

A lot of. Some problems

So now. Use the. Programs or to see applications of quickness all the problems.

So let us start. Here is my first problem. Let who made this drive? Industrial drive.

So this is something that is. We are asked to show that. See. Three times. Some of the things to understand before we actually start the problems here have been given 4 triangles in space. Keep trying. They wanted their title. It doesn't matter what kind of quality is this? OK. One minute, let me ask for a case of communications. Because of that, we use a similar protection. Since the game. See. Then what is being said is if I connect, if my initial point is a terminal point that is. Start with this. Then I start with. That is slightly shifted. Let's start with joining. Let me. There's. That's right. What? See what? Then you start with the. That is the same. Then I start with these. Just talking. We start with C and join C1,

So as you must have seen, this is this either direction in this event. Be the one. FCC. You must be like what is the centroid? It is something that is. Something like this? If I start with this point, then draw a line. Do the opposite side. Bicep just opposite side into two parts. 2 equal parts. Similarly, if I do this. For all the all the sides of the triangle. Then you should get a point. And I should get the point. That point is called sample for this particular circle. This is the for this particular triangle. This is the point which is just

So I will do a similar exercise over here. And this is a point.

So what is being said is? Switching. Being said this then of the vector in vector notation, $A_1 \text{ bar} + B_1 \text{ bar} + C_1 \text{ bar}$ is nothing but $3 * C_1 \text{ bar}$, Q and bar. And we want to prove it. OK. Yes, I will start with 120° . Even. Now if I want to prove this. If I want to prove that this plus some other vectors have the component of $G_1 \text{ bar}$, then I should express these components. These these vectors having component $G_1 \text{ bar}$? How will I achieve that? We're gonna do that very easily by considering the centroid. Is there any line that is coming to the centroid? Yes, there is a vector. Which is coming from A to J. ETA 5 How to make that easy? If I want to go to the point A1, which is the point here? How will I go? If I'm here, then there's only one way to connect that is 331 bar . Plus if I want to go to the table, then there is a box. There is a vector of this part which is. Can you verify this? We have actually used for triangle law in my implicit manner. That is, we started with PG and then we reset.

So it's one bar and then we again use the triangle lock, which is $1 \text{ bar} + C_1A_1 \text{ bar}$ and therefore we we have actually moved from A to one bar in a similar manner. We want a representation for. The. Now you can guess it will be busy. I will come to the center right? This. G_+ will be even. And then similarly I can do same calculation of CC which will be. See see. Terminal point.

So this is a repeated application of the law. That is what is needed.

So now if I sum all these three equations, I will get the left hand side. What is my left hand side? So. Like that? Instead of people. You see equal to.

So again, you can write this in salt, but let me do it. And we look at these 3 tops. You are getting part of oranges this three times 331193 . This. Plus some remaining thumbs, and if the importance the show is true, then I would show that these terms are. Let me write this. It's easy.

So let us take these three notes together.

So these are the terms which are our first triangle. Plus this thing.

So you have the terms of the same. No. If you look at the GRPC bar. In the context of the triangle. Let us name this point. This particular item is a C bar. We have BCR is this this, this this, this? Fire safety. Look at this stranger. Because one. Let's call that point is. What we can see is. BG bar on using the section volume that is derived in the previous classes. We can write this PHP bar C bar. Equal to violate this booking according to section. This on the line on the. Let me see. Continued internally therefore. And we just regarded into 2 equal halves there to. This should be two times. This is based on section formula or inception formula notation. We can write this as PC bar. Wanna get?

So I will use the same logic and I will write this down like this this term. Types.

So overall, our formulation now becomes G. Yes. Two times I can do as I can play a similar trick over this particular time. Not experience again, but you can guess what that will be.

So I have this this.

So there is a line. There is a line which connects the points P1 and C1 and there will be

an information .1. And it is called this point, and it cuts this input to equal halves.
 So I will again apply that section formula and write this as four types. See what? Steven
 it's fairly straightforward now. This is a centroid centroid,
 So this point, $8G \text{ bar } 2 * 8 G \text{ bar}$ is nothing but.
 So this length. Is twice the length covered over here and it is in the $GD \text{ bar } G \text{ bar}$. Both
 are instant directions. Bar is in opposite direction. Such as this easy bot. Similarly
 this thing it starts with C ends and
 So this will be a one. By the same logic.
 So now this expression can become. Yes. Do you use your body? Indeed. I don't know what
 are these. $18 \text{ bottom } GM \text{ bar}$ on nothing but opposite vectors, that is $PG \text{ bar}$ is equal to
 minus $G \text{ bar}$.
 So therefore. $3 * 5$ Plus this distance magnify the effect of this,
 So it essentially what we are starting with a we are going to see. Starting from G are
 coming to it,
 So this is nothing but bar,
 So this will be a \emptyset . Plus see my same login. This will again be a \emptyset
 So zero vector added. We will not get anything,
 So it's three which is our. We started with this was over. Then we split them into
 components using Python. Request visits. Then we isolated this $3G1 \text{ bar}$. Then we have used
 the properties of. Here we have used this Excel formula. Same formula we used here also.
 After using the Simpson Formula we have used G is the centroid. Therefore this thing is
 equal to this and this thing is equal to this and therefore we have root. Just finish
 this story. Then you have seen a lot of problems based on coordinates. Theory of vectors.
 So let us come to the coordinate system. Let's see some problems. Question. We have been
 given two points or you can save position vectors. That either we can give the
 coordinates of the point, or we can give the position vector of points.
 So here we are choosing the position vectors of the points, so. Like find a straight. I'm
 following the same convention. I will not write I cavity. The position where there is
 simply override. For the position requires $3 I + 3\emptyset$. For this please. List. This. Then the
 question is very generous. The question is.
 So this is the question, what kind of portal that is QR ? Glasses.
 So there are things first. We have the generated coordinate with this. But you are a bot.
 Artist bot.
 So these are the continent factors that make it.
 So let us Draw Something 2000 about it. Just call this this point to speak. This point is
 to this point is point.
 So tell me any coordinate,
 So I don't. I don't know. I don't know what kind of coordinate. But I know something that
 I can use my triangle law to obtain this.
 So I have been given a position right
 So all the points are positioned with respect to my origin which is. If I want to be
 killed by with, you know the next order, things that made repeated ones. Q . Three bodies
 in this direction. Your body is in this class,
 So so we have we want to fight for this $PU \text{ bar}$.
 So here if you look at this diagram you will if we want to point $Q \text{ bar}$ then you will
 start with B . You will go through and then you will go to Q .
 So this can be mathematically expressed as. Killed spots 435.
 So remember this way the initial point, you will subtract the position vector and the
 terminal point. You will add the position. Same thing you can write for this.
 So initial point is Q ,
 So you have to subscribe the initial point. Terminal Point is asked
 So you will add the terminal point. This voice part.
 So now it's just a matter of adding and subtracting the vectors that are given to us.
 So what is $op \text{ bar}$? It is right here. This is my top bar. Keep quiet.
 So we know all the vectors that will not.
 So Tokyo bar is four $8 - 2 - 2 I$ minus J ,
 So it's 4. Minus minus $2 + 2$. I . Minus $5\emptyset$
 So minus minus plus.
 So this will be. $6 + 6$. Then what would be the $QR \text{ bar}$? Easy. What what is $3 I$ plus three
 and four? I
 So only on the audition is there in the high component.

So $3 - 3 - 4$ which will be minus one I. Minus. Alright,
 So there is nothing to subtract. What is the best? Just this minus $8 + 3$. Similarly, what
 will be our spark? Let me not do the calculation. Let me leave the calculation to you.
 Minus 6. Wireless what is the State Bar? Again, just to verify it will be 5 minus. No.
 You can note pages. If you look at this particular expression. Minus $6 - 6$ and if you
 look at this particular expression which is $6I + J$, then. Wireless this particular
 expression $I - 3$. Minus $5 + 3$ Six again you are getting minus of. What about? Yes.
 So what we are seeing is new bar and R is bar. Are parallel to each other. Aren't we? And
 of course, your direction. Similarly. Alright. Similarly QR bar. That you bought. Little
 bit each other in the opposite direction. If you have not done. They are opposing.
 So if they are opposite to exist then. What we have seen is they are parallel.
 So one of the possibilities is because we are trying to address this question. What kind
 of quadrilateral is think you are? These vectors are parallel
 So this. Quadrilaterals can be parallelogram. But if all the sides are equal, then this
 can be robust. It's just a question, but one of the cases can be parallel to ground where
 we don't know whether it is obvious or not. It can be expanded. For it to be rectangle,
 either the diagonals will be equal or one of the angles will be able to show that it is
 90 degrees,
 So I don't know this, but for sure it will be a parallel.
 So let us try to eliminate or justify the possibilities of robots.
 So what we will do is we will first find. Or
 So what do you want with you? Square root of the coordinates $6I + 36 + 1$. You should
 see. What is 37? What is mod?
 So we will just check the opposite thing. This is important. OK. $36 + 1$ again, but this
 is again.
 So what we have? See. Similarly, we can do the other part that is our part. You see?
 These people. Again, this observance that this is a partial program. No. Now we want to
 see whether they form a degree or not. Or will we ensure that.
 So if we have to make this a bar and then if you if you are sure that this form of 90
 degree angle, then this product should be equal to 0 . Thought this was particular to me.
 So we're going to do within the product is equal to 0 whether the angle Q is 90 degrees
 or not. 65 yesterday I lost the last class. Before this class we have seen this component
 wise multiplication right?
 So this is 6 and $2 - 1$. Just 123 which is equal to minus $6 + 3$, which is 3. It is not
 clear because minus six is there,
 So it's minus 3. Similarly, you can check for all other things,
 So I will just write down what are the. Should be. PayPal. That's. R is bar dot.
 So you can notice some. First of all, they are not perpendicular to each other,
 So this cannot be a rectangle. Person is eliminated, then Q&R are the same. QRS PR
 same but this one devalue one let us say QR bar will evaluate.
 So what will it be?
 So it will be 1. And this is not equal to 37. Therefore all the sides are not equal.
 Using. Thank you
 So all the sides are not equal.
 So that eliminates we cannot be robust. It cannot be rectangular because the of the
 angles is. Is also elevated,
 So only thing that remains is parallelogram. Therefore quadrilateral which you are. Let
 us go to the next problem. Let us try to appeal come through the triangle and it shows.
 The next question is. Minus. Why? Sorry. First of all, we should show that they form a
 triangle. They both sides. Support. A bar.
 So this is the question. Now I have started answering about this. Equal let's just.
 Interesting observation. Body is something together. Then just see three plus $2/5$. My
 name is Jane. Minus $3 - 3$. What is this? So. And therefore these three vectors form.
 Well. We want to show that there are many. There are two ways to show. Either you show
 all the sites are same or you show all the answers are. Just 60 degrees,
 So we will choose the latter one because we can. We have an opportunity to do
 So what is? It's pretty easy, it's component wise,
 So $3/6$. $2 - 3$, which is minus 60 . Which is minus. That is $6 - 25$, which is minus 90 . Dot
 C. Very easy,
 So you just click. White. Into my. Minus three to two six. These are the three.
 So what is it? Why? All angles must be safe. So. Now, in order to see in order to find

the answers, we also need to find. More people. What is mode? Supported us right?

Similarly, since it's just a permutation of all the numbers,

So this also was all the vectors you can see are permutations of 3/5 and two.

So these are

So much featured here. Similarly, this also must be equal to see. Now let us go to our dot product. Now if I want to find angle between the two vectors, say constant $\bar{a} \cdot \bar{b}$. Want? I need you to. Which is equal to minus 19 upon 38 equal to minus one by two. It is called as Theta one. Posting two similar calculations. This will become one by two cost data.

So cost data one is an angle between \bar{A} and \bar{B} and all others are entered between. That is called this as. This policy is saying.

So this this angle. Because \bar{a} and \bar{b} are being considered, they cannot have anything here. They have been here. About here and here. Theta two Theta two is an angle between \bar{A} and \bar{C} . It's this. In the ideal between periods.

So you just see the last data is equal to half. That means Theta is equal to 60 degrees. Which are 60 degrees. But between \bar{a} and \bar{c} you are getting a negative number, So this must be an angle and therefore it is cost of 120 degrees \bar{c} equal to this. But for triangle we are not considering these things. We are considering the angle 180. This. So which is which? Therefore, this angle is also 60 degrees. What we have shown is all sites are safe. All angles are same which are 60 degrees. Therefore this must be an equilateral triangle.

So now this analyzed

So we wanted to show that some of the some opposition vectors are given and we wanted to show that. $\bar{a} + \bar{b}$ is equal to \bar{c} . It shows that this is a tiger. Then we are interested. Inshort, we need not prove this because the moment you say all sides have equal magnitude, you get an equilateral.

So it's $\bar{a} = \bar{b} = \bar{c}$. Therefore this is an equilateral. In addition to this, what we have done is we have figured out what our cost, Theta one, Cos Theta two and Cos Theta. Here the main purpose of showing this is even though this number is. This angle is not considered for the formation of. That is what I want to tell the same, So I will show you this one.

So in particular if you just want to show something is an equilateral triangle, first it should form a triangle and you have to show that all sides are equal. It suffices to flow. This is an equilateral. I'm gonna just move on to the next round. Problem on which you have. Say we have an isosceles right. Show that.

So you see, we have two. Points points. 66 why does 6?

So again, we don't have much time left. There is a one to one correspondence between this representation and the position with the representation,

So I will directly write. For these people.

So that part is Sponsored Triangle also.

So first here are three things that I have to know. First response are triangle.

Isosceles means two sides are equal and some dot product is equal to 0.

So let us write \bar{AB} is equal to \bar{BOA} .

So that will be. $\frac{3}{8} + \frac{3}{6}$ we can just verify minus 4. Minus minus one, which is plus one. This is this other $9 - 6$ which is 3 J and SIX minus 6360. OK, see you, bye. Which is equal. Hi this. 4. This PC box. Why this? You can do it quickly in your mind and verify my results are correct. Also you can see. He beat box. \bar{c} . Receive receive you can see this. Everybody just be \bar{c} box. Minus 3 plus 465. Equity minus 2. You saw the $3 - 2$. Is

1262 and there is 0. $\frac{4}{4} \bar{c}$ equal to \bar{BC} in. This ensures that the final response. Use the triangle lock. Now we want to show that there is a strangely isolated that means two sides are equal. Can you guess which two sides are equal? This representation.

So I guess these two sides are equal. Why? Because your square is down. I have seen if it is OK. Bought three square which is 9. This.

So that the square root of 18. What is a \bar{c} ? Sequel to. One square which is 1. Once. Foursquare 16.

So is it just my inspection I've seen and therefore my EP? \bar{c} . Thankful. It is a possible. It is nothing but. Now I want to show that this particular standard is right. No, you can see. Four times edition point.

So the angle at air must be right. Because these two sides are equal,

So suppose. I want to draw this figure. The sides are equal. I don't need two sides are equal then that definitely cannot be able to get us,

So it should be the. These two sides are equal in the angle at this point must be right. Let us verify that like how will we verify the claim? You can just take the dot product of these two schemes. We have the coordinates

So we can just fix the componentwise multiplication to minus 3. Let's see. There is no component of case it is 04 ,

So this is nothing. The claim is verified, therefore it is right as this therefore triangle. Please. Straight. Let's get another problem. Also I find the. Start cycling. Yes. 1st. Just. This is equal to 0 . This. Nearby. What would be the? How did I get this concerned because I need this crossbows. In order to generate the cost of something like this. About what I will come up with, they will come up with. Which are. Save. Plus bar bar dot C bar. All of them is some voice. The barn door. Yes. Dot C. Which is a bar. Was. Do I know anything about this? Yes, I do want to say about war is nothing but more papers. Boss yes. Facilities. Now what are these steps? That's right. 16 yes. What is this? 36 this bracket. This bracket is nothing but the town that we are.

So this bracket. Actually inquired to minus 26. This is. Hold on to this. To summarize, the basic training, what we have done is we have used vector algebra efficiently, solve some of the problems typically related to each other. Then we have used our scalar multiplication in order to show something is perpendicular or not. Basically, if we are using the property that the dot product of vectors is 0 . If the windows are not. There must be. That's all we have. Problems related to triangles where one of the angles was an optimal angle, but that angle was not used for in the triangle,

So you have to be aware of all these things when you are solving the problems.

So let us see. Let us see you next time we will solve some more advanced problems. Thank you for watching.