AN ROINN OIDEACHAIS M. 28

LEAVING CERTIFICATE EXAMINATION, 1994

58710

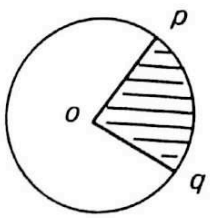
MATHEMATICS — ORDINARY LEVEL — PAPER 2

FRIDAY, 10 JUNE – MORNING, 9·30 to 12·00

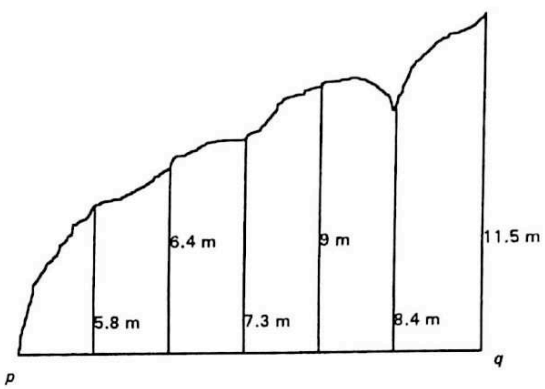
Attempt **5** Questions from Section A and **1** question from Section B. Each question carries 50 marks. Marks may be lost if necessary work is not shown or if you do not indicate where a calculator has been used.

Section A

1. *(a)* In the diagram, o is the centre of the circle of radius length 4 cm. $|\angle poq| = 90°$. Find in terms of π, the area of the shaded sector.



(b) The outline of a plot of land is shown in the sketch below.

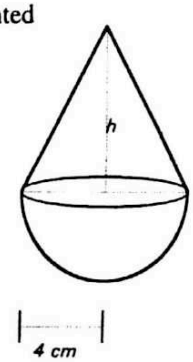


At intervals of 12 m along pq, perpendicular measurements 5.8m, 6.4m, 7.3m, 9m, 8.4m, 11.5m are made to the top boundary. Use Simpson's Rule to estimate the area of the plot, correct to the nearest square metre. [See Tables, page 42]

(c) A solid metal ornament consists of a hemisphere of radius length 4 cm surmounted by a solid cone.

(i) Find, in terms of π, the volume of the hemisphere.

(ii) The cone's volume is twice the hemisphere's. Find, h, the height of the cone.



2. A line L cuts the axes at q (–2,0) and p (0,4). Show this on a diagram.
Find (i) the slope of L (ii) the equation of L.
K is a line through q perpendicular to L. Find the equation of K.
K cuts the y-axis at r and $pqrs$, in that order, is a rectangle. Calculate the area of $pqrs$.

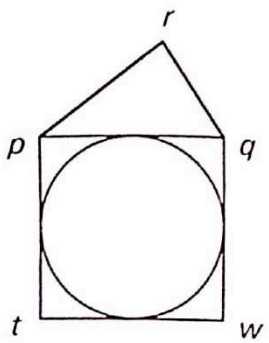
OVER→

3. (a) *(i)* A circle K_1 has equation
$x^2 + y^2 = 10$.
Write down its radius length.

(ii) L is the line having equation.
$x + y - 4 = 0$.
Calculate the coordinates of any points in $K_1 \cap L$
and state whether or not L is a tangent to K_1.

(b) State the centre and radius length of the circle
$K_2 : (x + 2)^2 + (y - 4)^2 = 25$.
Find the equation of the image of K_2 under the central symmetry in the point $(-1, 2)$

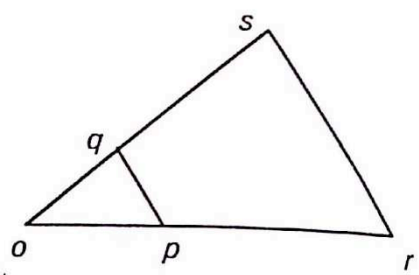
4. (a) Find, in terms of π, the area of the circle inscribed in the square $ptwq$
given that $|pr| = \sqrt{5}$ cm, $|qr| = 2$ cm
and $|\angle qrp| = 90°$



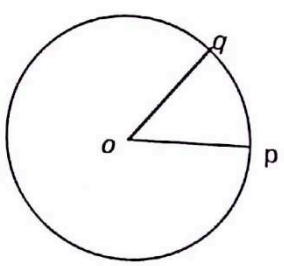
(b) Prove that if the degree measure of the angles of a triangle are respectively equal to the degree measure of the angles of a second triangle then the lengths of the corresponding sides are proportional.

(c) The triangle ors is the image of the triangle opq under an enlargement, centre o.
$|op| = 4$, $|pr| = 6$.

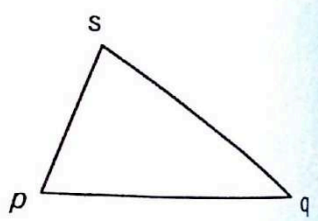
Find
(i) the scale factor of the enlargement.
(ii) the area of the triangle ors
given the area of Δopq to be 6 square units.



5. (a) In the diagram, o is the centre of the circle of radius length 14 cm.
Taking $\frac{22}{7}$ as an approximation to π, calculate the length of the minor arc pq
given $|\angle poq| = 45°$.



(b) pqs is a triangle in which
$|pq| = 8$ cm, $|ps| = 5$ cm, $|\angle spq| = 75°$.
Calculate $|sq|$ correct to one decimal place.



(c) $\sin\theta = \frac{\sqrt{3}}{2}$
Write two values for θ in $0 \leq \theta \leq 180°$.
Hence write the two corresponding values for $\cos\theta$.

Over→

6. *(a)* There are 40 people in a club, 24 male, 16 female. Four of the males and two of the females wear glasses.
When a club member is selected at random what is the probability

(i) that the person is a male?

(ii) that the person is a male not wearing glasses?

(b) (i) How many different arrangements can be made of the letters of the word COMPANY ?

(ii) How many of these begin with the letter C ?

(iii) How many begin with C and end with Y ?

(c) A bag contains 5 red and 3 yellow discs only. When a disc is drawn from the bag, it is returned before the next draw. What is the probability that two draws will yield

(i) both discs yellow?

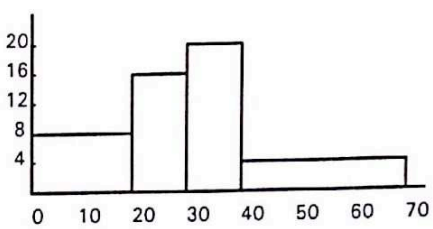
(ii) both discs the same colour?

7. *(a)*

Subject	Physics	Chemistry	Mathematics	Irish
Mark	74	65	82	58
Weight	3	4	5	2

The table shows a student's marks and the weights given to these marks.
Calculate the weighted mean mark.

(b) The distribution of ages of people in Main Street is shown in the histogram.
There are 20 people in the (30-40) age group.



How many are in (i) 0 - 20 age-group ? ; (ii) 40 - 70 age group?

(c) The Table show the number of people who saved money in a School Credit Union.
IR£(20-40) means 20 is included but 40 is not, etc.

Amount Saved in IR£	0-20	20-40	40-60	60-80	80-100	100-120
Number of People	10	24	44	32	22	8

Construct a cumulative frequency table. Draw a cumulative frequency curve.
Use the curve to estimate

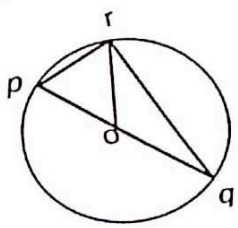
(i) the median amount of money saved per person, correct to the nearest IR£.

(ii) the interquartile range.

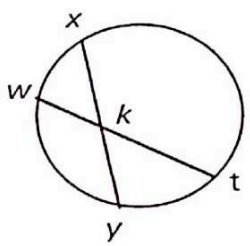
Section B

Attempt ONE question

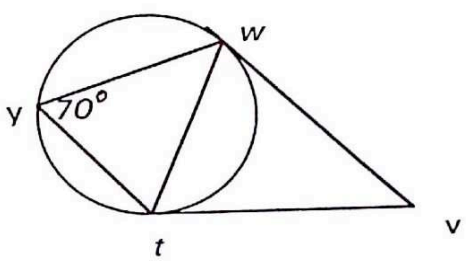
8. *(a)* In the diagram, o is the circle's centre and pq is a straight line. $|\angle qro| = 28°$. Find $|\angle orp|$ and $|\angle rpo|$ giving reasons for your answers.



(b) $[xy]$ and $[wt]$ are chords of a circle which meet at k. Prove $|xk| \cdot |ky| = |wk| \cdot |kt|$.



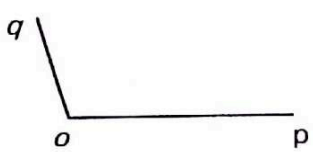
(c) In the diagram, tangents from v to the circle are drawn at t and w. $|\angle wyt| = 70°$. Give reasons for the following:
(i) $|\angle wtv| = 70°$
(ii) $|\angle tvw| = 40°$.



9. *(a)* The diagram shows vectors $\vec{p}$ and $\vec{q}$ with respect to an origin at o. Show on separate diagrams the points k_1 and k_2 such that

$\vec{k_1} = \vec{q} + \frac{1}{2}\vec{p}$

$\vec{k_2} = \vec{p} - \vec{q}$.



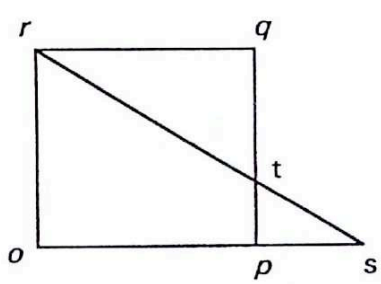
(b) $opqr$ is a square.

$|ps| = \frac{1}{3}|op|$. $rs \cap qp = \{t\}$.

Taking o as origin, express in terms of $\vec{p}$ and/or $\vec{r}$

(i) $\vec{os}$.

(ii) $\vec{rs}$.



Taking $\vec{i}$ and $\vec{j}$ as unit vectors along and perpendicular to os, respectively,

and given $\vec{p} = 4\vec{i}$ and $\vec{r} = 4\vec{j}$

calculate $|\vec{tr}|$, given $|pt| = \frac{1}{4}|pq|$.

Find $\vec{p} \cdot \vec{q}$, the scalar product of $\vec{p}$ and $\vec{q}$.

Over→

10. *(a)* Expand $(1 + x)^5$ in ascending powers of x. Find, using the expansion, the value of $(1 + \sqrt{3})^5$ in the form $a + b\sqrt{3}$ where a and $b \in \mathbf{N}$.

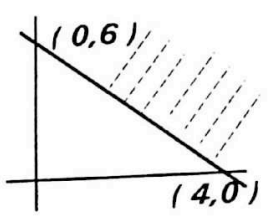
(b) IR£500 was invested on January 1st each year for four consecutive years at 7% per annum compound interest.

(i) What was the first IR£500 worth at the end of the four years?

(ii) Calculate the total value of the investment at the end of the four years, correct to the nearest IR£.

11. *(a)* (i) Graph the inequality $3x + 2y \leq 12$ indicating the correct half-plane.

(ii) Write down an inequality represented by the shaded region in the diagram.



A parking lot has an area of 1500 m^2. The parking area required for a car is 15 m^2 and for a bus is 60 m^2. Not more than 46 vehicles can be accommodated at any time.

If x represents the number of cars and y represents the number of buses parked, write two inequalities in x and y. Illustrate these on graph paper.

The daily parking charge is IR£5 for a car and IR£15 for a bus.
How many of each should be in the parking lot to give a maximum income ?
Calculate this income.