AN ROINN OIDEACHAIS

SAMPLE PAPER

INTERMEDIATE CERTIFICATE EXAMINATION, 1990

MATHEMATICS — SYLLABUS A — PAPER 2 (300 marks)

(TIME $2\frac{1}{2}$ HOURS)

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

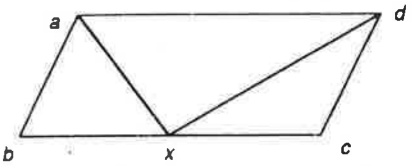
Marks may be lost if all your work is not clearly shown.

1. (i) Find 15% of IR£44·4.

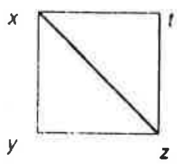
(ii) Simplify $64^{\frac{-2}{3}}$.

(iii) Express in terms of x and y the interest on IR£x for one year at y% per annum.

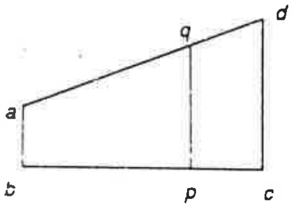
(iv) $abcd$ is a parallelogram in which $|ad| = 2|ab|$ and $|bx| = |xc|$.
Prove that
$ax \perp xd$.



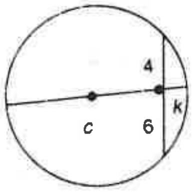
(v) $xyzt$ is a square.
Prove that $|\angle txz| = 45°$ and deduce that the line xz is an axis of symmetry of the square.



(vi) $ab \parallel dc \parallel qp$
If $|bp| = 2|pc|$,
prove that $|aq| = 2|qd|$



(vii) c is the centre of the circle of radius length 7 and $|ck| = x$.
Calculate x.



(viii) Find the image of (5, 0) under the composition of the two translations (5, 0) → (0, 0) and (−3, 0) → (0, 3).

(ix) K is the line $y = 2x$ and $f(K)$ is the image of K under the axial symmetry in the X axis. Find the equation of $f(K)$.

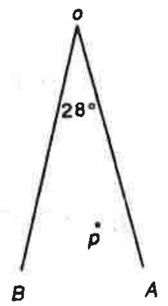
(x) If $0° \leq A \leq 360°$, find the values of A for which $\sin A = -\frac{1}{2}$.

2. (a) IR£1035 amounts to IR£1190.25 after one year. Find the rate per cent per annum.
A sum of money invested at compound interest amounts to IR£1035 after one year and to IR£1190.25 after two years, the rate remaining the same. Calculate the sum invested.

(b) If $s = \frac{1}{p} + \sqrt{q^2 + r^2}$,

find the value of p, as accurately as the Tables (p. 20-p.27) allow, when $s = 6{\cdot}995$, $q = 3{\cdot}489$ and $r = 8{\cdot}7 \times 10^{-1}$.

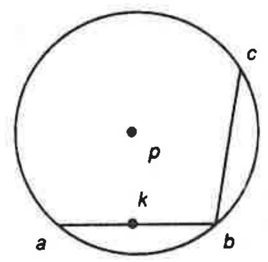
3. (a) Construct q, the image of p under the composition of axial symmetries S_B after S_A and then prove that $|\angle poq| = 56°$.



(b) Prove that the measure of the angle at the centre of a circle is twice the measure of an angle at the circle standing on the same arc.

p is the centre of the circle and $|ab| = |bc|$.

If k is the midpoint of $[ab]$, prove that $|\angle apq| = |\angle cab|$.



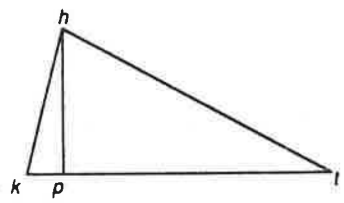
4. Prove that if two triangles are equiangular then the lengths of their corresponding sides are proportional.

In the Δhkt, $|\angle kht| = 90°$ and $hp \perp kt$.

Prove that the two triangles hkp and hkt are equiangular and write down two ratios equal to

$$\frac{|ph|}{|pk|}.$$

If $|ht| = 2|hk|$ and $|hp| = 4$, find the value of $|hk|$.



5. (a) $a(-4, 4)$, $b(-4, 0)$, $c(0, 4)$ are the vertices of a triangle and k is the midpoint of $[bc]$.

Δpqr is the image of the Δabc under the composition of central symmetries S_k after S_a.

Find the coordinates of p, q, r and name the one transformation that is equivalent to S_k after S_a.

(b) Show that the triangle formed by $a(0, 4)$, $b(-1, -1)$, $c(5, 3)$ is right angled. Verify that the line through the origin parallel to ac meets the circumcircle of the triangle at $(5, -1)$.

6. (a) Construct the angle A such that

$5 \sin A = 4$.

(b) A ship leaves port, p, and travels for two hours at a steady speed of 20 km/hour in the direction East 30° 20' North. The ship then changes course and travels in the direction North 40° 45' West. How far, to the nearest km, is the ship from p when its direction **from** p is North 30° 20' East?