G.C.E. Advanced Level

Grade 13

Combined Mathematics I

Three hours

Channel NIE®

Part A

01. Using the principal of **Mathematical induction**, prove that

$$\sum_{r=1}^{n} 2r(2r^2-1) = n(n+1)\,(n^2+n-1) \text{ for all } n \in \mathbb{Z}^+$$

02. Sketch the graphs of y =3 | 3-x| & y = |x|-2 on the same oxy plane. Hence determine the set of all $x \in \mathbb{R}$, such that |x-1|-3|x-4|>2 .

03. Let $Z = 2 + i$ and $Z' = x + iy$

Prove that

$$\frac{|Z| + Z'}{|Z| - Z'} = \frac{|Z|^2 - |Z'|^2 + 2\,|Z|\,Im\,(Z')i}{|Z|^2 + |Z'|^2 - 2\,|Z|\,Re\,(Z')}$$

Further, if $|Z| = |Z'|$ then deduce that $\frac{|Z| + Z'}{|Z| - Z'}$ is absolutely imaginary.

04. Using Binomial expansion, prove that $3^{2n+1} - 3.2^n$ is divisible by 21, for all $n \in \mathbb{Z}^+$

05. Show that $\lim_{x\to 0}\left(\frac{x^4}{\tan^2 4x - Sin^2 4x}\right) = \frac{1}{256}$

06. Let $S \equiv x^2 + y^2 - 100 = 0$ and $l \equiv x - 2y + 10 = 0$

Show that the volume generated by rotating the area which is enclosed by S= 0 , $l = 0$ and x-axis, about x-axis through 2π radian is 480π cubic units.

07. When θ is a parameter, $0 < \theta < \pi/2$, a point on a curre C is given by $x = a\,Sec\,\theta$ &

$y = b\,tan\,\theta$, parametrically, where a & b are constants.

Obtain the equation of the curve C as $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Prove that the equation of the tangent drawn to the curve C at the point P on the curve when $\theta = \pi/6$ is , $2bx - ay = \sqrt{3}ab$.

08. Prove that the area enclosed by the two angle bisectors between $4x - 3y + 2 = 0$, $4x + 3y - 7 = 0$ and x-axis and y-axis is $\frac{15}{16}$ square units.

09. The circle $s' = 0$, which passes through the two ends of the diameter of $S \equiv x^2 + y^2 - 6x - 14y + 54 = 0$ which parallel to y-axis , is also passes through the origin, find the equation of S'.

10. Using the identity $Sin^2\theta + Cos^2\theta = 1$, Prove that $Cosec^2\theta = 1 + Cot^2\theta$ When $n\epsilon\mathbb{Z}$ and $\theta \neq n\pi$. Further, when $Cosec\ \theta - Cot\ \theta = {}^1/_7$ deduce that $Cosec\ \theta + Cot\ \theta = 7$ and Hence obtain that $Sin\ \theta = {}^7/_{25}$.

Part B

11. (a). Let, $f(x) \equiv lx^2 + (n-1)\,x + 1$ and $g(x) \equiv (m+1)\,x^2 - nx - 1$ There exist a common root as $x = (\propto +1)$ for both $f(x) = 0$ and $g(x) = 0$. The other roots of $f(x) = 0$ and $g(x) = 0$ are β and γ respectively. Also $\propto \neq -1$ and $(l + m) \neq -1$.

Obtain the results.

(i) $\propto = \frac{-(l+m)}{l+m+1}$

(ii) $\beta - \gamma = \frac{(1+m)(1-n)-ln}{l(m+1)}$

(iii) $l\beta + (m+1)\gamma = 0$

Write down the determinants Δf and Δg of $f(x) = 0$ and $g(x) = 0$ respectively and prove that $\Delta f + \Delta g = 2n^2 + 4m - 4l - 2n + 5$

If all $(\propto +1), \beta$ and γ are real and distinct, deduce that, $8(\mathrm{l} - \mathrm{m}) < 9$

(b). Let $P(x) \equiv x^4 + x^3 - px^2 + p^2x - 1$

Prove that there exist no factors as $(x+1)$ or as (x^2+1) for $P(x)$.

But, if $(x+1)$ is a factor for " $P(x) + 1$ " then show that $P(x) + 1$ can be expressed as, $x(x+1)\,(x^2+1)$ or as $x^3(x+1)$.

12. (a). A selected pool of boys and girls from two schools A & B are given below.

	boys	girls
School A	3	4
School B	7	5

A committee of 5 members has to be appointed from the above set of students.

Find the number of different committees that can be appointed under each condition.

(i) Any five of the pool,

(ii) Any five including both male and female,

(iii) Any five including both schools A and B,

(iv) Any five from both schools and also both male and female from each school.

(b). Let $\lambda \geq 0$ and $r \in \mathbb{Z}^+$

Show that $\dfrac{2}{r+\lambda} - \dfrac{2}{r+\lambda-2} = \dfrac{-4}{(r+\lambda)(r+\lambda-2)}$

Hence find V_r such that $U_r = V_r - V_{(r+2)}$

Where $U_r = \dfrac{2}{(r+\lambda)(r+\lambda-2)}$

Prove that $\sum_{r=1}^{n} U_r = \dfrac{2\lambda-1}{\lambda(\lambda-1)} - \left[\dfrac{2(\lambda+n)-1}{(n+\lambda)(n+\lambda-1}\right]$

Show that the finite series $\sum_{r=1}^{n} U_r$ is convergence & find the sum of that

intinite series

- Using a suitable value for λ, deduce that.

$$\sum_{r=1}^{\infty} \frac{2}{(r+1)(r+3)} = \frac{5}{6}$$

13. (a). $P = \begin{pmatrix} 1 & 0 \\ 0 & \lambda \\ \lambda & -2 \end{pmatrix}$, $Q = \begin{pmatrix} -2 & \lambda \\ 3 & 4 \\ 0 & -1 \end{pmatrix}$ and $R = \begin{pmatrix} \mu-1 & 0 \\ -3 & \mu-1 \end{pmatrix}$ *are three matrices*

such that, $P^TQ = R \quad \lambda, \mu \in \mathbb{R}$

- Show that $\lambda = \mu = -1$
- Write down corresponding R

By considering that R and the matrix $A = \begin{pmatrix} -1/2 & 0 \\ 3/4 & -1/2 \end{pmatrix}$

- Prove that $A = R^{-1}$

When $S = \begin{pmatrix} 0 & 0 \\ 3 & 0 \end{pmatrix}$

- Prove that (i). (R+I)S = -S and
- (ii). R+2I+S = 0 and, hence deduce that,
- (R+2I) (S-I) = S

Where I is the 2nd order identity matrix.

(b). Let $Z_1 = -1+2i$ and $Z_2 = 2 + i$

Find $\frac{Z_1}{Z_2}$ and deduce that $\frac{Z_2}{Z_1}$. Hence obtain

$\frac{Z_1 + Z_2}{Z_1}$ and $\frac{Z_1 + Z_2}{Z_2}$ and deduce that

(i). $\frac{Z_1 + Z_2}{Z_2} + \frac{Z_1 + Z_2}{Z_1} = 2$ and

(ii). $\frac{(Z_1)^2 - (Z_2)^2}{Z_1 Z_2} = 2i$

Z_A is a complex number such that,

$|Z_A| = 4$ and $Arg(Z_A) = \pi/_6$ and $Z_B = iZ_A$

Mark Z_A and Z_B on **Argand plane.**

Obtain the position of $Z_C = (Z_A + Z_B)$.

Deduce that, $Tan(\pi/_{12}) = \left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$

When O, A, B and C are the points on argand plane representing $(o + oi)$, Z_A, Z_B and $(Z_A + Z_B)$ respectively. Show that the area enclosed by the lines AB and BC and the arc of the circle passing through both A and B with the centre O, is $4(4 - \pi)$ square units.

14. (a). For $x \in \mathbb{R} - \{2\}$ Show that the first derivative of $f(x) = \frac{2(3-x-x^2)}{(x-2)^3}$, relative to x is given by $f'(x) = \frac{2(x+7)(x-1)}{(x-2)^4}$

Further, obtain that, the second derivative of $f(x)$, relative to x as,

$$f''(x) = \frac{4(x+3)}{(x-2)^4} - \frac{4}{(x-2)} f'(x)$$

Sketch the graph of $y = f(x)$, indicating the stationary points - asymptotes and intercepts on ox and oy clearly.

Its is giver that,

$$f''_{(x)} = \frac{-4(x^2 + 11x - 8)}{(x-2)^5}$$

Determine the inflection points on $y = f(x)$. (assume that $\sqrt{153} \approx 12.4$)

(b). A person of height h to his eye level is watching a picture, which is hanged from a vertical wall. He is at a certain distance from the wall. Height of the picture is $3h$ and the lower horizontal edge of the picture is $2h$ above the ground level.

Find the optimal distance to the observer from the wall so that the picture subtends the maximum angle on his eye in the vertical plane.

15. (a). By using the substitution $x^3 = 2\tan^2\theta$ (for $x > 0$) find $\int \sqrt{x(2+x^3)}\, dx$

(b). Prove that $\int_o^a f(x)dx = \int_o^a f(a-x)dx$

By using above result and by considering the integration $\int_o^{\pi/2} \frac{\sin^2\theta}{\cos^3 2\theta}\, d\theta$ (deduce that) $\int_o^{\pi/2} \sec^3 2\theta = 0$

(c). Evaluate the integration $\int_o^{\pi} \frac{e^{2x}\cos x - e^x \cos x}{1 - e^x}\, dx$

16. Find the co-ordinates of the intersection point P of the straight lines,

$l_1 \equiv y = mx$ and $l_2 \equiv 2mx - 3y + 1 = 0$ where $m > 0$.

This point P is at a distance of $\sqrt{2m}$ from the origin O. Show that $m = 1$

Find the equation of the straight line $l_3 = O$ which is passing through above intersection point P and which makes and intercept of 2 units on the positive direction of x-axis.

When A is the point of intersection of $l_2 = O$ and y-axis, and B is the point of intersection of $l_3 = O$ and x-axis, find the equation of the circle $S_1 = O$ which is passing through the points O, A & B.

Further, find the equation of the circle $S_2 = O$ whose centre is P and radius PA.

Are $S_1 = O$ & $S_2 = O$ orthogonal. Justify your answer.

Find the equation of the circle whose centre is P and which is orthogonal to $S_1 = O$.

17. (a). State the "**Cosine rule**" for a triangle ABC in usual notation.

i. Lengths of the sides BC, CA and AB of a triangle ABC are $(x+y), x$ and $(x-y)$ respectively.

Show that,

$$\cos A = \frac{x - 4y}{2(x - y)}$$

ii. If $y = {}^{x}/_{7}$ obtain $\hat{A} = \cos^{-1}({}^{1}/_{4})$

iii. Lengths of three sides of a triangle are in the ratio 6:7:8.

Deduce that the largest angle of the triangle is, $\cos^{-1}({}^{1}/_{4})$

(b). Prove that, $(\cos \propto + \cos \beta)^2 + (\sin \propto + \sin \beta)^2 = 4\cos^2\left(\frac{\propto - \beta}{2}\right)$ and

find the general solutions of the equation,

$(\cos x + \cos 3x)^{2} + (\sin x + \sin 3x)^2 = 1$

(c). Solve the equation, $2\tan^{-1}(\sin x) - \tan^{-1}(2\sec x) = 0$

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Part A

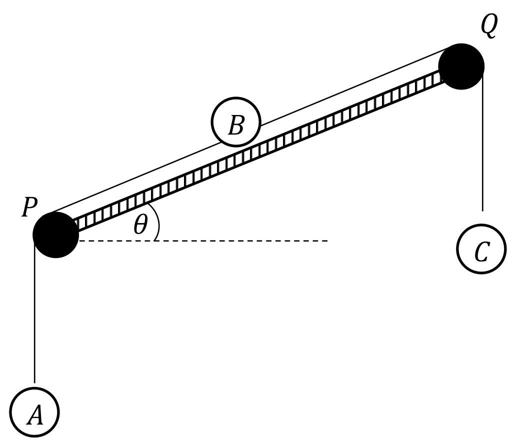
01. Two particles of masses $3m$ and λm are moving in the same straight line on a smooth horizontal table in opposite directions with velocities λu and u respectively and collide directly. After the collision the particle of mass $3m$ comes to rest. Find the velocity of the other particle and also find the coefficient of restitution between the two particles.

Further, show that $\lambda = 1$ if there is no loss of kinetic energy in the system due to the collision. What is the impulse of the collision.

02. An aircraft wihich is moving with velocity 360 Km h^{-1} on a straight level track takes off from the point O at an inclination ${}^{\pi}/_{6}$ to the horizontal. After flying one minute with the same uniform velocity it releases a bomb at rest.

Find the distance from O, to the point at which the bomb hits on the ground.

03. As shown in the figure, two smooth pulleis P and Q are fixed at the two ends of an inclined plane which is θ to the horizontal. The smooth particle B, which is on the inclined plane is attached to the ends of two inextensible light strings. This strings pass over the pulleis P and Q and the particles A and B are attached to the other ends. Masses of A, B, and C are $2m$, $3m$ and $3m$ respectively.



Find the acceleration where the system is released from rest.

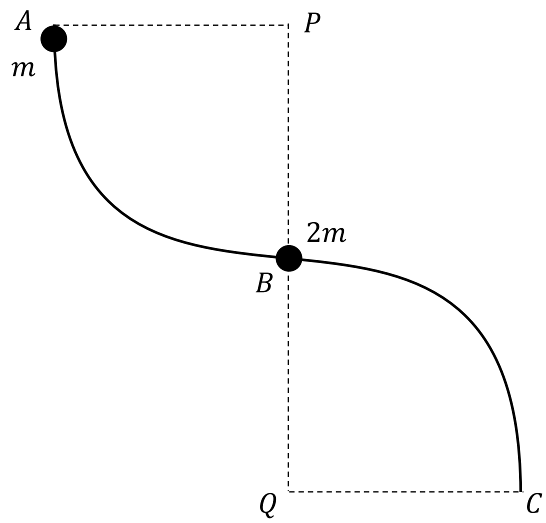
If the particle A moves vertically upwards, then show that, $\theta < \sin^{-1}({}^{1}/_{3})$

04. The power of the engine of a vehicle is $10^3 HK\ W$. The maximum velocity which it can maintain along a level track is $90\ km\ h^{-1}$. Find the total resistance to the motion of the vehicle.

Calculate the acceleration of the vehicle when it is moving up on an inclined straight road with the same resistance and power, if the inclination is $\pi/_6$ to the horizontal with speed $54\ km\ h^{-1}$.

Total mass of the vehicle is K metric tons.

05. As show in the figure AB and BC are thin smooth wires which are circular arcs of equal radii and there centers are P and Q respectively. Both are of quadrent shaped arcs. At B a smooth bead of mass 2m and at A another smooth bead of mass m are attached to the wire. Entire wire is in a verticle place. When the particle which is at A is released from rest it moves along wire AB and hits on the particle 2m at B and combined. And then the combined prticle starts to move along wire BC. Show that the angle between QB verticle line and the radius through the combined particle $\cos^{-1}(^{20}/_{27})$ when the reaction between wire and combined particle is zero.



06. Position vectors of the vertices of the rhombus, with relative to vector origin O are $\overrightarrow{OP} = -3\underline{i} - 5\underline{j}$, $\overrightarrow{OQ} = 3\underline{i} - 3\underline{j}$, $\overrightarrow{OR} = \propto \underline{i} + \beta\underline{j}$ and $\overrightarrow{OS} = -\underline{i} + \underline{j}$. Determine the values of $\propto$ & β and show that the diagonals PR & QS bisect each other perpendiculearly

07. Length of a uniform rod AB is $2l$ and weight W. The end A is smoothly hinged to a fixed point. The rod is kept in equilibrium making an angle $\pi/_3$ with upword verticle by joining one end of a light inextensible string to the points P on the rod and the other and of the string to a point Q which is l verticly above from A. $AP = {}^{l}/_{2}$. Rod and the string are in the same vertical plane. Draw the force diagram and find the tension in the string and the reaction at A.

08. A rough sphere of weight W and radius 3r is kept in equilibrium on a rough inclined plane with inclination $\pi/_6$ to the horizontal by joining one end of a light inextensible string to a point on the sphere and the other end to a point P on the plane. Point P is above the point Q at which the sphere touches the plane. Distance PQ is 4r. Mark the forces on the sphere and find the normal reaction on sphere.

09. Fallowing probabilities are given about the events A, B, C of which A & C are independent.

$$P(A) = \frac{1}{5}, \quad P(B) = \frac{1}{6}, \quad P(A \cap C) = \frac{1}{20} \quad \text{and} \quad P(B \cup C) = \frac{3}{8}$$

Find the probability of event C and show that the events B & C are independent.

10. The mean of the set of numbers 1, 2, 8, 9 is increased by 1 when the positive number x is added to the set.

Determine the value of x and show that the increment in the standard deviation due to the addition of the positive number x to set, is $\left(\frac{2\sqrt{7}-5}{\sqrt{2}}\right)$

Part B

11. (a). A particle A is projected vertically upwards under gravity with initial velocity $\sqrt{10ga}$ from a point on the ground. When it is at height ${}^{9a}/_{2}$ from the ground it separates to two parts P & Q of equal masses due to an internal explosion. Instantly the velocity of P comes to zero.

Show that the velocity of Q is double the velocity which was before the explosion.

Draw the velocity-time graphs of the motions of the particle A and the parts P & Q until P comes to the ground.

Hence find,

(i) Height to the P from the ground when Q is at the highest point of its path.

(ii) Time taken to P to comes to the ground from the intant $t = O$

(b). Velocity of a helicopter in still air is $u\ km\ h^{-1}$. The points A, B and C are on level ground such that $A\hat{C}B = {}^{\pi}/_{2}$, $AB = d\ km$ and $AC = BC$. In a certain day, the helicopter flies uniformly from A to B and then B to C and again C to A without stopping while a wind is blowing due BA direction with uniform velocity $V\ km\ h^{-1}$, $(v < u)$. The time taken by helicopter to turn at each point B & C are niglegible.

Find the time taken by helicopter to complete the journey ABCA.

Explain with reasons that, what will happen to the first $A \rightarrow B$ part of the journey, when,

(i) $V = U$

(ii) $V > U$

12. (a). A smooth wedge of mass 2m and angle at one vertex θ is kept on a smooth inclined plane with one surface is touching the plane. Inclination of the plane is θ to the horizontal. Upper surface of the wedge is horizontal. One end of a light inextensible string is attached to the upper edge of the surface of wedge which touches the inclined plane. The string passes over a small smooth pully which is fixed at the top of the inclined plane and hangs a particle of mass 3m at the others end.

Entire string is in a vertical plane which passes through the center of mass of the wedge.

Now the system is released from rest with a particle of mas m which is kept on the line of intersection of the upper horizontal surface of wedge and the vertical plane though the centre of mass of wedge.

Then the wedge starts to move with a constant acceleration which is $\frac{2}{7}$ of gravity, in magnitude, along the upward direction of the inclined plane.

Show that $\theta = {}^{\pi}/_{6}$

After moving in a time period t, the particle of mass m, which is on the upper horizontal surface of wedge removes from the surface without any impulse and starts to move under gravity.

Does the particle m release from surface horizontally with relative to earth. Justify your answer.

Show that the ratio of accelerations of wedge before and after m releases it, is 5:7

(b). A particle P is projected under gravity of a point O on the horizontal ground with initial velocity $\sqrt{48gh}$ at an inclination ${}^{\pi}/_{3}$ to the horizontal. When P reaches to the highest point of its path it combines with another particle Q of same mass at rest which was at that highest point. The particle Q was hanging from a light inextensible string of length l from the fixed point O'. $l = 3h$. Let the combined particle as R.

- Find the velocity with which R starts to move.
- Let the velocity of R when $O'R$ makes an angle θ with vertical is W, and the tension in the string is T,

Show that,

$W^2 = 3gh\,(2\cos\theta - 1)$

$T = 2mg\,(3\cos\theta - 1)$

If the particle R falls under gravity, instantly from the string, when $O'R$ makes and angle ${}^{\pi}/_{3}$ with vertical,

Find,

(i) Hight from O to the particle R when it falles from string.

(ii) Horizontal distance from O to the point at which R hits on the ground.

13. Two ends of a light elastic spring of natural length 3a are A and B. The srping is vertically fixed at the end A on a horizontal plane. When a particle P of mass 2m is kept at rest its upper end B, the length of the spring is 2a.

Show that the modulus of elasticity of the spring is 6mg.

Now the particle P is released at rest from the point, 4a vertically above A.

Show that the minimum length of the spring during the subsequent motion, is $(2-\sqrt{3})a$.

Show that the time period from the starting point of P to the instant at which the spring comes its minimum length for the first time is,

$$\sqrt{\frac{a}{g}}\left\{\sqrt{2}+\frac{\pi}{2}+\sin^{-1}\left({}^{1}\!/_{\sqrt{3}}\right)\right\}$$

At the above instant at which the spring has its minimum length a part of mass m falls from P without any collision with spring.

How long does the remaining mas m remains on the end A of the spring with touching it.

14. (a). $OACB$ is a parallelogram where O is the vector origin. The points P, Q, R and S are on the sides OA, AC, CB and BO respectively such that,

$OP:OA = AQ:AC = CR:CB = BS:BO = 1:3$

$\underline{a}$ and $\underline{b}$ are the position vectors of A & B respectively with relative to origin.

(i) Writedown the position vectors of P, Q, R and S in terms of $\underline{a}$ and $\underline{b}$

(ii) Show that $PQRS$ is a parallelogram.

(iii) if

$$\theta = \cos^{-1}\frac{2\left(|\underline{a}|^2 - |\underline{b}|^2\right)}{3|\underline{a}|\,|\underline{b}|} \quad \text{where } A\hat{O}B = \theta$$

Show that $PQRS$ is a rectangle.

(b). The forces P_1, P_2, P_3 are acting at the points A, B, C on oxy plane, respectively.

where $A \equiv (3a, -2a)$ $P_1 = -P\underline{i} + 3P\underline{j}$

$B \equiv (-a, -3a)$ $P_2 = 2P\underline{i} + 4P\underline{j}$

$C \equiv (2a,\ 5a)$ $P_3 = 3P\underline{i} - 2P\underline{j}$ වේ.

($\underline{i}, \underline{j}$, are in usual notation)

a, λ, μ are positive quantities, a- measured in meters and P in newtons.

Show that the clockwise moment of the system about origin O is $10Pa\ N\ m$.

Now an extra force $P_4 = \left(\lambda P\underline{i} + \mu P\underline{j}\right)$ is added to the system which is acting at the point $D\ (\lambda a, \mu a)$

Show that there is no change in moment about origin O.

Now let the resultant of the system of forces P_1, P_2, P_3 and P_4 is a single force R which is acting at $E(O, \mu)$. The line of action of R makes an angle $\pi/3$ counterclockwise with the positive direction of ox axis.

Writedown the magnitude of R.

Determine the values of λ and μ.

15. (a). One end of a uniform rod of length $2\sqrt{3}\,r$ and weight $2w$ is smoothly hinged to a fixed point P on a vertical wall. One end of a light inelastic string is attached to the other end of the rod. The other end of the string is attached to a fixed point on a ceiling so that the string is vertical and the rod is in equilibrium in a vertical plane which is perpendicular to the wall.

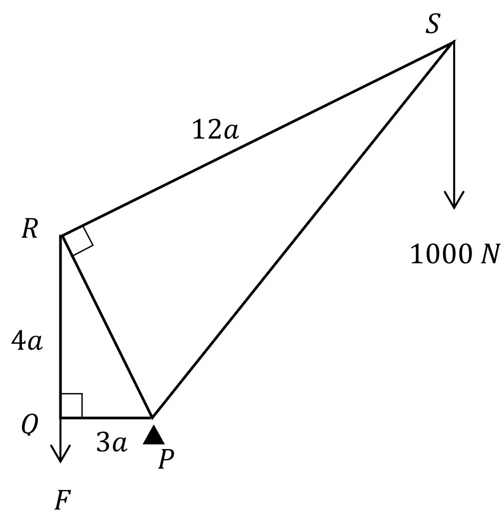
The rod makes an angle $\pi/6$ with the upward vertical at P.

Now a thiu smooth circular lamina of weight w and radius r is kept in equilibrium on the rod in the acute angled gap between the rod and the wall with touching both the rod and the wall, in a vertical plane.

Mark all the forces acting on the lamina and on the rod correctly in two separate diagrams.

Find the tension in the string and the resultant reaction acting on the rod at P.

(b). In the frame work which is shown in the figure $PQ = 3a$, $QR = 4a$ and $RS = 12a$. It consists of five light rods , QR, PR, SR and SP. $P\hat{Q}R = P\hat{R}S = \pi/2$. The frame work is smoothly hinged at a fixed point P and kept in equilibrium in a vertical plane. A weight $1000\ N$ at S and a vertically downward force $F\ N$ at Q are applied.



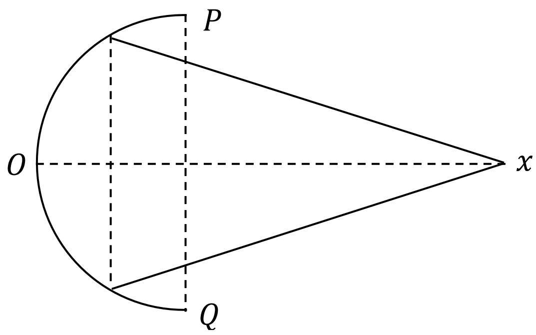
Find the magnitude of F.

Using **Bow's notation,** draw a stress diagram for the framework and find the stresses in all rods, distinguishing between tensions and thrusts.

16. (i). Show that the centre of mass of a uniform hollow hemisphere of radius a is on its axis of symmetry at a distance $\frac{a}{2}$ from the centre of the base.

(ii). The centre of mass of a uniform hollow right circular cone of height h, is on its axis of symmetry at a distance $\frac{h}{3}$ from the centre of the base.

A uniform hollow hemisphere of radius $2a$ and surface dencity ρ and, a right circular hollow cone of base radius $\sqrt{3}a$, cemi-vertical angle $\frac{\pi}{6}$ and surface dencity σ are fixed together as shown in the figure.



Edge of the circular base of hollow cone is attached to the inner surface of the hollow hemispher so that the composite body has a same axis of symmetry.

Show that the distance to the centre of mass G of composite body, from O, along the axis of symmetry ox is

$$OG = 2\frac{(2\rho + 3\sigma)}{(4\rho + 3\sigma)}\,a$$

The composite body is hanged freely from P at a fixed point by alight inextensible string. Then the axis of symmetry makes an angle $\tan^{-1}(3)$ with the verticle when its equilibrium position.

Show that $\rho : \sigma = 3 : 2$

Now by joining an extra particle to the vertex of the cone, the composite body is kept in equilibrium so that the axis of symmetry of the composite body is horizontal.

Show that the mass of the extra particle is half of the mass of the hollow hemisphere.

17. (a). In a certain population 40% are male. Among this male population p% are government servants. The probabiliti of a female in this population being a goverment servent is q.

Probability of a person who is selected at random from this population is a male-government servant is 0.08 and a female - government servant is 0.18.

Draw a tree diagram to illustrate above data.

Find the values of p and q.

Find the probability of a person, selected at random from this population is,

(i) Not a government servant.

(ii) Either a male or a female-government servant,

(iii) Not a male-government servant

(iv) If not a government servant, probability of being a female,

(b). Fallowing table represent a set of no of 120 data which divided in to 6 equal class intervals.

Mid point (class mark) of each class interval and the respective frequencies are given there. **Mode** of this distribution is 52.5

Writedown all the class intervals in integer form.

Find the values of f_1 and f_2 .

What is the **median** of this frequency distributic.

By using the code, $u_i = \left(\frac{x_i - \overline{x}}{c}\right)$ in usual notation calculate the **mean, variance** and the **coefficient of skewness** of the distribution.

	class interval	mid point (class mark)	frequency	
1		10	12	
2		25	f_1	
3		40	f_2	
4		55	33	
5		70	13	
6		85	14	