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Did this video help you?If two vectors can be shown to be parallel then this can be used to prove parallel linesIf two vectors are scalar multiples of each other then they are parallelTo prove that two vectors are parallel simply show that one is a scalar multiple of the otherIf two vectors can be shown to be perpendicular then this can be used to prove perpendicular linesIf the scalar product is zero then the two vectors are perpendicularIf two vectors can be shown to have equal magnitude then this can be used to prove two lines are the same lengthTo prove a 2D shape is a parallelogram vectors can be used toShow that there are two pairs of parallel sidesShow that the opposite sides are of equal lengthThe vectors opposite each other will be equalIf the angle between two of the vectors is shown to be 90 then the parallelogram is a rectangleTo prove a 2D shape is a rhombus vectors can be used toShow that there are two pairs of parallel sidesThe vectors opposite each other with be equalShow that all four sides are of equal lengthIf the angle between two of the vectors is shown to be 90 then the rhombus is a squareIn a geometric diagram the vector forms a path from the point A to the point BThis is specific to the path ABIf the vector is labelled a then any other vector with the same magnitude and direction as a could also be labelled aThe vector would be labelled -aIt is parallel to a but pointing in the opposite directionIf the point M is exactly halfway between A and B it is called the midpoint of A and the vector could be labelledIf there is a point X on the line AB such that then X is two-thirds of the way along the lineOther ratios can be found in similar waysA diagram often helps to visualise thisIf a point X divides a line segment AB into the ratio p : q thenIf the point A has position vector a and the point B has position vector b then the position vector of the midpoint of isThe displacement vectorLet M be the midpoint of thenThe position vectorThree points are collinear if they all lie on the same lineThe vectors between the three points will be scalar multiples of each otherThe points A, B and C are collinear ifIf the points A, B and M are collinear and then M is the midpoint ofThink of vectors like a journey from one place to anotherYou may have to take a detour e.g. A to B might be A to O then O to BDiagrams can help, if there isnt one, draw oneIf a diagram has been given begin by labelling all known quantities and vectorsUse vectors to prove that the points A, B, C and D with position vectors a = (3i 5j 4k), b = (8i - 7j - 5k), c = (3i - 2j + 4k) and d = (5k 2i) are the vertices of a parallelogram.Did this page help you?The diagram shows trapezium OABC.ABis parallel toOC,with.(a) Find expressions for vectors and in terms ofa andc.and so.(b) Point P lies on AC such that AP : PC= 3 : 1.Find expressions for vectors and in terms ofa andc.AP : PC = 3 : 1 means that (c) Hence, prove that point P lies on line OB, and determine the ratio .To show that O, P, and B are colinear (lie on the same line), note that therefore OP is parallel to OB and soP must lie on the line OB If thenPage 2The following diagram consists of a grid of identical parallelograms.Vectors aand bare defined by and.Write the following vectors in terms of a andb.a) To get fromA to E we need to follow vector a four times to the rightb) There are many ways to get from G to TOne option is to go fromGtoQ(btwice), and then fromQtoT(a three times)c) There are many ways to get from E to K One option is to go from Eto O(btwice), and then fromO to K(-a four times) is also acceptablePage 3The points and have position vectors and respectively.Find and simplify the vector .Let and be position vectors of P and Q is the displacement vector from P to QUse the rule thatSubstitute in and Expand and simplifyYou can also get this answer by seeing what vector must be added to to get Page 4Consider two points and .(a) Write down the column vector . Find the horizontal and vertical distances between the two pointsSubtract the x and y components of A from B(b) Find the modulus of vector .Sketching a diagram of the vector can helpApply Pythagoras' theorem to the x and y components of (c) Briefly explain why .The magnitude of a vector is it's 'size'Direction of the vector is ignored since both vectors have the same distanceAnother vector, , has three times the magnitude of vector .(d) Write down a possible column vector for .Being three times means the vector is three times longerOne way to find a vector is to multiply each component of the vector by 3 or -3Another possible answer is Page 5The points A, B and C are shown on the following coordinate grid.(a)Write the vectors and as column vectors.Start by drawing the three vectors onto the gridFrom A to B, it is 6 to the right and 2 upFrom A to C, it is 7 to the right and 6 downFrom C to B, it is 1 to the left and 8 up(b)Without using any calculations, explain why .The vector goes from A to B, then from B to C, then from C back to AThe vector returns to its starting pointPage 6 and.Given that, find the value of and the value of.Write the left-side side as one vectorMultiple each vector by the scalar in front of itAdd the vectors togetherThe top components are equalForm and solve an equationThe bottom components are equal andPage 7Exam code: 1MA13 hours48 questions1a1 markThe vector and the vector are shown on the grid.On the grid, draw and label vector1b2 marksWork out as a column vector.Did this page help you?2a1 markis a triangle. Find in terms ofand .2b3 marks is the point on such thatFind in terms of and . Give your answer in its simplest form.Did this page help you?3a1 markis a parallelogram. is the point on such thatWrite down, in terms of and , an expression for3b3 marksExpress in terms of and.Did this page help you?43 marks is a triangle. is the midpoint of . is the midpoint of .Show that is parallel to.Did this page help you?5a1 markis a quadrilateral.Express in terms ofand .5b4 marks is the point onsuch that andProve thatDid this page help you?62 marksHere are two vectors. Find, as a column vector,Did this page help you?71 mark and are regular hexagons each with centre . is an enlargement of , with centre and scale factor 2Write the following vectors, in terms of and . Simplify your answers.i) [1]ii) [2]iii) [2]Did this page help you?84 marksis a regular hexagon. and are straight lines.Find in terms of and . Give your answer in its simplest form.Did this page help you?91 markHere is vector .Circle the column vector that represents .Did this page help you?101 mark andWork out Circle your answer.Did this page help you?11a2 marksVectors and are drawn on the grid.Write vector as a column vector.11b2 marksFind vector as a column vector.Did this page help you?123 marksVector and vectorGavin starts to draw a diagram to show thatComplete Gavins diagram.Did this page help you?133 marksis a vector.Given that is parallel to , find two possible answers for . orDid this page help you?14a2 marksVector , vector.On each grid below, draw a vector to represent14b1 markEmma says that if she draws vector and vector they will be the same.Explain why this is incorrect.Did this page help you?153 marksVectors a, b, c, d and e are drawn on an isometric grid.Write each of the vectors c, d and e in terms of a and/or b.c = ...d = ...e = ...Did this page help you?1a1 markis a triangle. is a point on .Find the vector , in terms of and .1b4 marks is the midpoint of . is the midpoint of .Show that is a straight line.Did this page help you?2a2 marksis a trapezium.i) Find in terms of and[1]ii) Find in terms of and Give your answer in its simplest form. [1]2b2 marks is the point on such that = 1 : 3Find in terms of and . Give your answer in its simplest form.2c2 marksWhat does your answer to part (b) tell you about the position of point ?Did this page help you?34 marksis a triangle. is the point on such thatShow that is parallel to the vectorDid this page help you?4a2 marks and is the midpoint of .Write in terms of and . Give your answer in its simplest form.4b4 marks is the midpoint of . is the point on such that = 2 : 1Show that is a straight line.Did this page help you?55 marksis a quadrilateral. is the point on such thatProve thatDid this page help you?64 marksis a triangle. is the point on such that where is a scalar quantity.Find the value of .Did this page help you?73 marksis a triangle. The midpoint of is . is a point on .Find the ratioDid this page help you?83 marksis a triangle. The point lies on such that The point lies on such that Using a vector method, prove that is a trapezium.Did this page help you?9a3 marksThe diagram shows parallelogram . The point has coordinates (5, 8) Work out the coordinates of the point .9b2 marksThe point has coordinates (63, 211) Use a vector method to prove that is a straight line.Did this page help you?10a3 marksThe diagram shows triangle is the midpoint of . is the midpoint of . is the point on such that and Express, in terms of and ,i) ii) 10b2 marksState, giving reasons, two different geometric facts relating andDid this page help you?113 marksIn triangle is the midpoint of Work out in terms of and .Give your answer in its simplest form.Did this page help you?121 mark is a straight line.Circle the vectorDid this page help you?13a2 marks Work out13b2 marksShow that is parallel to Did this page help you?143 marksIs a straight line? Show working to support your answer.Did this page help you?155 marksGiven thatfind the value of and the value of . = ... = ...Did this page help you?163 marksTwo vectors, a and b, are shown on the 1 centimetre grid below.Show that the vector a + 2b has length 7cm. You may use the grid below.Did this page help you?172 marksVector , vector.Find the value so that = ...Did this page help you?185 marksP, Q, R and S are the midpoints of OX, XY, YZ and OZ respectively. , and .Show that is parallel to .Did this page help you?1a3 marksis a parallelogram.is the point such that The point dividesin the ratioWrite an expression for in terms of and .1b3 marksProve that is a straight line.Did this page help you?24 marksis a straight line.Express in terms of and . Give your answer in its simplest form.Did this page help you?35 marksis a parallelogram. is the midpoint of . is the midpoint of .Show that is a straight line.Did this page help you?44 marksis a parallelogram. is the midpoint of the line .is a straight line so thatGiven that find the value ofDid this page help you?55 marks and are straight lines. is the midpoint of . where is a scalar quantity.Given that is a straight line, find the value of .Did this page help you?65 marks and are straight lines. is the midpoint of . is the midpoint of .where is a scalar quantity.Given that is a straight line, find the value of .Did this page help you?7a2 marksis a quadrilateral.Express in terms of and/or . Give your answer in its simplest form.7b4 marks is the midpoint of . is the point on such that is a straight line.Work out the value of .Did this page help you?85 marksThe diagram shows triangle is the point on such that is the midpoint of is the point of intersection of and Using a vector method, find as a simplified expression in terms of and Show your working clearly.= .....Did this page help you?95 marks is a trapezium.is the midpoint of is the point such that and are straight lines. Given that use a vector method to find the value of .....Did this page help you?10a2 marksIn the diagramShow that10b4 marksIs a straight line?Show working to support your answer.Did this page help you?113 marksHere is quadrilateral . and are not parallel. is a point on where is a point on where Is parallel to?Show working to support your answer.Did this page help you?123 marks is a pentagon.Show that is a parallelogram.Did this page help you?134 marksVector m= and vector n =Vector 2m + n is parallel toFind the value of .....Did this page help you?145 marksThe diagram shows triangle OAB and points C and D. = 3and = 3. C lies on AB such that AC = 2CB. D is such that = + 2 + . Show, using vectors, that OCD is a straight line.Did this page help you?153 marksis a parallelogram. and. is the midpoint of . is the midpoint of . Prove that and are parallel.Did this page help you?Page 8Simplifying Surds, Rationalising DenominatorsUsing a CalculatorAlgebraic Roots & IndicesAlgebraic Roots & IndicesCompleting the SquareAlgebraic ProofSolving Linear EquationsIterationEquation of a Circle, Equation of a TangentDirect & Inverse ProportionDirect Proportion, Inverse ProportionExchange Rates & Best BuysExchange Rates, Best BuysArea & Volume of Similar ShapesSimilar Areas & Volumes3D Pythagoras & Trigonometry3D Pythagoras & TrigonometryPage 9Exam code: 1MA1Tools designed specifically for the Edexcel GCSE Maths: Higher syllabus, to help you ace your exams, including: past papers, revision notes, and exam-style questions, created by our expert team of teachers and examinersExam specification alignedPersonalised feedback on exam answersWritten by teachers and examinersExaminer tips and tricksExam practice with solutionsPDF downloadsStep-by-step mark schemesDid this video help you?Vectors can be used to prove two lines are parallel (see Vector Addition)They can also be used to show points are collinear(lie on the same straight line)Vectors can be used to find missing vertices of a given shapeYou will need a good understanding of how to divide a line segment into a given ratioWhen problem-solving with vectors, trigonometry can help us:convert between component form and magnitude/direction form (see Magnitude Direction)find the angle between two vectors using Cosine Rule (see Non-Right-Angled Triangles)find the area of a triangle using a variation of Area Formula (see Non-Right-Angled Triangles)Think of vectors like a journey from one place to another you may have to take a detour eg. A to B might be A to O then O to B.Diagrams can help, if there isnt one, draw one. For a given diagram labelling all known vectors and quantities will help.Did this page help you?Report this resourceto let us know if it violates our terms and conditions. Our customer service team will review your report and will be in touch.Related PagesVectorsEqual VectorsVector MultiplicationVector GeometryA vector is a quantity that has both magnitude and direction.What Are Parallel Vectors?Vectors are parallel if they have the same direction.Both components of one vector must be in the same ratio to the corresponding components ofthe parallel vector.Example:How To Define Parallel Vectors?Two vectors are parallel if they are scalar multiples of one another.If u and v are two non-zero vectors and u = cv, then u and v are parallel.The following diagram shows several vectors that are parallel. Example: Determine which vectors are parallel tov = Show Video Lesson What Are The Conditions For Two Lines To Be Parallel Given Their Vector Equations?Lines are parallel if the direction vectors are in the same ratio.Example: If the lines l1:\(r = \left({\begin{array}{*{20}{c}}1\\{ - 5}\\7\end{array}} \right) + \lambda \left({\begin{array}{*{20}{c}}{a - 1}\\{ - a - 1}\\b\end{array}} \right)\) and l2: \(r = \left({\begin{array}{*{20}{c}}9\\3\\{ - 8}\end{array}} \right) + \mu \left({\begin{array}{*{20}{c}}{2a}\\{3 - 5a}\\{15}\end{array}} \right)\).Find the values of a and b.Show Video LessonWhat Is A Vector Is, How To Add And How To Prove Vectors Are Parallel And Collinear?Examples:A, B, C are midpoints of their respective lines. Find the vector OB.N = midpoint of OB, M = midpoint of OA. Show that MN is parallel to AB.Given the vectors, prove that the three given points are collinear.Show Video LessonHow To Answer A Question That Involves Vectors - Lines, Parallel, Perpendicular & Intersection?Show Video Lesson Try out our new and fun Fraction Concoction Game.Add and subtract fractions to make exciting fraction concoctions following a recipe.There are four levels of difficulty: Easy, medium, hard and insane. Practice the basicsof fraction addition and subtraction or challenge yourself with the insane level. We welcome your feedback, comments and questions about this site or page. Please submit your feedback or enquiries via our Feedback page. The parallel vectors are vectors that have the same direction or exactly the opposite direction. i.e., for any vector a, the vector itself and its opposite vector -a are vectors that are always parallel to a. Extending this further, any scalar multiple of a is parallel to a. i.e., a vector a and ka are always parallel vectors where 'k' is a scalar (real number).Let us learn more about parallel vectors along with its definition, formula, and examples. What are Parallel Vectors? Two vectors are said to be parallel if and only if the angle between them is 0 degrees. Parallel vectors are also known as collinear vectors. i.e., two parallel vectors will be always parallel to the same line but they can be either in the same direction or in the exact opposite direction. In the following image, the vectors shown in the left-most figure are NOT parallel as they have different directions (i.e., neither the same nor opposite directions).The parallel vectors that are in opposite directions are sometimes referred to as anti-parallel vectors too. In the above image, the last figure shows the anti-parallel vectors. But how to identify the parallel vectors mathematically? Let's see.How to Find Parallel Vectors? Two vectors a and b are said to be parallel vectors if one isa scalar multiple of the other. i.e., a = k b, where 'k' is a scalar (real number). Here, 'k' can be positive, negative, or 0. In this case,a and b have the same directions if k is positive.a and b have opposite directions if k is negative.Here are some examples of parallel vectors:a and 3a are parallel and they are in the same directions as 3 > 0.v and (-1/2) v are parallel and they are in the same directions as (-1/2) < 0.a = and b = are parallel as b = = 3 = 3a.In the above examples, example 2 refers to the anti-parallel vectors.Dot Product of Parallel Vectors The dot product of any two parallel vectors is just the product of their magnitudes. Let us consider two parallel vectors a and b. Then the angle between them is = 0. By the definition of dot product,a b = |a| |b| cos = |a| |b| cos 0 = |a| |b| (1) (because cos 0 = 1) = |a| |b|Therefore, the dot product of two parallel vectors is the product of their magnitudes.Cross Product of Parallel Vectors The cross product of any two parallel vectors is a zero vector. Consider two parallel vectors a and b. Then the angle between them is = 0. By the definition of cross product,a b = |a| |b| sin \(\hat{n}\) = |a| |b| sin 0 \(\hat{n}\) = |a| |b| (0) \(\hat{n}\) (because sin 0 = 0) = 0Note that 0 here is a vector, not a scalar. Thus, the cross-product of two parallel vectors is a zero vector (not simply zero).Parallel Vectors Formula The parallel vectors can be determined by using the scalar multiple, dot product, or cross product. Here is the parallel vectors formula according to its meaning explained in the previous sections.Unit Vector Parallel to a Given Vector The unit vector that is parallel to a given vector a is denoted by \(\hat{a}\) and is given by \(\hat{a}\) = a / |a|. Observe two things here:a and a / |a| (which is 1/|a| a) are scalar multiples of each other. Hence, a and \(\hat{a}\) are parallel.The magnitude of a / |a| is |a| / |a| = 1. Hence \(\hat{a}\) is a unit vector.Hence, a / |a| is a unit vector parallel to a. It is obtained by dividing a vector by its magnitude.Example: Find the unit vector that is parallel to the vector a = 3i + 4j.Solution:It is given that a = 3i + 4j.Its magnitude is |a| = (32 + 42) = (25) = 5.Thus, the unit vector parallel to a is, \(\hat{a}\) = a / |a| = (3i + 4j) / 5 = (3/5)i + (4/5)jProperties of Parallel Vectors Two vectors a and b are parallel to each other if and only if a = kb, where 'k' is a scalar.Here, a and b are in the directions if k > 0 and are in opposite directions if k < 0.Every vector a is parallel to itself as a = 1 a.Two vectors a and b are said to be parallel if their cross product is a zero vector. i.e., a b = 0.For any two parallel vectors a and b, their dot product is equal to the product of their magnitudes. i.e., a b = |a| |b|. Related Topics: Example 1: Determine whether the vectors a = and b = are parallel. Solution:We cannot see that if something is taken as a common factor from one of a or b gives the other vector. So let us assume that:a = kb = k 10 = 15k; -6 = -9kk = 2/3; k = 2/3Since the value of 'k' is the same in both cases,a = (2/3) bAnswer: a and b are parallel vectors.Example 2: Find the unit vector that is parallel to the vector a = i + 2j + 2k.Solution:The given vector is a = i + 2j + 2k.Its magnitude is, |a| = (12 + 22 + 22) = 9 = 3.The unit vector parallel to a is:\(\hat{a}\) = a / |a| = (i + 2j + 2k) / 3 = (1/3)i + (2/3)j + (2/3)kAnswer: The required unit vector is (1/3)i + (2/3)j + (2/3)k.Example 3: Find a vector that is parallel to v = i + 2j + 2k and is in its opposite direction.Solution:To find the parallel vector of v that is in the opposite direction of v, i.e., to find the anti-parallel vector of v, it is sufficient to multiply it by a negative number.Let us multiply v by any random negative number, say -2.-2v = -2 (i + 2j + 2k) = -2i - 4j - 4k.Answer: The required vector is -2i - 4j - 4k.View Answer >go to slidego to slidego to slideHave questions on basic mathematical concepts?Become a problem-solving champ using logic, not rules. Learn the why behind math with our certified expertsBook a Free Trial ClassFAQs on Parallel Vectors Two vectors a and b are said to be parallel vectors if one of the conditions is satisfied:If one vector is a scalar multiple of the other. i.e., a = kb, where 'k' is a scalar.If their cross product is 0. i.e., a b = 0.If their dot product is equal to the product of their magnitudes. i.e., a b = |a| |b|.How Do You Find a Vector Parallel to a Given Vector?To find a vector that is parallel to a given vector a, just multiply it by any scalar. For example, 3a, -0.5a, 2 a, etc are parallel to the vector a.How Can You Determine if Two Vectors are Parallel?To determine if two given vectors are parallel, just see whether you can take a common factor out of one vector so that it is a multiple of the other vector. Another way is to check whether their cross product is 0.What is the Difference Between Perpendicular and Parallel Vectors?Here are the differences between perpendicular and parallel vectors.Perpendicular VectorsParallel VectorsTwo vectors are said to be perpendicular if the angle between them is 90 degrees.Two vectors are said to be parallel if the angle between them is 0 degrees.The dot product of two perpendicular vectors is 0.The cross-product of two parallel vectors is 0.If a and b are perpendicular then |a b| = |a||b|.If a and b are parallel then a b = |a||b|.Is a Vector Parallel to Itself?Every vector a is a scalar multiple of itself. i.e., a = 1a. So every vector is parallel to itself. Also, the angle between a vector and itself is always 0 degrees. In this way also we can tell that a vector is parallel to itself.What is the Formula for Unit Vector Parallel to the Resultant Vectors?We know that the unit vector parallel to a vector a is a / |a|. So the unit vector parallel to the resultant of two vectors a and b is (a+b) / |a+b|.What Is the Difference Between Parallel Vectors And Skew Lines?Parallel vectors and the skew lines are both in the three-dimensional space. The parallel lines never intersect and are parallel with reference to the x, y, and z coordinates. The skew lines are also in the three-dimensional space, but are neither parallel nor are them intersecting. The skew lines are the line present in different planes.What are Equal and Parallel Vectors?Equal vectors have the same magnitude and same direction. The parallel vectors may have different magnitudes but they have the same/opposite directions. For example:a and a are equal vectors.a and 3a are parallel vectors. Back to AQA Vectors (H) Home4.12 D) Proving that Vectors are Parallel We are able to prove that vectors are parallel by showing that the two vectors have a common vector factor. Lets have a few examples. Example 1Prove that the vectors below are parallel to one another. To prove whether these two vectors are parallel to each other, we need to find a common vector factor. Both of the vectors have a common vector factor of the column vector below: We can prove that this is the case by factorising the common vector factor out of both of the vectors. Factorising the 1 out of vector b is a bit pointless, but it does show that both of the vectors have a common vector factor. Example 2Prove that the vectors below are parallel. Like before, we are looking for a common vector factor for the two vectors and the common vector factor is shown below: The next step is to factorise this common vector factor out of both of the vectors. The final step would be to say something like: the two vectors are parallel to one another because they have a common vector factor.

How to tell if two lines are parallel vectors. How to prove lines are parallel using vectors. How to prove parallel lines vectors. How to prove two vectors are not parallel. How do you prove vectors are parallel. How do i prove that two lines are parallel.