Link to bitesize lessons and interactive applets and quizzes.
	(c) use scales in practical situations;	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_ips/measuring_scales/number/measuringScales_1_8.swf	Link to interactive applets.
	(d) calculate average speed;	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=485	Link to animation and interactive quiz.
	(e) express direct and inverse variation in algebraic terms and use this form of expression to find unknown quantities.	http://argyll.epsb.ca/jreed/math9/strand1/1203.htm	Link to applet.

Percentages	(a) calculate a given percentage of a quantity;	http://illuminations.nctm.org/ActivityDetail.aspx?id=44 http://nlvm.usu.edu/en/nav/frames_asid_160_g_3_t_1.html?open=activities http://argyll.epsb.ca/jreed/math8/strand1/1210.htm	Link to interactive applets.
	(b) express one quantity as a percentage of another;	http://www.bbc.co.uk/schools/gcsebitesize/maths/numberih/percentagesrev2.shtml	Link to bitesize lessons.
	(c) calculate percentage increase or decrease;	http://www.bbc.co.uk/schools/gcsebitesize/maths/numberih/percentagesrev1.shtml	Link to bitesize lessons.
	(d) carry out calculations involving reverse percentages, e.g. finding the cost price given the selling price and the percentage profit.	http://www.bgfl.org/bgfl/custom/resources_frp/clientftp/ks2/maths/percentages/index.htm http://www.bbc.co.uk/schools/gcsebitesize/maths/numberih/percentagesrev2.shtml http://argyll.epsb.ca/jreed/math8/strand1/1104.htm	Link to applets.
Use of a scientific calculator	(a) use a scientific calculator efficiently;	http://www.calculator.org/CalcHelp/index.htm	Link to applet.
	(b) apply appropriate checks of accuracy.	http://www.geocities.com/razashome/scical.html	Link to applet.
Everyday mathematics	(a) use directed numbers in practical situations (e.g. temperature change, tide levels);	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns/itps/thermometer/numitp/thermometer_1_7.swf	Link to applet
	(b) use current units of mass, length, area, volume, capacity and time in practical situations (including expressing quantities in terms of larger or smaller units);	http://www.bgfl.org/bgfl/custom/resources_frp/clientftp/ks2/maths/measures/index.htm http://argyll.epsb.ca/jreed/math7/strand3/3104.htm	Link to applets.

	(c) calculate times in terms of the 12-hour and 24-hour clock (including reading of clocks, dials and timetables);	http://nlvm.usu.edu/en/nav/frames_asid_318_g_3_t_4.html http://nlvm.usu.edu/en/nav/frames_asid_317_g_1_t_4.html http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_itps/tell_the_time/num_itp_tellTime_09.swf	Link to applets.
	(d) solve problems involving money and convert from one currency to another;	http://www.active-maths.co.uk/whiteboard/2calc/calc_y6_71.html	Link to applet.
	(e) use given data to solve problems on personal and household finance involving earnings, simple interest, compound interest (without the use of formula), discount, profit and loss;		
	(f) extract data from tables and charts.		
Graphs in practical situations	(a) interpret and use graphs in practical situations including travel graphs and conversion graphs;	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_itps/line_graph/num_itp_line_graph_1_1.swf	Link to applet.
	(b) draw graphs from given data;	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_itps/line_graph/num_itp_line_graph_1_1.swf http://illuminations.nctm.org/ActivityDetail.aspx?ID=63	Link to applets.

	(c) apply the idea of rate of change to easy kinematics involving distance-time and speed-time graphs, acceleration and retardation;	http://www.hkedcity.net/iclub_files/a/1/38/webpage/motion/index.htm http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=589	Link to applets.
	(d) calculate distance travelled as area under a linear speed-time graph.		
Graphs of functions	(a) construct tables of values and draw graphs for functions of the form $y = ax^n$ where $n = -2, -1, 0, 1, 2, 3$, and simple sums of not more than three of these and for functions of the form $y = ka^x$ where a is a positive integer;	http://nlvm.usu.edu/en/nav/frames_asid_109_g_3_t_1.html?open=activities http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/quad_graphs.shtml http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/flash/proportion_graphs/proportion_graphs.shtml	Link to applet.
	(b) interpret graphs of linear, quadratic, reciprocal and exponential functions;	http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/linear_graphs.shtml http://nlvm.usu.edu/en/nav/frames_asid_109_g_3_t_1.html?open=activities http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/3graphsrev1.shtml http://argyll.epsb.ca/jreed/math7/strand2/2102.htm	Link to applets.
	(c) find the gradient of a straight line graph;	http://argyll.epsb.ca/jreed/math7/strand2/2102.htm http://nlvm.usu.edu/en/nav/frames_asid_109_g_3_t_1.html?open=activities	Link to applets.
	(d) solve equations approximately by graphical methods;		

	(e) estimate gradients of curves by drawing tangents.		
Coordinate geometry	(a) demonstrate familiarity with Cartesian coordinates in two dimensions;	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_ips/coordinates/num_itp_coordinates_1_1.swf http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=414 http://argyll.epsb.ca/jreed/math7/strand2/2102.htm	Link to applets and animated lesson.
	(b) calculate the gradient of a straight line from the coordinates of two points on it;	http://argyll.epsb.ca/jreed/math7/strand2/2102.htm	Link to applet.
	(c) interpret and obtain the equation of a straight line graph in the form $y = mx + c$;	http://argyll.epsb.ca/jreed/math7/strand2/2102.htm	Link to applets.
	(d) calculate the length and the coordinates of the midpoint of a line segment from the coordinates of its end points.	http://www.active-maths.co.uk/whiteboard/3geom/2points_pythag.html	Link to applet.
Algebraic representation and formulae	(a) use letters to express generalised numbers and express basic arithmetic processes algebraically	http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/1solvingequationsrev1.shtml http://argyll.epsb.ca/jreed/math8/strand2/2101.htm	Link to animated lesson and applets.
	(b) substitute numbers for words and letters in formulae;	http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/2writtenequationsrev1.shtml	Link to bitesize lesson.
	(c) transform simple and more complicated formulae;		
	(d) construct equations from given situations.	http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/2writtenequationsrev3.shtml	Link to bitesize lesson and applet.

		http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/written.shtml	
Algebraic manipulation	(a) manipulate directed numbers;		
	(b) use brackets and extract common factors;	http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/quadraticrev1.shtml	Link to bitesize lesson.
	(c) expand products of algebraic expressions;	http://www.moe.gov.sg/edsoftware/ir/files/maths-algebra/index.html http://www.moe.gov.sg/edsoftware/ir/files/maths-sec-algebraic-expansion-ii/index.htm http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/quadraticrev1.shtml http://argyll.epsb.ca/jreed/math9/strand2/2103.htm	Link to bitesize lesson and applets.
	(d) factorise expressions of the form $ax + ay$; $ax + bx + kay + kby$; $a^2x^2 - b^2y^2$; $a^2 + 2ab + b^2$; $ax^2 + bx + c$;	http://www.bbc.co.uk/schools/gcsebitesize/maths/algebra/quadraticrev1.shtml	Link to bitesize lesson and applets.
	(e) manipulate simple algebraic fractions.	http://argyll.epsb.ca/jreed/math9/strand2/2212.htm	

Indices	(a) use and interpret positive, negative, zero and fractional indices.	http://www.bbc.co.uk/schools/gcsebitesize/maths/num berih/powersrev2.shtml http://argyll.epsb.ca/jreed/math9/strand1/1104.htm	Link to bitesize lesson and applets.
Solutions of equations and inequalities	(a) solve simple linear equations in one unknown;	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=554 http://argyll.epsb.ca/jreed/math8/strand2/2202.htm	Link to animated lesson and applets.
	(b) solve fractional equations with numerical and linear algebraic denominators;	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=553	Link to animated lesson.
	(c) solve simultaneous linear equations in two unknowns;	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=544	Link to animated lesson.
	(d) solve quadratic equations by factorisation and either by use of the formula or by completing the square;	http://lgfl.skool.co.uk/viewdetails_ks4.aspx?id=390 http://www.bbc.co.uk/schools/gcsebitesize/maths/activ ities/intalg_factorising.shtml http://www.bbc.co.uk/schools/gcsebitesize/maths/activ ities/flash/snap_factorising/snap_factorising.shtml http://jblanco_60.tripod.com/	Link to animated lesson, applet and snap game.
	(e) solve simple linear inequalities.	http://www.bbc.co.uk/schools/gcsebitesize/maths/activ ities/intalg_inequalities.shtml	Link to applet.

Geometrical terms and relationships	(a) use and interpret the geometrical terms: point, line, plane, parallel, perpendicular, right angle, acute, obtuse and reflex angles, interior and exterior angles, regular and irregular polygons, pentagons, hexagons, octagons, decagons;	http://www.bgfl.org/bgfl/custom/resources_ftp/clientftp/ks2/maths/3d/index.htm	Link to interactive lesson.
	(b) use and interpret vocabulary of triangles, circles, special quadrilaterals;		
	(c) solve problems (including problems leading to some notion of proof) involving similarity and congruence;	http://argyll.epsb.ca/jreed/math9/strand3/3203.htm	Link to applets.
	(d) use and interpret vocabulary of simple solid figures: cube, cuboid, prism, cylinder, pyramid, cone, sphere;	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=551 http://en.wikipedia.org/wiki/Cube_%28geometry%29 http://en.wikipedia.org/wiki/Prism_%28geometry%29 http://www.mathsisfun.com/geometry/cylinder.html http://www.mathsisfun.com/geometry/triangular-pyramid.html http://www.mathsisfun.com/geometry/cone.html http://www.mathsisfun.com/geometry/sphere.html	Link to animated lesson and animations.
	(e) use the relationships between areas of similar triangles, with corresponding results for similar figures and extension to volumes of similar solids.		

Geometrical constructions	(a) measure lines and angles;	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_itps/ruler/num_itp_ruler_1_2.swf http://www.standards.dfes.gov.uk/primary/publications/mathematics/12886/nns_useict0260002anglehelp.exe http://www.active-maths.co.uk/whiteboard/meas_angle1.html http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=415	Link to animated lesson and applets.
	(b) construct simple geometrical figures from given data using protractors or set squares as necessary;		
	(c) construct angle bisectors and perpendicular bisectors using straight edges and compasses only;	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=550	Link to animated lesson.
	(d) read and make scale drawings. (Where it is necessary to construct a triangle given the three sides, ruler and compasses only must be used.)		
Bearings	(a) interpret and use three-figure bearings measured clockwise from the north (i.e. 000° - 360°).	http://www.active-maths.co.uk/whiteboard/3measure/meas_bearing1.html	Link to applet.
Symmetry	(a) recognise line and rotational symmetry (including order of rotational symmetry) in two dimensions, and properties of triangles, quadrilaterals and circles directly related to their symmetries;	http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_itps/symmetry/num_itp_symmetry_2_2.swf http://www.active-maths.co.uk/whiteboard/2shape/rotate_shapes.html	Link to applets.

	(b) recognise symmetry properties of the prism (including cylinder) and the pyramid (including cone);	http://lgfl.skool.co.uk/keystage3.aspx?id=65	Interactive lessons and interactive applets.
	(c) use the following symmetry properties of circles: <ul style="list-style-type: none"> • equal chords are equidistant from the centre; • the perpendicular bisector of a chord passes through the centre; • tangents from an external point are equal in length. 		
Angle	(a) calculate unknown angles and solve problems (including problems leading to some notion of proof) using the following geometrical properties: <ul style="list-style-type: none"> • angles on a straight line; • angles at a point; • vertically opposite angles; • angles formed by parallel lines; • angle properties of triangles and quadrilaterals; • angle properties of polygons including angle sum; • angle in a semi-circle; • angle between tangent and radius of a circle; • angle at the centre of a circle is twice the angle at the circumference; • angles in the same segment are equal; angles in opposite segments are supplementary.	http://www.mathsnet.net/dynamic/circle2.html http://www.mathsnet.net/dynamic/circle3.html http://argyll.epsb.ca/jreed/math9/strand3/triangle_angle_sum.htm	Interactive lessons and interactive applets.

Locus	(a) use the following loci and the method of intersecting loci: set of points in two dimensions (i) which are at a given distance from a given point; (ii) which are at a given distance from a given straight line; (iii) which are equidistant from two given points;	http://math.nie.edu.sg/bwjyeo/it/MathsOnline_EM/geo/sketch/jsps/IT4EMLoci.html#Locus%20from%	GSP Applet with animation
	(b) use the following loci and the method of intersecting loci: sets of points in two dimensions which are equidistant from two given intersecting straight lines.		

Mensuration	(a) solve problems involving: (i) the perimeter and area of a rectangle and a triangle; (ii) the circumference and area of a circle; (iii) the area of a parallelogram and a trapezium; (iv) the surface area and volume of a cuboid, cylinder, prism, sphere, pyramid and cone. (Formulae will be given for the sphere, pyramid and cone.); (v) arc length and sector area as fractions of the circumference and area of a circle.	http://nlvm.usu.edu/en/nav/frames_asid_282_g_3_t_3.html?open=activities http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/area_squares.shtml http://illuminations.nctm.org/ActivityDetail.aspx?ID=106 http://illuminations.nctm.org/ActivityDetail.aspx?ID=21 http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/area_triangle.shtml http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/volume_cuboids.shtml	Link to applets.
Trigonometry	(a) apply Pythagoras' theorem and the sine, cosine and tangent ratios for acute angles to the calculation of a side or of an angle of a right-angled triangle	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=538 http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=562	Link to animated lessons and applets

	(angles will be quoted in, and answers required in, degrees and decimals of a degree to one decimal place);	http://lgfl.skool.co.uk/viewdetails_ks3.aspx?id=561 http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/trigonometry.shtml	
	(b) solve trigonometrical problems in two dimensions including those involving angles of elevation and depression and bearings;		
	(c) extend sine and cosine functions to angles between 90° and 180°;		
	(d) solve problems using the sine and cosine rules for any triangle and the formula $\frac{1}{2}ab \sin C$ for the area of a triangle;		
	(e) solve simple trigonometrical problems in three dimensions. (Calculations of the angle between two planes or of the angle between a straight line and a plane will not be required.)		
Statistics	(a) collect, classify and tabulate statistical data;	http://www.bbc.co.uk/schools/gcsebitesize/maths/datahandlingfi/interpretingrawdatarev1.shtml	Link to bitesize lesson
	(b) read, interpret and draw simple inferences from tables and statistical diagrams;		

	(c) construct and use bar charts, pie charts, pictograms, dot diagrams, stem-and-leaf diagrams, simple frequency distributions and frequency polygons;	http://argyll.epsb.ca/jreed/math8/strand4/4103.htm http://www.standards.dfes.gov.uk/primary/teachingresources/mathematics/nns_itps/data_handling/datahandling_3_0.swf http://nlvm.usu.edu/en/nav/frames_asid_200_g_3_t_5.html?open=instructions http://nlvm.usu.edu/en/nav/frames_asid_323_g_3_t_5.html http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/frequencybar.shtml	Link to applets.
	(d) use frequency density to construct and read histograms with equal and unequal intervals;	http://nlvm.usu.edu/en/nav/frames_asid_145_g_3_t_5.html?open=instructions	Link to applet.
	(e) calculate the mean, median and mode for individual data and distinguish between the purposes for which they are used;	http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/mean.shtml	Link to applet.
	(f) construct and use cumulative frequency diagrams;	http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/cumulative_frequency.shtml	Link to applet.
	(g) estimate the median, percentiles, quartiles and interquartile range from the cumulative frequency diagrams;		
	(h) calculate the mean for grouped data;		
	(i) identify the modal class from a grouped frequency distribution.		

Probability	(a) calculate the probability of a single event as either a fraction or a decimal (not a ratio);	http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/probability_foundation.shtml http://nlvm.usu.edu/en/nav/frames_asid_305_g_3_t_5.html http://nlvm.usu.edu/en/nav/frames_asid_186_g_3_t_5.html?open=activities	Link to applets
	(b) calculate the probability of simple combined events, using possibility diagrams and tree diagrams where appropriate (in possibility diagrams outcomes will be represented by points on a grid and in tree diagrams outcomes will be written at the end of branches and probabilities by the side of the branches).		
Transformations	(a) use the following transformations of the plane: reflection (M), rotation (R), translation (T), enlargement (E), shear (H), stretch (S) and their combinations (if $M(a)=b$ and $R(b)=c$ the notation $RM(a)=c$ will be used; invariants under these transformations may be assumed);	http://www.mathsonline.co.uk/nonmembers/gamesroom/transform/golftrans.html http://nlvm.usu.edu/en/nav/frames_asid_297_g_3_t_3.html?open=activities http://nlvm.usu.edu/en/nav/frames_asid_294_g_3_t_3.html?open=activities http://nlvm.usu.edu/en/nav/frames_asid_301_g_3_t_3.html?open=activities http://nlvm.usu.edu/en/nav/frames_asid_299_g_3_t_3.html?open=activities	Link to applets
	(b) identify and give precise descriptions of transformations connecting given figures.		

Vectors in two dimensions	(a) describe a translation by using a vector represented by $\begin{pmatrix} y \\ x \end{pmatrix}$, \overrightarrow{AB} or \mathbf{a} ;	http://www.bbc.co.uk/schools/gcsebitesize/maths/activities/vectors.shtml	Link to applet.
	(b) add vectors and multiply a vector by a scalar;		
	(c) calculate the magnitude of a vector $\begin{pmatrix} y \\ x \end{pmatrix}$ as $\sqrt{x^2 + y^2}$ (Vectors will be printed as \overrightarrow{AB} or \mathbf{a} and their magnitudes denoted by modulus signs, e.g. $ \overrightarrow{AB} $ or $ \mathbf{a} $. In their answers to questions candidates are expected to indicate a in some definite way, e.g. by an arrow or by underlining, thus \overrightarrow{AB} or $\underline{\mathbf{a}}$);		
	(d) represent vectors by directed line segments;	http://illuminations.nctm.org/ActivityDetail.aspx?ID=42	
	(e) use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors;	http://illuminations.nctm.org/ActivityDetail.aspx?ID=43	
	(f) use position vectors.		