AN ROINN OIDEACHAIS **S. 35**

JUNIOR CERTIFICATE EXAMINATION, 1992 20605

MATHEMATICS – HIGHER LEVEL – PAPER 2 (300 marks)

FRIDAY, 12 JUNE – MORNING, 9.30 to 12.00

Attempt **QUESTION 1** (100 marks) and **FOUR** other questions (50 marks each)

Marks may be lost if all your work is not clearly shown.
Mathematics Tables may be obtained from the Superintendent.

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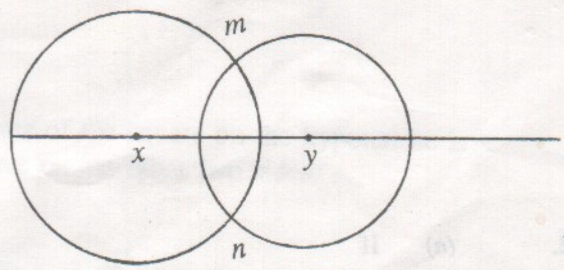
1. *(i)* Find 80% of (90% of 100).

(ii) Find the value of $6561^{\frac{1}{2}}$.

(iii) When the height of a cylinder is halved and its radius length is doubled the volume is increased k times. Find k .

(iv) x and y are the centres of the two circles which intersect at m and n.



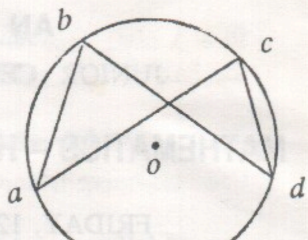
Prove $|\angle mxy| = |\angle nxy|$

(v) Draw a diagram to illustrate $S_m \circ S_a = 2\,\overrightarrow{am}$

OVER →

(vi) o is the centre of the circle. Prove

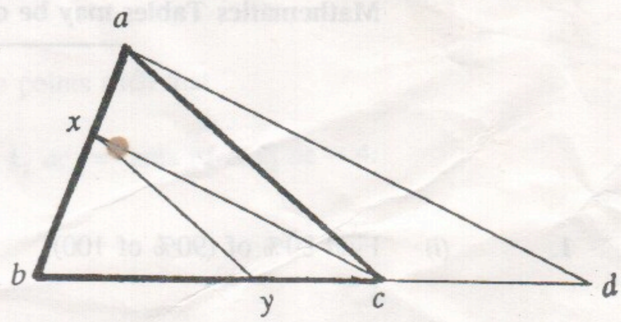
$$|\angle abd| = |\angle acd|$$



(vii) In the $\Delta\, abc$ $xy \parallel ac$.
A line through a parallel to xc cuts bc, produced, at d.

Prove

$$\frac{|by|}{|yc|} = \frac{|bc|}{|cd|}$$



(viii) The line $4x + ty = 12$ is perpendicular to the line $8x - y = 8$.
Find the value of t.

(ix) Let A be the line $x = 1$ and B the line $x = 2$. Find the image of the Y axis under $S_B \circ S_A$ and write down its equation.

(x) If $0° \leq A \leq 90°$, find the minimum value of A for which $\cos A \geq \frac{1}{2}$.

2. *(a)* If

$$\frac{8 - q^2}{2a^2} = m$$

express a in terms of m and q.

Find the values of a when $q = 2$ and $m = 40{\cdot}5$.

(b) IR£400 was invested at 5% per annum compound interest.
At the end of the 2nd year IR£x was withdrawn and at the end of the 3rd year the investment amounted to IR£451·5.
Calculate x.

3. In a Δ abc, $|ab| = |ac|$ and the line ad bisects the $\angle bac$ where d is a point in the base $[bc]$.

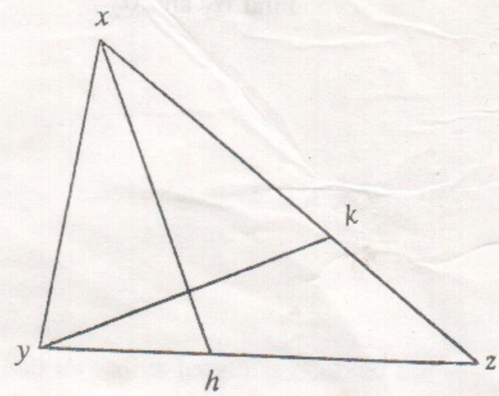
Use congruent triangles, or otherwise, to prove that $|\angle abc| = |\angle acb|$.

In the Δ xyz the line xh bisects the $\angle yxz$ and

k is a point such that

$$|\angle xyk| = |\angle kzy| + |\angle kyz|.$$

Prove



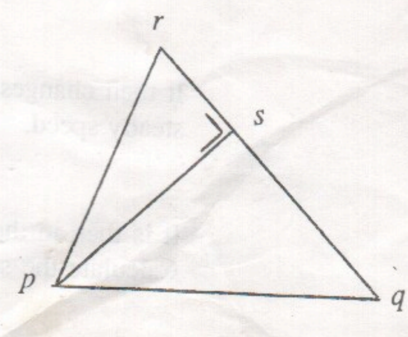
(a) $yk \perp xh$

(b) $|xz| > |xy|$

(c) $|\angle xhy| > |\angle yxh|$

4. In a right angled triangle prove that the area of the square on the hypotenuse is equal to the sum of the areas of the squares on the other two sides.

In the Δ pqr, $ps \perp rq$.



Use $|rs| = |rq| - |qs|$
to write an expression for $|rs|^2$.

Deduce that

$$|rp|^2 = |rq|^2 + |qp|^2 - 2|qr||qs|.$$

OVER→

5. $a\ (2, -1)$, $b\ (1, -3)$, $c\ (-1, 1)$ form the $\Delta\ abc$.

Show that the triangle is not right angled at the point a.

Find the equation of the line through b which is parallel to ac .

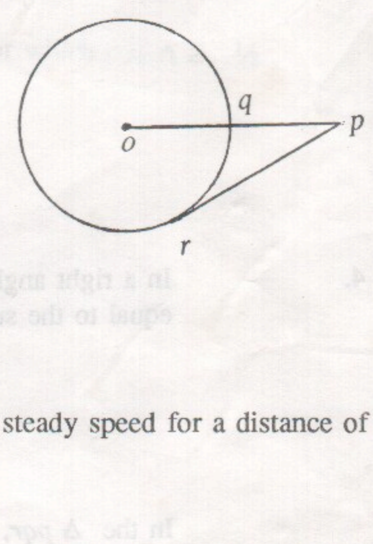
Show that the area of $\Delta\ abc$ is 4.

$k_1\ (\alpha_1\ , 0)$ and $k_2\ (0\ , \alpha_2)$ are two points such that

area of $\Delta\ k_1\ ac$ = area of $\Delta\ k_2\ ac = 4$.

Find α_1 and α_2 .

6. *(a)* From a point p outside the circle, centre o, the tangent pr is drawn and the line po cuts the circle at q .



If $|\ pq\ | = 2$ and $|\ \angle opr\ | = 30°$, calculate the radius length of the circle.

(b) A ship leaves port P and sails East 48° South at a steady speed for a distance of 4·5 km.

It then changes course and sails West 37° 18′ South for 0·5 hours at the same steady speed.

It is then in the direction West 66° 30′ South, as measured from the port P. Calculate the steady speed correct to the nearest km/h.