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LEAVING CERTIFICATE EXAMINATION, 1994

MATHEMATICS — ORDINARY LEVEL

SAMPLE PAPER II (300 marks) — 2½ hours

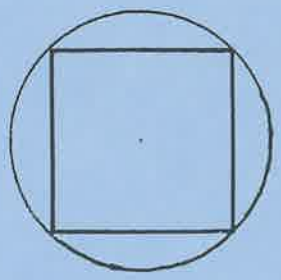
Attempt 5 Questions from Section A and 1 Question from Section B. Each question carries 50 marks.

Marks may be lost if necessary work is not shown or if you do not indicate where a calculator has been used.

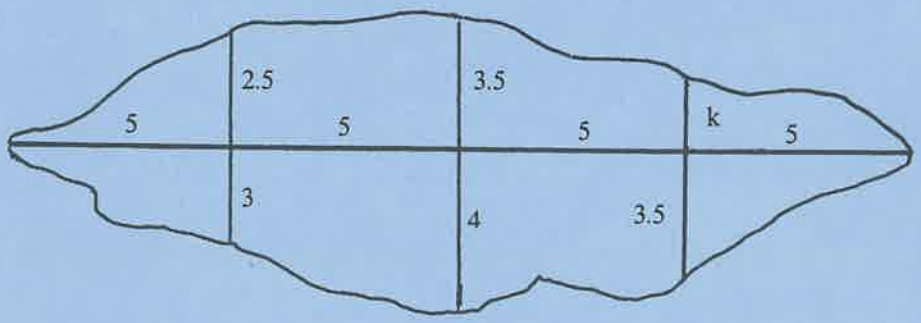
SECTION A

1. (*a*) 50 is taken as an approximation for 52.47. Calculate the % error in making this approximation.

(*b*) A square is incribed in a circle. The diameter of the circle is 4 cm in length. Find the area of the square.



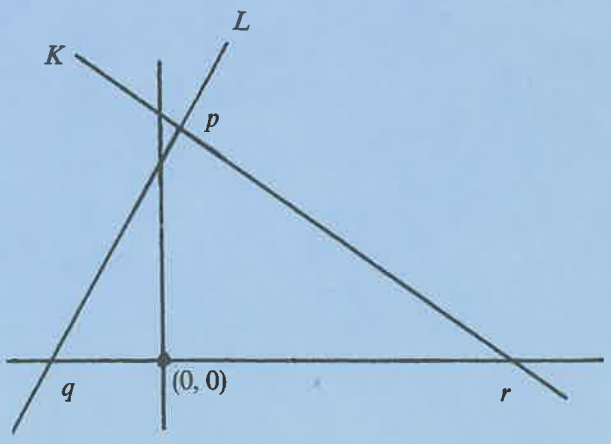
(*c*) Surveyors make the following sketch in estimating the area of a building site, where k is the length shown. Using Simpson's Rule, they estimate the area of the site to be 100 square units. Find k.



2. (*a*) The equation of the line L is $2x - y + 1 = 0$. Verify that p (1, 3) is in L.

(*b*) If a line $K \perp L$ contains the point p, find the equation of K.

(*c*) L and K intersect the x axis at q and r, respectively. Calculate the area of triangle pqr.



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3. C is a circle centre $(0, 0)$ and passing through $(-3, 1)$. Find

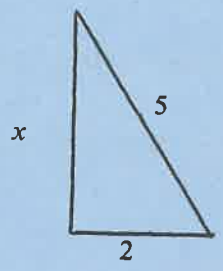
(i) the radius length of C,

(ii) the equation of C.

T is a tangent to C at $(-3, 1)$. Find the equation of T.

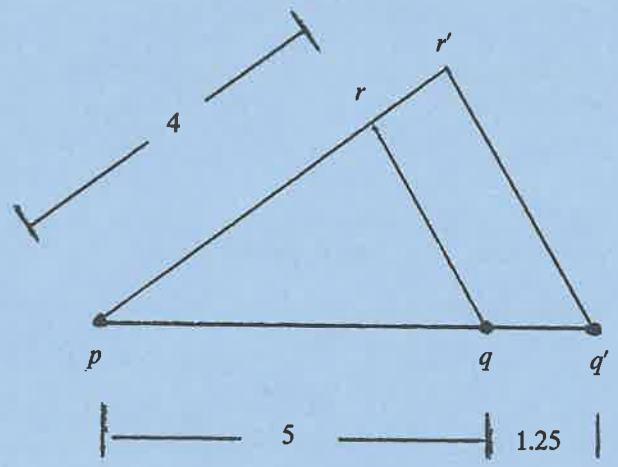
K is a second tangent to C and $K \parallel T$. Find the equation of K and the distance between T and K.

4. (*a*) If triangle *abc* is a right angled triangle, with the length of the sides as shown, calculate the value of x to one decimal place.



(*b*) Prove that if the three angles of one triangle have degree-measures equal, respectively, to the degree-measures of the angles of a second triangle, then the lengths of the corresponding sides of the two triangles are proportional.

(*c*)



The triangle $pq'r'$ is the image of the triangle pqr by an enlargement, centre p, as shown.

Calculate

(i) the scale factor of enlargement.

(ii) $|r'r|$.

(iii) $|rq| : |r'q'|$.

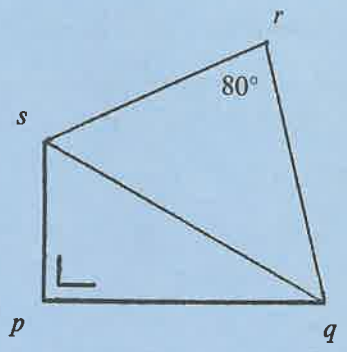
5. (*a*) Find the length of an arc of a circle of radius length 3 cm subtending an angle of 60° at the centre. Give your answer in terms of π.

(*b*) A garden *pqrs* is in the shape of a quadrilateral.

$|pq| = 15$ m, $|ps| = 8$ m, $|rs| = 9$ m,

the angle at p is 90° and

$|\angle qrs| = 80°$.



Find the value of

(i) $|qs|$

(ii) $|\angle rqs|$ to the nearest degree.

Find $|pr|$ to one decimal place.

6. (*a*) Three cards, numbered 3, 4 and 5 respectively are to be shuffled and placed in a row so that the numbers are visible.

List the six possible outcomes.

Find the probability that

(i) the numbers are 3, 4, 5 in that order

(ii) the middle number is 4

(iii) the number on the right is less than the middle number

(iv) the first and second numbers are each odd.

(*b*) Seven people take part in a chess competition. How many games will be played if each person must play each of the others?

7. A group of children were asked how much money they spent on sweets on the way to school on a particular day. The results are given in the following table.

money in pence	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30
number of children	3	5	15	12	10	5

{**Note** that 0 – 5 means greater than or equal to 0 but less than 5}

How many children were in the group?

Construct the cumulative frequency table. Draw the cumulative frequency curve and estimate the median amount of money to the nearest penny.

Use you graph to estimate

(i) the interquartile range

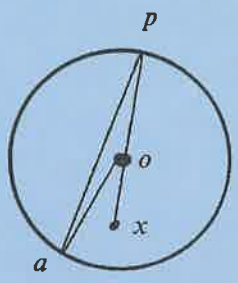
(ii) the number of children who spent less than 23p.

SECTION B

Attempt one question.

8. (*a*) p is a point of a circle, centre o.

If $|\underline{pao}| = 10°$. Find $|\underline{aox}|$.

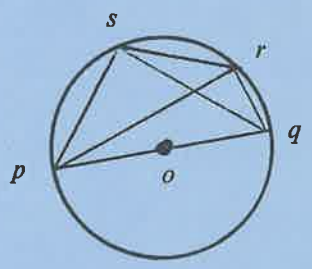


(*b*) Prove that the degree-measure of an angle subtended at the centre of a circle by a chord is equal to twice the degree-measure of any angle subtended by the chord at a point of the arc of the circle which is on the same side of the chordal line as is the centre.

(*c*) In the diagram, o is the centre of the circle and $|ps| = |sr|$, $|\underline{pqr}| = 56°$.

Find (i) $|\underline{qpr}|$

(ii) $|\underline{qps}|$.

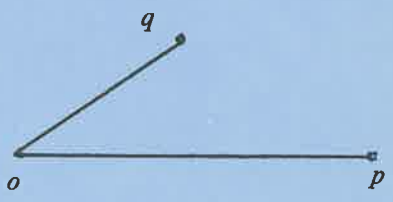


9. (*a*) Copy the diagram and show on separate diagrams, o being the origin,

(i) the point k_1, so that $\vec{k}_1 = 2\vec{q}$

(ii) the point k_2, so that $\vec{k}_2 = \vec{p} + \vec{q}$

(iii) the point k_3, so that $\vec{k}_3 = \vec{p} - \vec{q}$



(*b*) For the vectors

$\vec{m} = 5\vec{\imath} - 6\vec{j}$

$\vec{n} = -10\vec{\imath} + 2\vec{j}$,

find $\vec{mn}$ in terms of $\vec{\imath}$ and $\vec{j}$.

$\vec{m} + \frac{1}{2}\vec{mt} = \vec{n}$, find $\vec{t}$ in terms of $\vec{\imath}$ and $\vec{j}$.

(*c*) If $\vec{p} = -\vec{\imath} + 2\vec{j}$ and $\vec{q} = \vec{p}^{\perp}$, where o is the origin, express $\vec{q}$ in terms of $\vec{\imath}$ and $\vec{j}$. Verify $|\vec{p}| = |\vec{q}|$.

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10. (*a*) 0.5 written as an infinite series is

$$\frac{5}{10} + \frac{5}{100} + \frac{5}{1000} + \ldots$$

By finding the sum to infinity of the series, express 0.5 as a fraction.

(*b*) Write the terms of the expansion of $(1 + x)^5$ in ascending powers of x. By putting $x = \sqrt{3}$, use this expansion to express $(1 + \sqrt{3})^5$ as a number in the form $a + b\sqrt{3}$, where $a,b \in Z$.

Show that

$$(1 + x)^5 - (1 - x)^5 = 2x(5 + 10x^2 + x^4)$$

11. Graph the solution set of $3x + 4\frac{1}{2}y \leqslant 90$.

A community workshop produces two types of articles, X and Y. During production an article of type X requires 3 minutes on machine A and $4\frac{1}{2}$ minutes on machine B; an article of type Y requires $1\frac{1}{2}$ minutes on machine A and 1 minute on machine B.

Owing to overheating, each machine can only operate for a maximum of 90 minutes each day.

Graph the set showing the possible number of each type of article that can be produced each day.

The profit on an article of type X is IR£2.50 and for an article of type Y is IR£1.

How many of each type of article should be produced each day so that the profit is a maximum? What is the maximum profit?