A/L | COMBINED MATHEMATICS

STATICS

VECTORS & COPLANAR FORCES

Raj Wijesinghe

1) [redacted] are the mid points of $\overrightarrow{LM}$ and $\overrightarrow{MN}$ respectively, find LM and OQ.

[redacted]

i. $\overrightarrow{OP}, \overrightarrow{OQ}$

ii. $|\overrightarrow{OP}|$, $|\overrightarrow{OQ}|$

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

11) P,Q,R,S are four points on a plane. Mid points of the PR and QS are U,V respectively.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

16) position vectors of A,B,C, of the triangle ABC are $\underline{r}_1, \underline{r}_2, \underline{r}_3$. Position vector of ortho-centre H is given by $\underline{r}$.

[redacted]

[redacted]

18) The position vector of point A and B are $\underline{a}$ and $\underline{b}$. C is a point on AB such that AC : CB = P : Q . Find the position vector of C and show that it can be written as $\lambda \underline{a} + \mu \underline{b}$, where $\lambda + \mu = 1$

A,B,C,D, are the points on a co - plane. position vector of the points are $\underline{a}$, $\underline{b}$, $\underline{c}$, $\underline{d}$ Respectively. such that $\underline{d} = \lambda \underline{a} + \mu \underline{b} + \gamma \underline{c}$ where $\lambda + \mu + \gamma = 1$. If AB and BC meet at E, Show that the position vector of E is $\frac{1}{\lambda+\mu}[\lambda \underline{a} + \mu \underline{b}]$

19) [redacted],D are $\underline{a}$, $\underline{b}$, $\underline{c}$, $\underline{d}$ respectively. Show that $\alpha\underline{a} + \beta\underline{b} + \gamma\underline{c} + \delta\underline{d} = \underline{0}$, itence α, β, γ, δ are the scalars such that

$\alpha + \beta + \gamma + \delta = 0$

When

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

26) (i) [redacted] BD such that BE=FD. Apply vector addition for the triangles ADF and BCE and find the vectors $\overline{AF}$ and $\overline{EC}$. Hence show that AECF is a parallelogram.

[redacted]

[redacted]

[redacted]

[redacted]

32) Let $A \equiv (1,k)$, $B \equiv (k,-1)$

[redacted]

[redacted]

[redacted]

34) [redacted]
that SG:GP=λ: $(\mu + \nu)$. Show that $\lambda\overrightarrow{GP} + \mu\overrightarrow{GQ} + \nu\overrightarrow{GR} = \vec{0}$.
Let I be the incentre of the triangle ABC .
Deduce that $a\overrightarrow{\mathrm{I}A} + b\overrightarrow{\mathrm{I}B} + c\overrightarrow{\mathrm{I}C} = 0$
Here a, b, c are the points on the sides BC, CA, AB respectively of the triangle ABC.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

40) $\underline{a}$ and $\underline{b}$ are the position vectors of the points A and B relative to the point O which are nonparallel and nonzero. If $\alpha\underline{a} + \beta\underline{b} = 0$, show that $\alpha = 0$ and $\beta = 0$. A, B, O are the non collinear points such that and the angular bisectors of angles AOB and OAB meet at R. Let $a = |\underline{a}|$, $b = |\underline{b}|$, $c = |\overrightarrow{AB}|$.

[redacted]

[redacted]

41) O, A, B, C are four distinct points such that O, A, B are non collinear. If α, β are nonzero scalars, $\overrightarrow{OA} = \underline{a}$, $\overrightarrow{OB} = \underline{b}$, and $\overrightarrow{OC} = \alpha\underline{a} + \beta\underline{b}$.

i. D lies on OA such that $\overrightarrow{OD} = \gamma\underline{a}$. Find γ and δ such that $\overrightarrow{DC} = \delta\underline{b}$.

ii. Write down $\overrightarrow{AB}$ and $\overrightarrow{AC}$ in terms of α, β, $\underline{a}$ and $\underline{b}$. If $\alpha + \beta = 1$, show that the points A, B, C are collinear. If C lies between A and B, state the ratio AC: CB in terms of α and deduce that $0 < \alpha < 1$.

iii. P and Q are two points such that $\overrightarrow{OP} = 2\underline{a}$ and , $\overrightarrow{OQ} = \frac{2}{3}\underline{b}$. AB and PQ intersect at point R. Write down $\overrightarrow{OR}$ in terms of $\underline{a}$ and $\underline{b}$. Find the ratios AR:RB and PR: RQ.

[redacted]

B and C lie on QP and OQ respectively such that $\frac{OB}{BP} = \gamma(> 0)$ and $\frac{QC}{CO} = \mu(> 0)$.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

47) (i) $\underline{a}$ and $\underline{b}$ are free vectors and the angle between them is θ.

Show that $|\underline{a}| - |\underline{b}| \leq |\underline{a}+\underline{b}| \leq \sqrt{a^2 + b^2 + 2\underline{a}\underline{b}\cos\theta} \leq |\underline{a}|+|\underline{b}|$.

(ii) O is a point on the plane of triangle ABC. The midpoints of the sides BC, CA, AB are D, E, F respectively.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

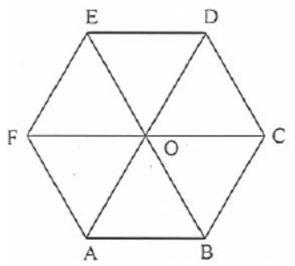
[redacted]

[redacted]

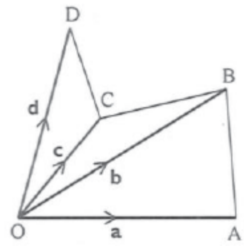
[redacted]

[redacted]

[redacted]



57) With respect to the origin O, let the position vectors of A, B, C and D be a, b, c and d respectively. In terms of a, b, c and d find the values of;



[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

63) [redacted] respectively. Show that if $\lambda + \mu \neq 0$, the position vector of P which divides the line AB in the ratio $\lambda : \mu$, is represented by $\frac{\mu a+\lambda b}{\lambda + \mu}$.

If $\alpha + \beta + \gamma = 0$ and $\alpha a + \beta b + \gamma c = 0$, prove that the points represented by a, b and c is collinear.

64) If a and b represents any two non-zero non-parallel vectors, λ and μ [redacted]

65) OACB is a parallelogram. Let D be the midpoint of AC and, the diagonal AB and the line OD bisect at E. If $\overrightarrow{OA} = a$ and $\overrightarrow{OB} = b$, by expressing $\overrightarrow{OD}$ in terms of a and b, show that $AE = \frac{1}{3}AB$.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

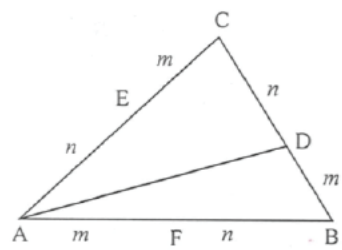
70) [redacted].

71) In respect to the origin O, the position vectors of the points A and B are a = 6i + j and b = 3i + 4j respectively. Find the position vectors of P which divided AB in the ratio 1:2. Hence, find the coordinates of P and $|\overrightarrow{OP}|$.

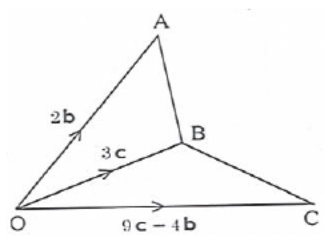
[redacted]

[redacted]

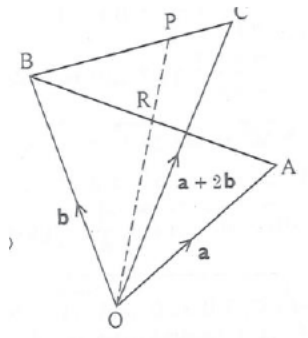
[redacted]

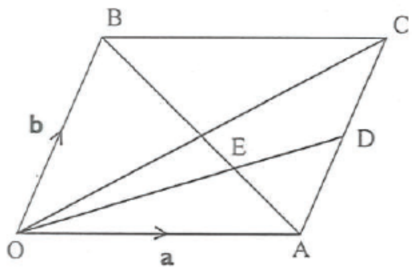


[redacted]



[redacted]





77) If a and b represents any two non-zero vectors, λ and μ are two scalar parameters, explain what requierments are to be fulfilled for the vector $\lambda a + \mu b$ to be reduced to a null vector.

OACB is a parallelogram. D is the midpoint of AC, and the diagonal AB and the line OD intersects at E. If $\overrightarrow{OA} = a$ and $\overrightarrow{OB} = b$, express $\overrightarrow{OD}$ interms of a and b, and show that $AE = \frac{1}{3}AB$.

78) [redacted] AC : CB = 3 : 2. If $5\overrightarrow{OE} = 2a + 5b$, show that OAEB is a parallelogram.

[redacted]

80) [redacted].

[redacted]

extended OA, BO and AB respectively such that $\frac{AP}{PO} = \alpha, \frac{OQ}{QB} = \beta$ and $\frac{BR}{RA} = \gamma$. Here, $\alpha\beta\gamma \neq 0$. With respect to the origin O, find the position vectors of the points P, Q and R. Hence, if $\alpha\beta\gamma = -1$, show that P, Q [redacted]

[redacted]

82) [redacted]

AOB and OAB meet at E. When $|\overrightarrow{OA}| = a$, $|\overrightarrow{OB}| = b$ and $|AB| = c$ and, α and β are scalar, show that $\overrightarrow{OE} = \alpha\left\{\frac{a}{|a|} + \frac{b}{|b|}\right\}$ and $\overrightarrow{OE} = a + \beta\left\{\frac{b}{|c|} - \frac{a}{|c|} - \frac{a}{|a|}\right\}$ and, also show that $\alpha = \frac{ab}{a+b+c}$ and $\beta = \frac{ca}{a+b+c}$. Hence, show that the internal bisectors of the angles of a triangle are concurrent.

83) If $\overrightarrow{OA} = \underline{a}$ and $\overrightarrow{OB} = \underline{b}$ of the parallelogram OACB, prove that $\overrightarrow{BC} = \underline{a}$.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

101) [redacted]

given that $a = |a|$, $b = |b|$ and $c = |a - b|$ .Show that $\overrightarrow{OP} = \lambda \left\{\frac{a}{|a|} + \frac{b}{|b|}\right\} = a + \mu \left\{\frac{a}{|a|} + \frac{b-a}{|c|}\right\}$. Here λ and μ are scalar. Find λ and μ, hence show that angle OBA is externally bisected by BP.

[redacted]

[redacted]

104) P, Q and R are three distinct points. Position vectors of them are $\overrightarrow{OP} = p$, $\overrightarrow{OQ} = q$ and $\overrightarrow{OR} = r$ respectively.

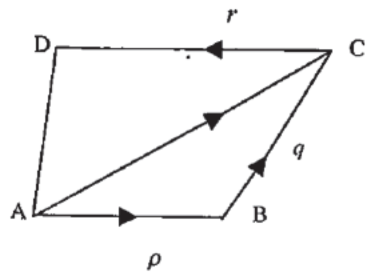
If an a value exists as such $r = \ a\,p + (1 - \ a)q$, show that P, Q and R are collinear.
Points P, Q and R are located on the sides BC, CA and AB of the triangle ABC such that $\overrightarrow{BP} = \lambda\,\overrightarrow{PC}, \overrightarrow{CQ} = \mu\,\overrightarrow{QA}$ yd $\overrightarrow{AR} = \ \nu\overrightarrow{RB}$. Here, $\lambda\mu\nu \ \neq 0, \overrightarrow{CA} = a$ and $\overrightarrow{CB} = b$, find the position vectors of P , Q and R by taking the point C as the origin. Hence, only using $\lambda\mu\nu = \ -1$, show that P, Q and R are collinear.

[redacted]

[redacted]

[redacted]

[redacted]

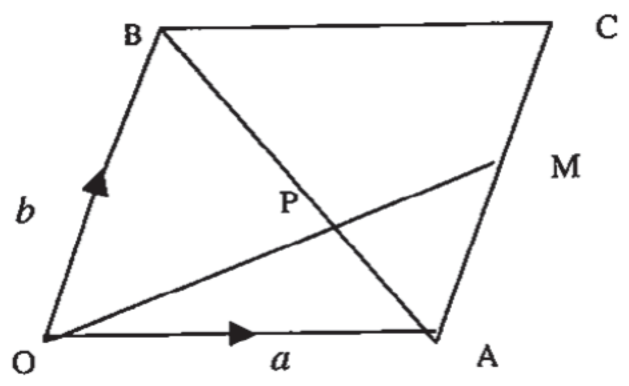


[redacted]

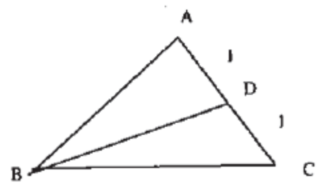
[redacted]

(ii) Write $\overrightarrow{OP}$ in terms of a and b when $\overrightarrow{BA} = x\overrightarrow{PA}$ is given.

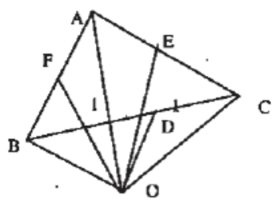
[redacted]



[redacted]



[redacted]



[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] ABCD is a parallelogram O is a point on the plane containing the quadrilateral. Midpoints of the sides AB, BC, CD and DA are E, F, G [redacted]

[redacted]

127) O, A and B are three collinear points. $\overrightarrow{OA} = a$ and $\overrightarrow{OB} = b$.

(i) If $\alpha a + \beta b = 0$, show that $\alpha = 0$ and $\beta = 0$.

(ii) Show that r = (1 – x) a + xb when P is any point on the line AB, $\overrightarrow{OP} = r$ and $0 \leq x \leq 1$. Hence, show that the diagonals of the parallelogram bisect.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

135) In reference with the origin O, the position vectors of the two points A and B are a and b respectively. Show that the position vector of any point on the bisector of the angle AOB can be written as $r = \lambda\left(\frac{a}{|a|} + \frac{b}{|b|}\right)$. Here, λ is a constant parameter. Hence or by using any other method show that $\frac{AL}{LB} = \frac{a}{b}$ if side AB meets the bisector of the angle AOB at L.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

iii. Vector of magnitude 20 units in the direction of $\overrightarrow{OP}$.

iv. The angle made by $\overline{OP}$ with the positive direction of the x axis.

[redacted]

148) If $\underline{a} = 4\underline{i} + 4\underline{j}, \underline{b} = 2\underline{i} + \underline{j}, \underline{c} = 2\underline{i} - 3\underline{j}$, find

i) $2\underline{a} + \underline{b} + 3\underline{c}$ ii) $3\underline{a} - 7\underline{b} + 4\underline{c}$

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

176) Two [redacted] when the values of k are 1 and 2 respectively. Find the directions of P,Q.

[redacted]

[redacted]

178) [redacted] the two forces is 150°. Show that the resultant force is P and the direction of the resultant is 30° inclined to the force $P\sqrt{3}$.

[redacted]

180) [redacted] is $\cos^{-1} 1/6$.

[redacted]

[redacted]

[redacted]

[redacted]

186) [redacted] of two forces are swapped, the angle of the resultant force shifts by γ. Show that $\tan\frac{\gamma}{2} = \frac{A-B}{A+B}\tan\frac{\theta}{2}$.

If $A = 2P$, $B = P$, show that $\gamma = 2\tan^{-1}\left(\frac{1}{3}\tan\frac{\theta}{2}\right)$.

(i)What happens when $A = B = P$.

[redacted]

[redacted]

[redacted]

189) [redacted] x, y. Show that $\alpha = \cos^{-1}\left(\frac{x^2+y^2-A^2-B^2}{2AB}\right)$. When A= P, B= P, and the forces are 30° and 60° inclined to the horizontal, find x, y and prove that $\alpha = 30°$ using the equation.

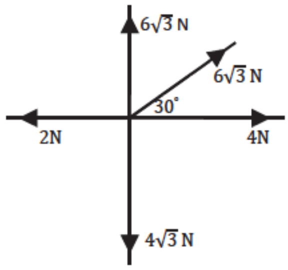
[redacted]

191) [redacted] between the first force and the resultant force is $\tan^{-1}\sqrt{3}\,\frac{(1-\cos\alpha)}{3+\cos\alpha}$. [redacted]

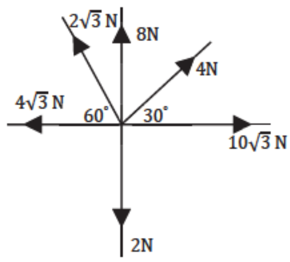
[redacted] Forces of magnitude $\sqrt{P}+\sqrt{Q}$ and $\sqrt{P}-\sqrt{Q}$ act on a particle. The resultant of the two forces is $2\sqrt{P-Q}$. Find the angle between the [redacted]

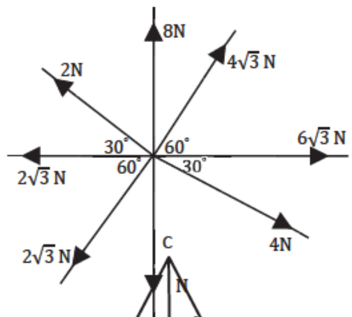
[redacted]

[redacted]



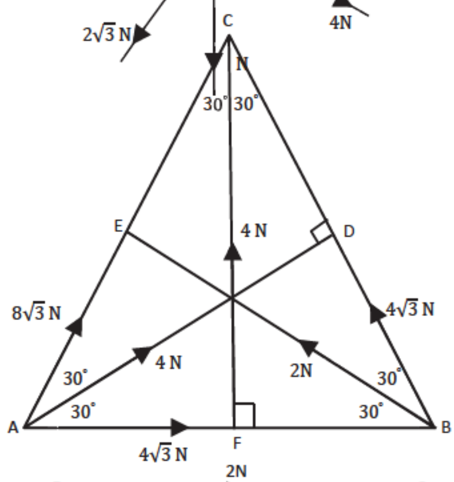
[redacted]



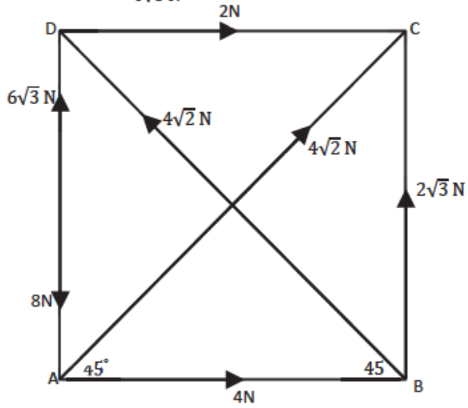


[redacted]

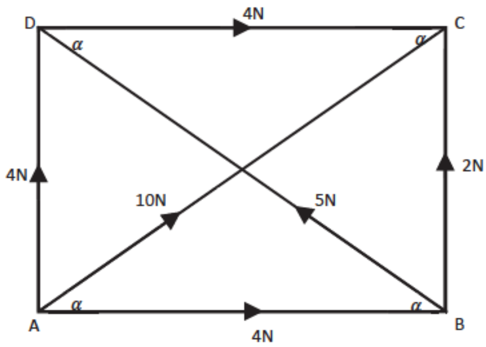
[redacted]



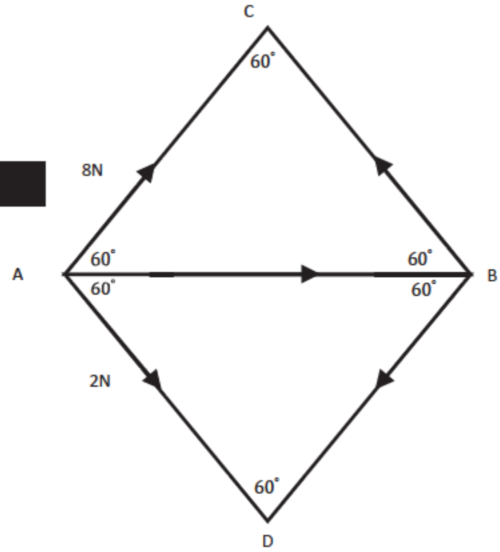
198) ABCD is a square with a side length a m. The forces acting on a particle are shown in the figure. Find the magnitude and the direction of the resultant.



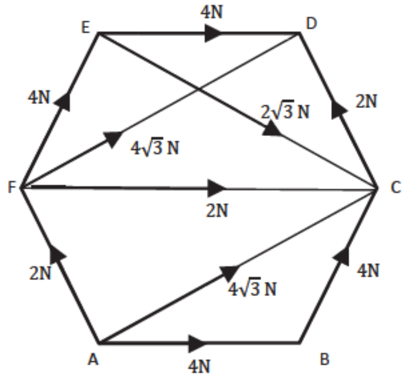
[redacted]



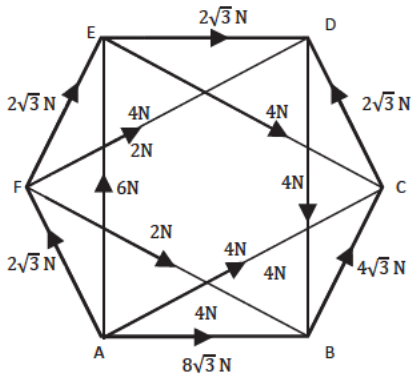
[redacted]



[redacted]



[redacted]



203) Forces 14P , 6P , $6\sqrt{3}\,P$, $4\sqrt{3}\,P$, $2\sqrt{3}\,P$, $4P$, $2\sqrt{3}P$ act on a particle in the directions 60° , 90° , 150° , 210° , 240° , 270°, 300° respectively. Find the magnitude and the direction of the resultant.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

(ii) [redacted] $\underline{P}$ and $\underline{Q}$ along with their magnitudes and directions, if the system is equivalent to a vertical resultant.

[redacted]

[redacted]

[redacted]

213) [redacted] R and force 2PN.

[redacted]

[redacted]

[redacted]

217) [redacted] P_1 and P_2 that act on a particle. When the angle between P_1 and P_2 is 2α, show that the resultant is $\sqrt{P^2cos^2\alpha + Q^2sin^2\alpha}$. [redacted] resultant.

218) The angle between P, Q forces acting on a particle is α. The resultant force is $(k+1)\sqrt{P^2 + Q^2}$. When the angle between the forces is $90^0 - \alpha$, the resultant force is $(k-1)\sqrt{P^2 + Q^2}$. Show that the resultant force is $Tan\alpha=\frac{k-2}{k+2}$. Does this true for any value of P, Q. Prove that using when P=4,Q=3.

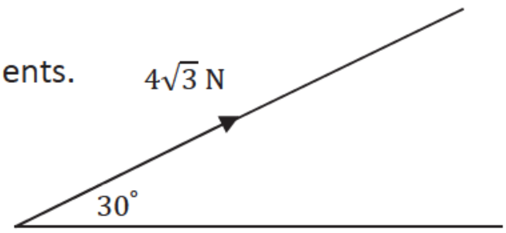
219) The magnitude of the resultant force of the two forces P, Q is P. The magnitude of the resultant of forces 2P, Q acting to the original direction is also P. Show that $Q = \sqrt{3}P$ and the angle between P and Q is 150^o.

[redacted]

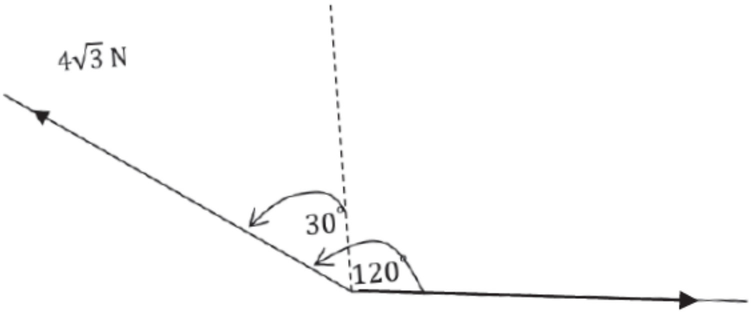
[redacted] values of the resultant force. If the maximum force is three times the minimum force, find the value of P_2 in terms of P_1. If the [redacted]

222) Angle between the two forces P, Q acting on a particle is α. The resultant force R inclined θ with the force P. The angle between the forces P+R and Q is α. Show that resultant force of the two forces makes $\theta/2$ with the force P+R.

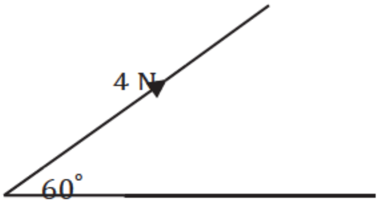
223) Find the vertical and horizontal components.



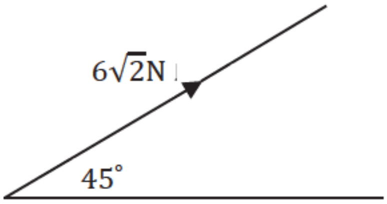
224) Find the vertical and horizontal components

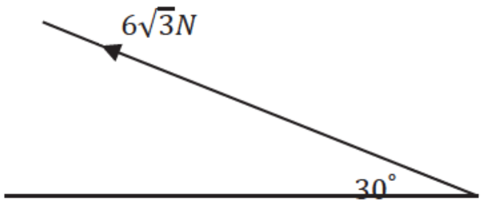


[redacted]

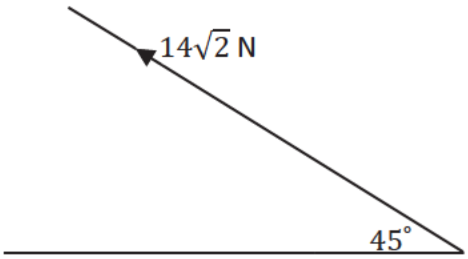


[redacted]

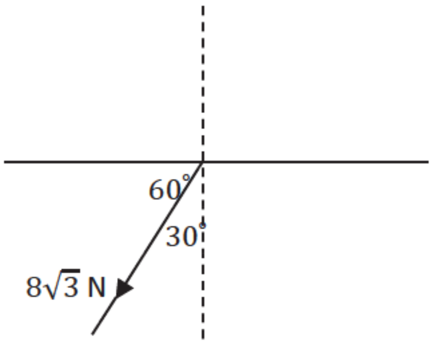




[redacted]

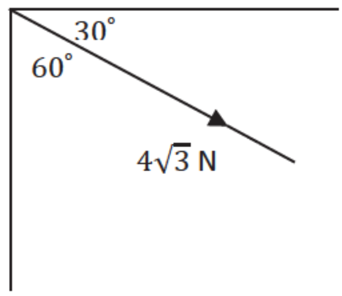


[redacted]

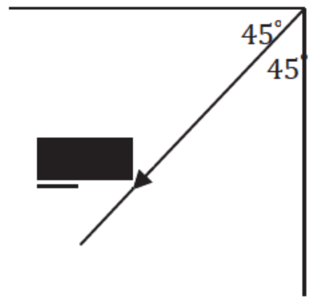


[redacted]

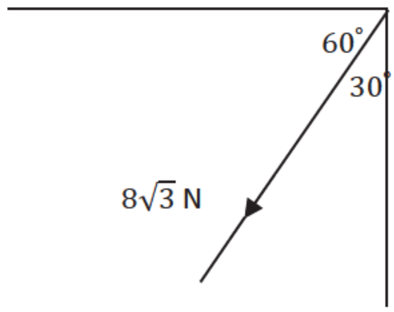
[redacted]



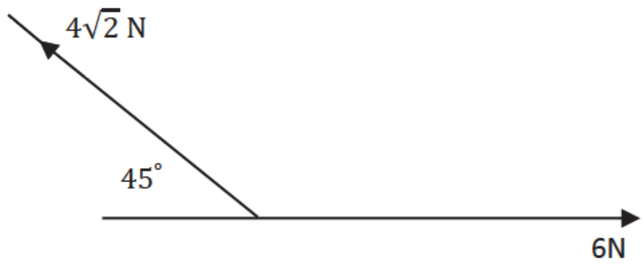
[redacted]



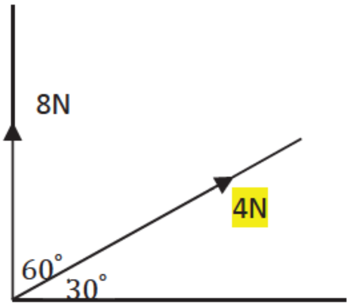
[redacted]



[redacted]

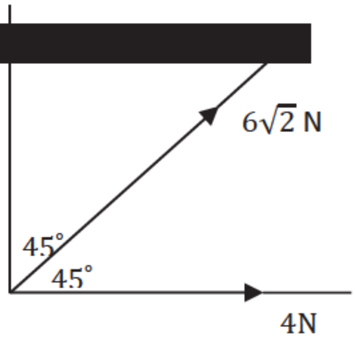


234) Find the vertical and horizontal components

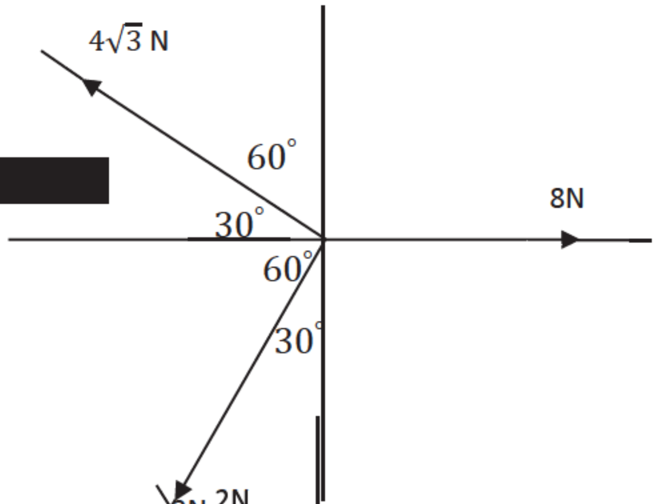


[redacted]

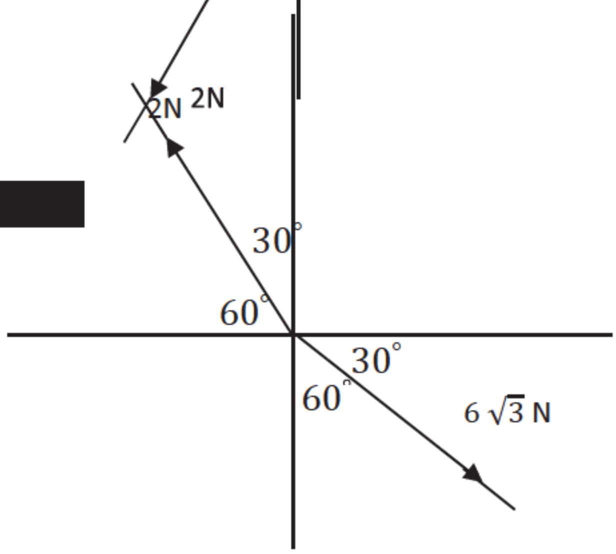
[redacted]



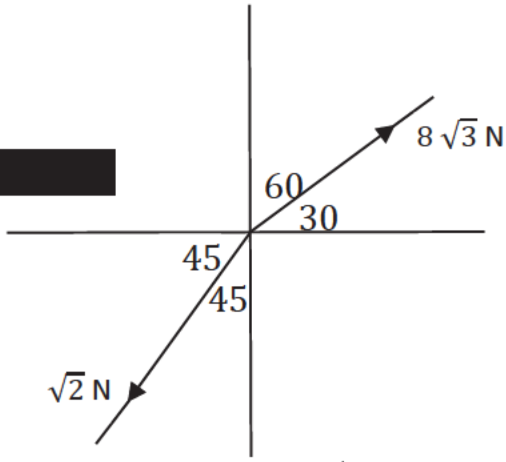
[redacted]



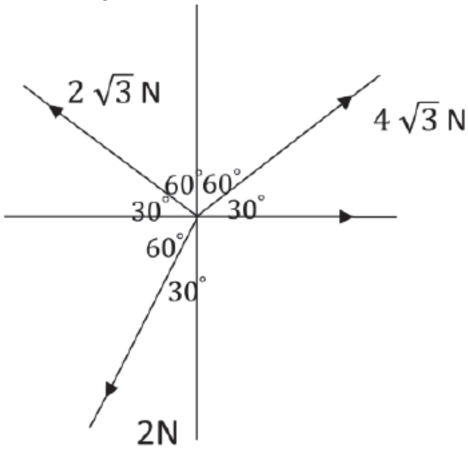
[redacted]



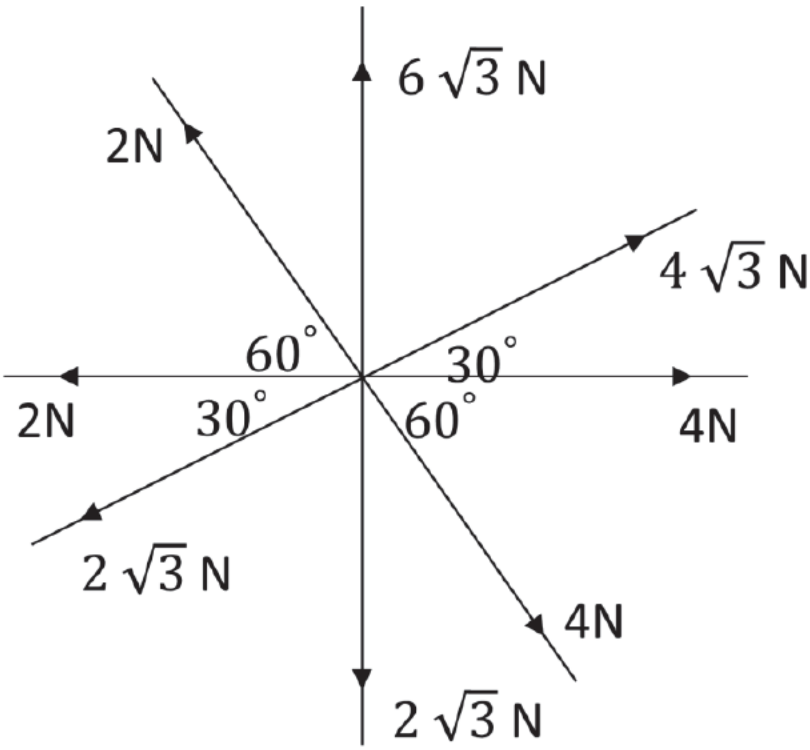
[redacted]



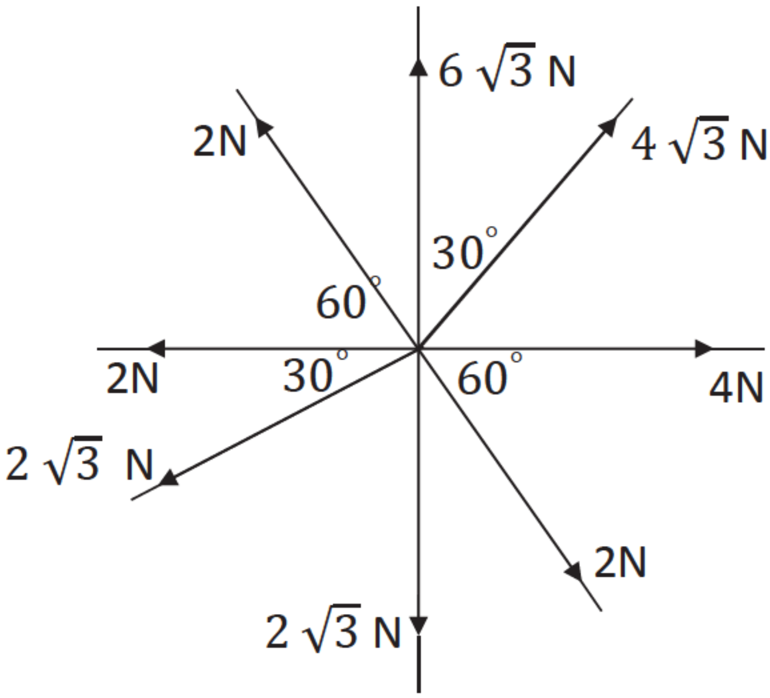
[redacted]



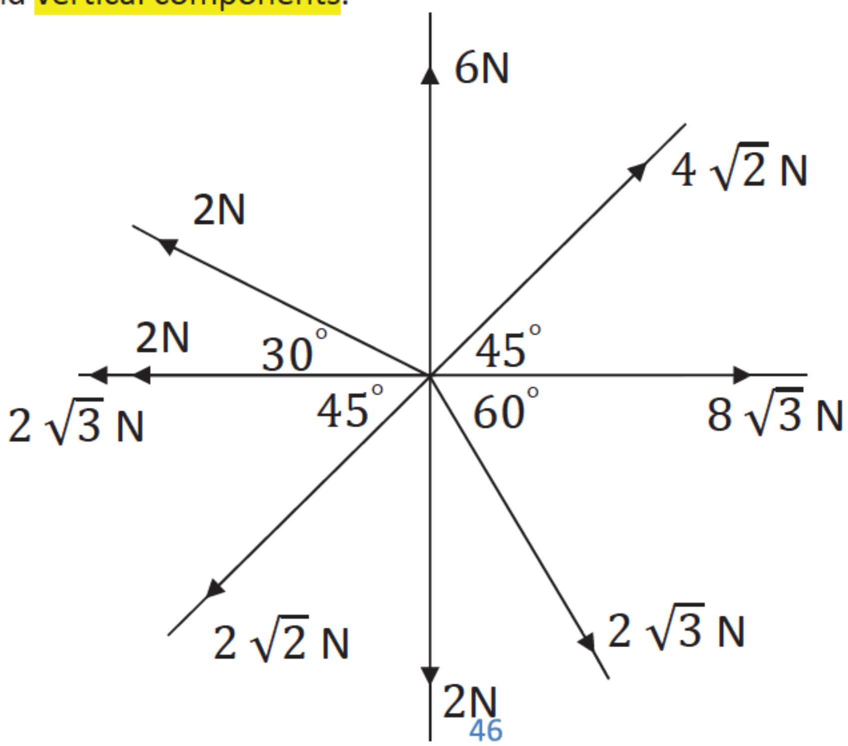
[redacted]



241) Forces acting on a particle is indicated in the diagram. Find the horizontal and vertical components.



242) Forces acting on a particle is indicated in the diagram. Find the horizontal and vertical components.



[redacted]

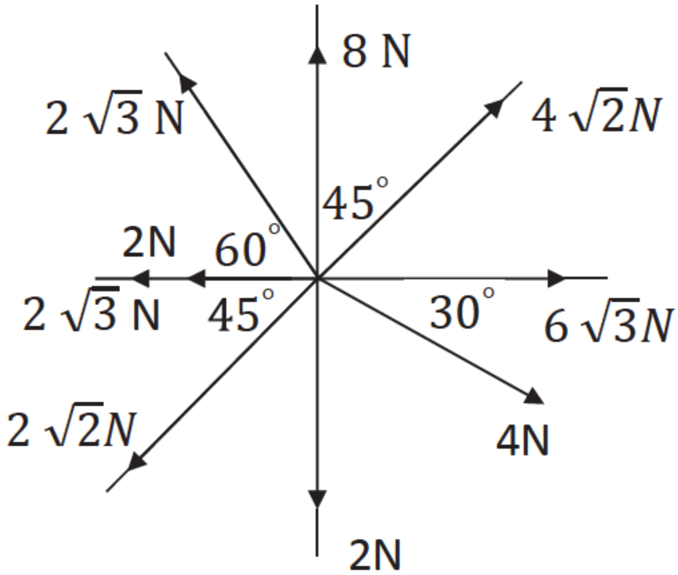
[redacted]

[redacted]

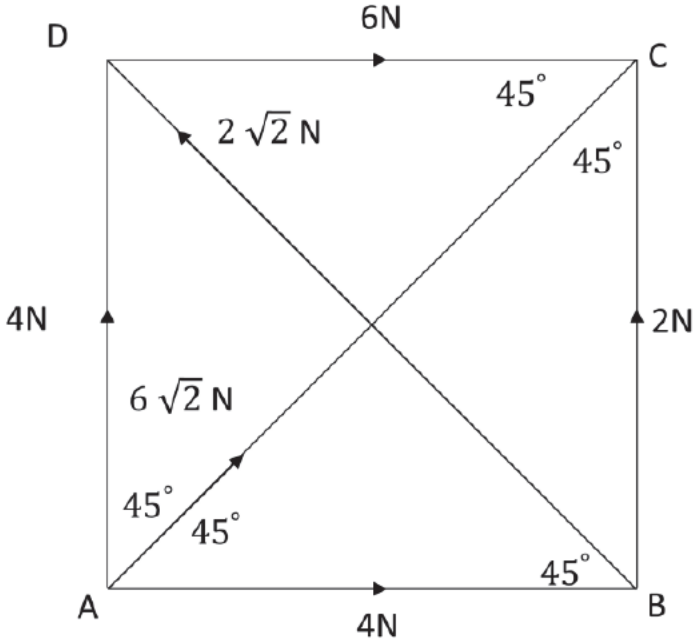
246) [redacted].

247) Forces 5i + 2 j, - 2i + 4j, - 3i – 5j and P, Q act on a particle. The resultant force is 4i + 5 j. The P and Q forces act in a direction parallel to the vectors 2i - j and i + j respectively. Find the magnitude and the direction of the forces P, Q.

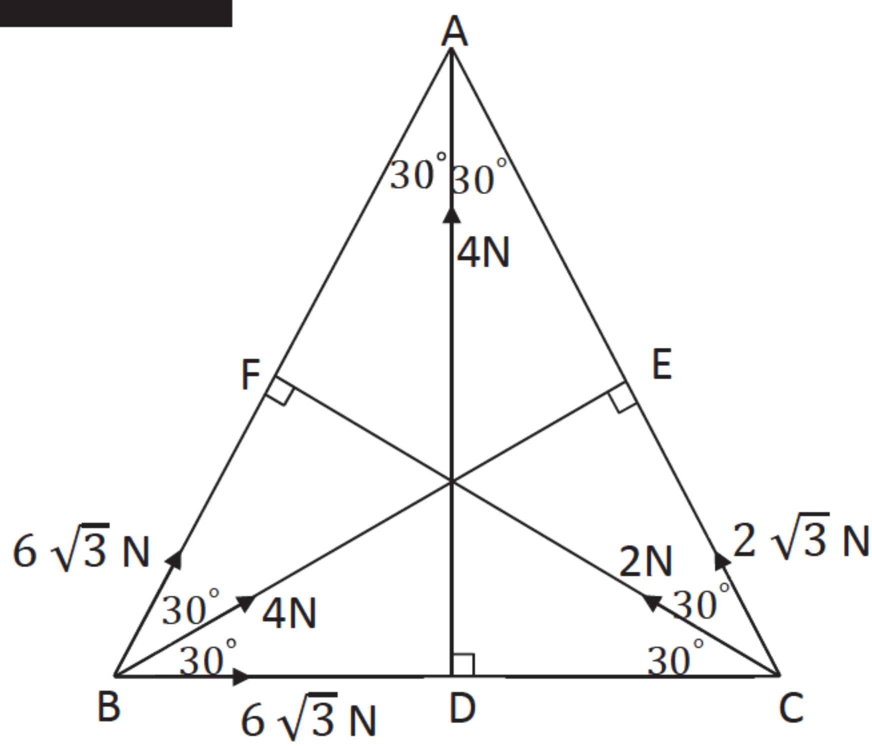
248) The forces acting on a particle is given in the diagram. Find the magnitude and the direction of the resultant. Take the resultant force as R and the inclination of the resultant force to the horizontal as θ.



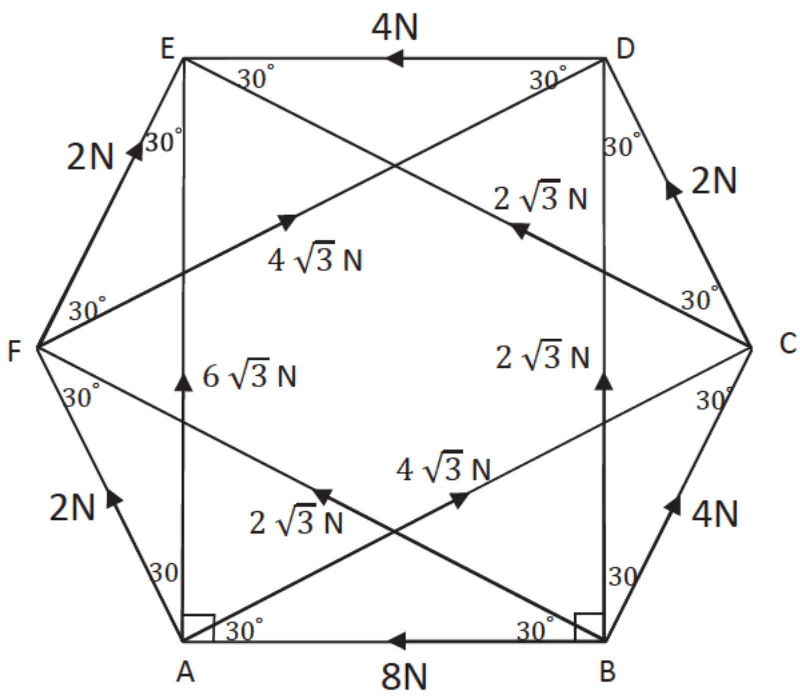
[redacted]



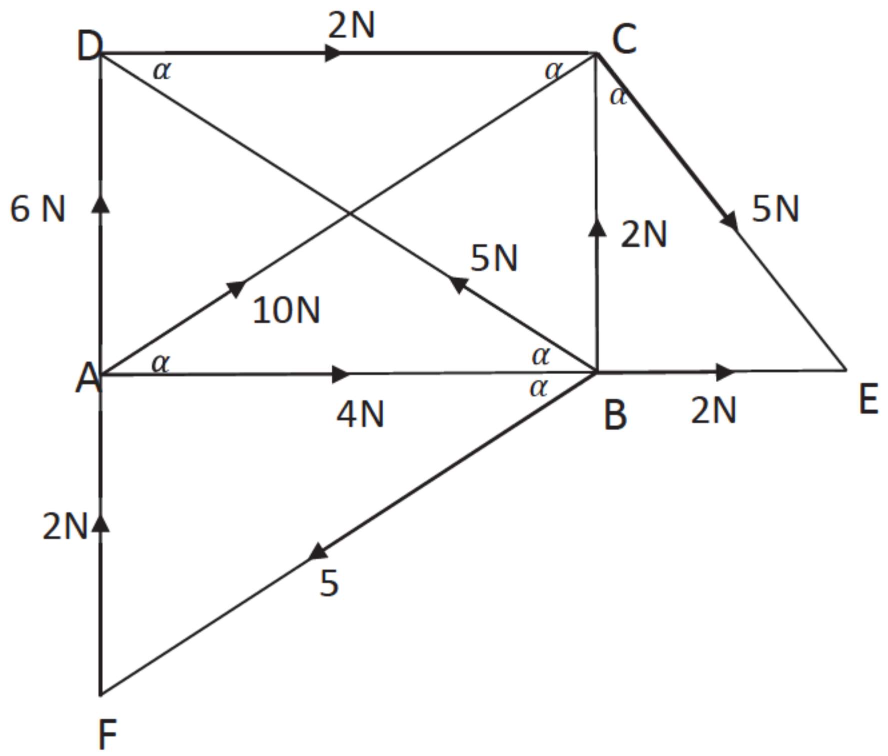
[redacted]



[redacted]



[redacted]



[redacted]

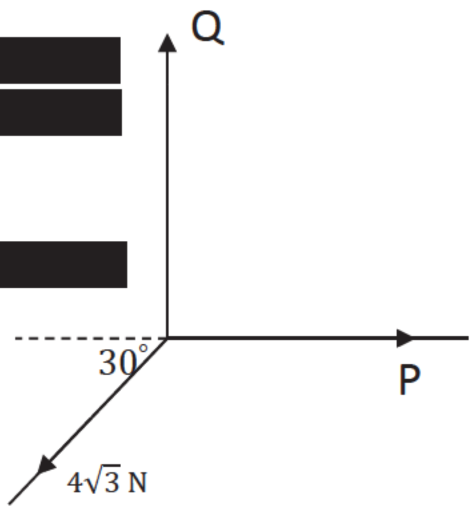
[redacted]

[redacted]

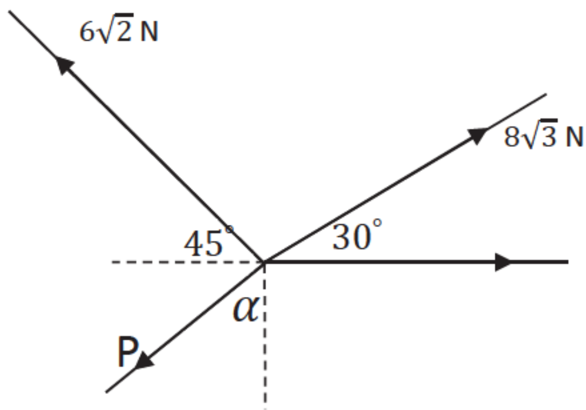
[redacted]

[redacted]

[redacted]



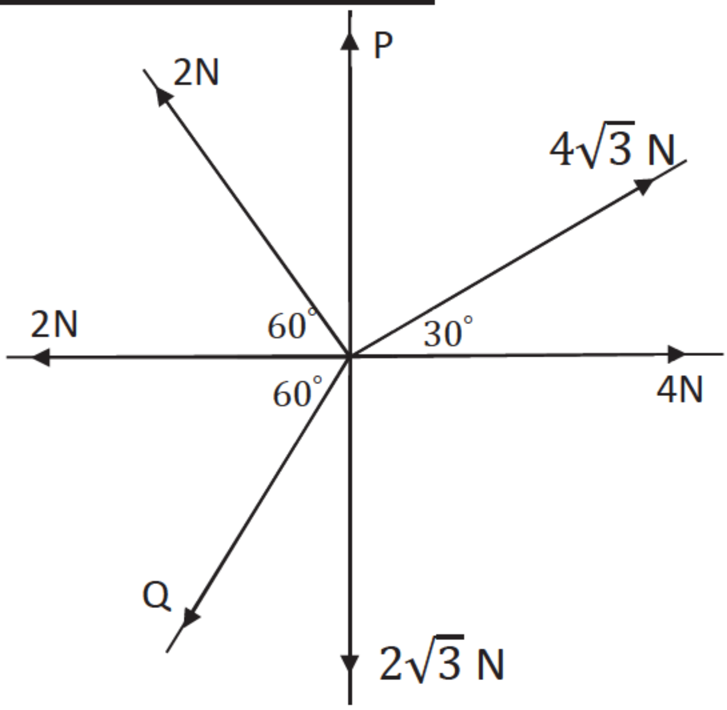
[redacted]



[redacted]

262) Forces $3\underline{i} + \underline{j}$, $4\underline{i} - 3\underline{j}$, $-3\underline{i} - 2\underline{j}$ and $\underline{P}$, $\underline{Q}$ act on a particle. The forces $\underline{P}$ and $\underline{Q}$ are parallel to the vectors $-2\underline{i} + 3\underline{j}$ and $\underline{i} - 3\underline{j}$. Find the magnitude and the direction of $\underline{P}$ and $\underline{Q}$, if the system is equivalent to a couple.

[redacted]



[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

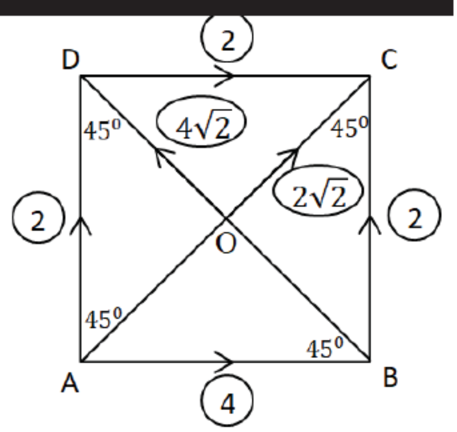
[redacted]

[redacted]

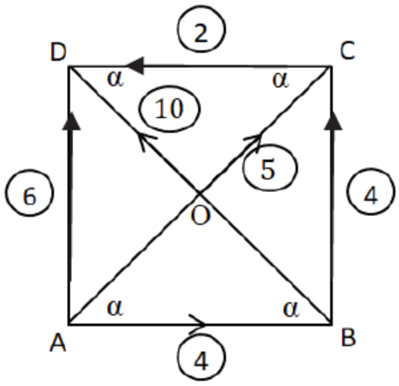
270) A [redacted]. Find the moment vector around B which is given by $\underline{i} + 2\underline{j}$. The moment around B is $\underline{G}_B$.

[redacted]

[redacted]

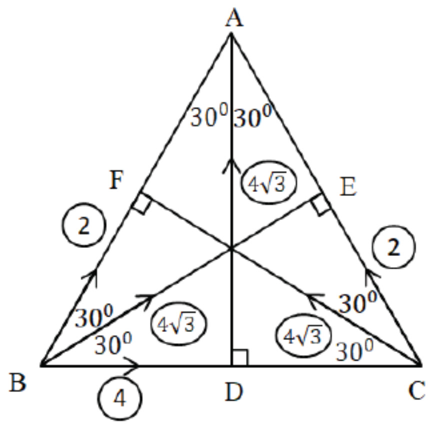


272) A system of forces act along the sides of a square ABCD on a rigid body as shown in the diagram. The length of a side is 2m. [redacted]. Find the resultant moment around the points,



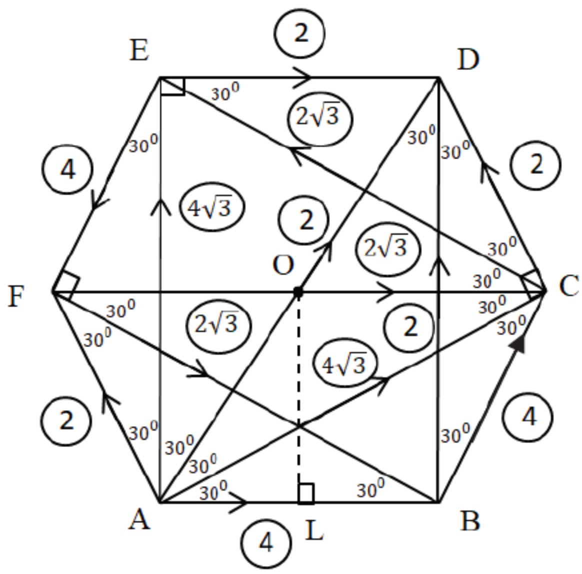
[redacted]

[redacted]



[redacted]

[redacted]

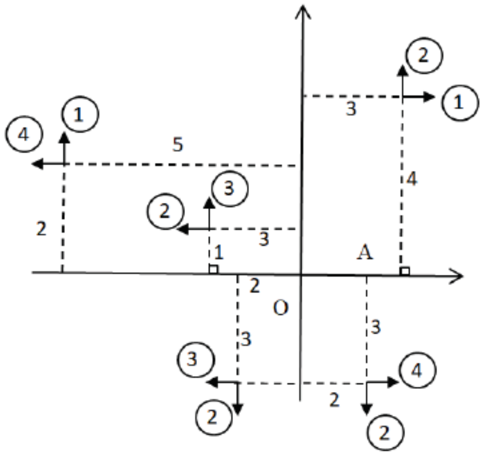


[redacted] A system of forces act along the sides of a [redacted]

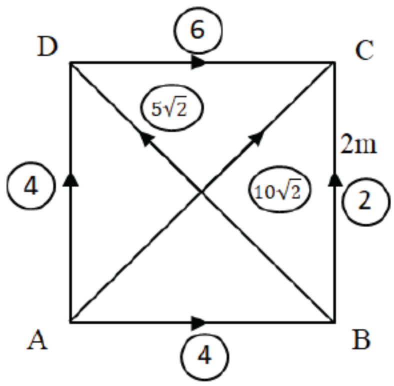
[redacted]

[redacted]

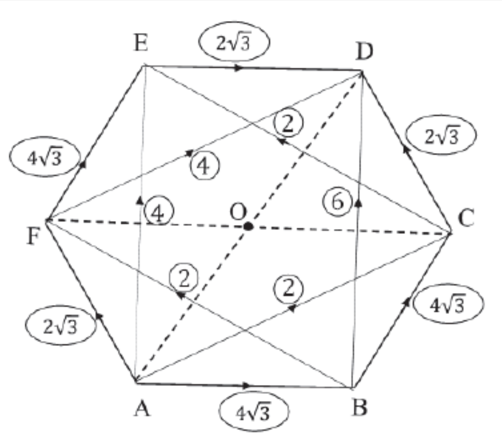
[redacted]



277) [redacted] of a side is 2m. Find the magnitude, direction and the line of action of the resultant force. The magnitude of the resultant force is R and the direction is θ to the horizontal. Lets take the distance from A to the point where the resultant cuts the AB line as xm. Find the value of x.



278) ABCDEF is a regular hexagon with am side length. A system of forces act on a rigid body as shown in the figure. Find the magnitude, direction of the resultant force and the distance from A to the point where the resultant force cuts the AB line.



[redacted]

[redacted]

280) [redacted] magnitude and direction. Find the point where the resultant cuts the OY axis. (Take the horizontal and vertical components of the resultant as X, Y and the intersection point of OY axis and resultant as P≡ (o,y))

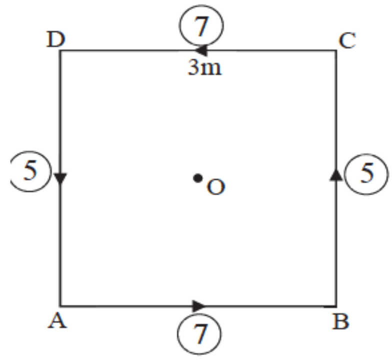
281) ABCD is a rectangle. A system of forces acts along $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{DC}, \overrightarrow{DA}, \overrightarrow{AC}$ and $\overrightarrow{AE}, \overrightarrow{CD}, \overrightarrow{DA}$ The midpoint DC is E. The magnitude of the forces are $4\sqrt{3}, 4, 2\sqrt{3}, 2, 10\sqrt{3}, 4\sqrt{3}, 8, 6\sqrt{3}$ respectively. Find the magnitude, direction of the resultant force and the points where the resultant force cuts the AB, BC sides. AB = 4m, BC = 3m. The system of forces is equivalent to two forces P, Q along BC and AL. L is a point on CD. Find the positions of P, Q and L.

282) Forces $\underline{i} + 3\underline{j}$ and $3i + 3\underline{j}$ acts on a rigid body. i is the unit vector in the horizontal direction. Find the resultant vector along with its magnitude and direction.

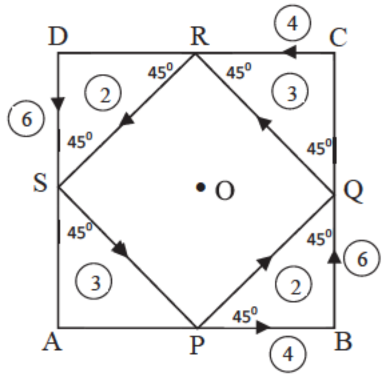
[redacted]

[redacted]

[redacted]



[redacted]



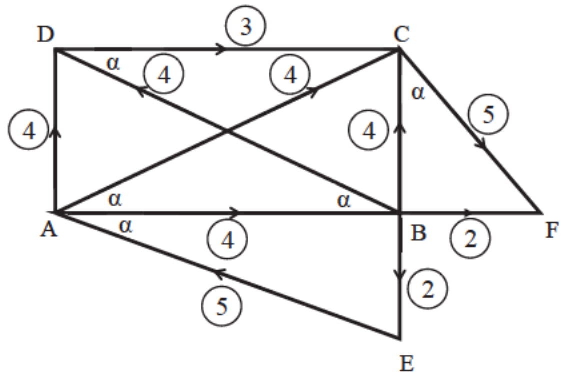
[redacted] ABCD is a square. The midpoints of the sides AB, BC, CD, DA are P, Q, R, S. The length of a side is 4m. Forces of magnitude 4, 6, 4, 6, 2, 3, 2, 3N acts along [redacted]

[redacted]

[redacted] ABCD is a square of side 2m. Forces of magnitude 2, 3, 4, P, Q, $4\sqrt{2}$ N acts on the rigid body along the sides $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{CD}, \overrightarrow{DA}, \overrightarrow{AC}, \overrightarrow{BD}$. Find [redacted]

292) ABCDEF is regular hexagon. Forces of magnitude 6P, 2P, P, 7P, P, 2P acting along the sides $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{CD}, \overrightarrow{DE}, \overrightarrow{EF}, \overrightarrow{FA}$ respectively. The length of a side is 2am. Show that system is equivalent to a couple and find its magnitude.

[redacted]



[redacted] ABC is an equilateral triangle. The perpendicular distance from A to the opposite side is AD. ADCE is a rectangle. AB=2m. Forces of magnitude P, 4, 2, 2, $3\sqrt{3}$, 4, 2, Q Newton forces act along the sides $\overrightarrow{BA}, \overrightarrow{BD}\ \overrightarrow{DC}, \overrightarrow{AE}, \overrightarrow{EC}, \overrightarrow{DE}, \overrightarrow{CA}, \overrightarrow{DA}$. When the resultant force R acts [redacted]

[redacted]

[redacted]

[redacted]

Point	Position Vector	Force
A	2i+5j	P(i + 3j)
B	4j	-P(2i+ j)
C	-i+ j	P(i -2j)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

304) [redacted] letters. Three new forces Q, R, S newtons acting along the sides AF, FO, OA respectively, of the triangle AFO are added to the system. Find the values of Q, R, S in terms of P, in order that the combined system is.

i) in equilibrium,

[redacted]

(2007 A/L)

[redacted] the line of action of the resultant. €

[redacted]

308) a) Define the dot product **a. b** of two vectors a and b.

[redacted]

If the system is in equilibrium, find L, M and N in terms of P.

(2011 A/L)

309) $\underline{a} = \underline{i} + \sqrt{3}\ \underline{j}$ where $\underline{i}$ and $\underline{j}$ have the usual meaning $\underline{b}$ is a vector with magnitude $\sqrt{3}$. If the angle between the vectors $\underline{a}$ and $\underline{b}$ is $\frac{\pi}{3}$, find $\underline{b}$ in the form $x\underline{i} + y\underline{j}$ where $x(<0)$ and y are constants to be determined.

(2012 A/L)

[redacted]

b) The coordinates of the Points A, B and C with respect to a rectangular Cartesian axes Ox and Oy, are $(\sqrt{3},0)$ $(0,-1)$ and $\left(\frac{2\sqrt{3}}{3},1\right)$ respectively.

[redacted]

[redacted]

[redacted]

[redacted]

line of action of the resultant is parallel to BC.Also, find the moment of the system about O.

If the line of action of the resultant meets AB produced at the point E, show that BE =2l

Now, additional forces of magnitude αP, βP, γP and αP newtons are [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

[redacted]

[redacted]

[redacted] that the line of action of the single force passes through the point $D(\frac{11}{3}, -\frac{1}{3})$.

(2015 A/L)

[redacted]

[redacted]

[redacted]

[redacted]

$\overrightarrow{AB}$ and $\overrightarrow{OQ} = (1 - \lambda)\ \overrightarrow{OD}$, where $0 < \lambda < 1$. Show that $\overrightarrow{PC} = 2\overrightarrow{CQ}$.

(b) In parallelogram ABCD, let AB = 2m and AD = 1m, and let $B\hat{A}D = \frac{\pi}{3}$

Also, let E be the mid-point of CD. Forces of magnitudes 5,5,2,4 and 3 newtons act along AB, BC, DC,DA and BE respectively, in the directions indicated by order of the letters. Show that their resultant force is parallel to $\overrightarrow{AE}$, and find its magnitude.

Also, show that the line of action of the resultant force meets AB produced at a distance $\frac{3}{2}m$ from B.

An additional force action through C is now added to the above system of force so that resultant force of the new system is along $\overrightarrow{AE}$. Find the magnitude and direction of the additional force.

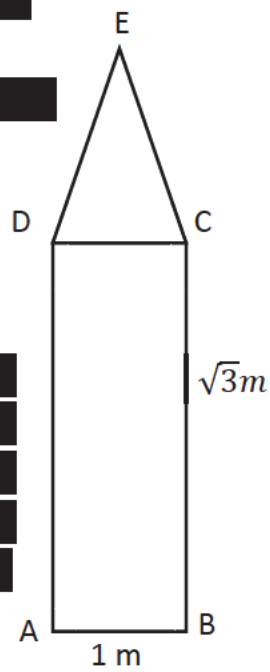
(2016 A/L)

319) [redacted]

α (>0) is a constant. Using scalar product. Show that $A\hat{O}B = \frac{\pi}{2}$

[redacted]

[redacted]



[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

A/L | COMBINED MATHEMATICS

STATICS

VECTORS & COPLANAR FORCES

Maths Simplified !

mathscriber.com
0772461477

RAJ WIJESINGHE
B.Sc ,(Math Sp.) M.Sc