

INTERMEDIATE CERTIFICATE EXAMINATION, 1971

MATHEMATICS—LOWER COURSE—PAPER I
(150 marks)

WEDNESDAY, 9th JUNE—MORNING, 9.45 to 12.15

Six questions to be answered.

All questions are of equal value.

Mathematical Tables may be had from the Superintendent.

1. If the diameter of a disc is 14 cm calculate its area.
From a rectangular strip of tin 14 cm wide five discs each of radius 7 cm are cut out. Calculate the least length of strip required.
Find also the area of tin remaining from this latter strip after the five discs have been cut out.
(Take $\frac{22}{7}$ as an approximate value of π .)

2. On average a car uses 1 gallon of petrol for every 34 miles it travels. In a certain period a salesman travels 7242 miles in the car. If petrol costs 32p per gallon, find the total cost of the petrol.
If the cost of petrol is increased by $1\frac{1}{2}$ p per gallon, find the increase in the cost of the travel.

3. Construct a quadrilateral $abcd$ given that

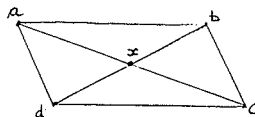
$$|bc| = 5 \text{ cm}; |cd| = 6 \text{ cm}; |bd| = |ba|, ab \perp bc, \angle bcd = 60^\circ.$$

Construct a point $k \in bc$ such that the area of $abcd$ is equal to the area of the $\triangle abk$.

4. A, B, C, D are lines. Draw diagrams to illustrate whether each of the following is true or false:
(i) $A \cap B = A \cap C$ means $B = C$ always,
(ii) $A \perp B$ and $B \perp C$ means $A \perp C$,
(iii) $A \parallel B \perp C$ means $A \parallel C$,
(iv) $A \parallel B$ and $C \parallel D$ means A, B, C, D form a parallelogram always.

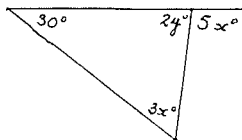
5. $abcd$ is a parallelogram as in diagram and the diagonals intersect at x .

- (i) What is the image of $\triangle axd$ by S_x , the central symmetry in x ?
(ii) Find the image of $\triangle abc$ by the translation \vec{ax} .
(iii) If S_x is the central symmetry in x is $S_x \circ S_x = S_x$?
Explain your answer.



6. Prove that the sum of three angles of a triangle is two right angles.

The diagram shows the measures of four angles. Calculate x and y .

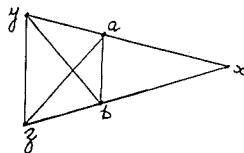


7. Prove that two triangles on the same base and between the same parallels are equal in area.

In the diagram $ab \parallel yz$.

Name pairs of triangles such that the triangles in each pair are on the same base and are between the same parallels, and prove that

$$\text{area of } \triangle axz = \text{area of } \triangle bxy.$$

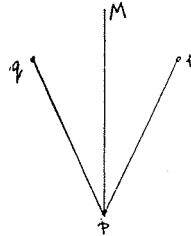
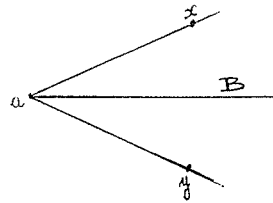


8. $[ax$ and $[ay$ are two half-lines as in the diagram and B is the bisector of $\angle xay$.

What is the image of $[ax$ by S_B , the reflection in B ?
 p, q, r are three points as shown in the diagram, such that $|pq| = |pr|$, and M is the bisector of $\angle qpr$.

Prove that M is also the perpendicular bisector of $[qr]$.

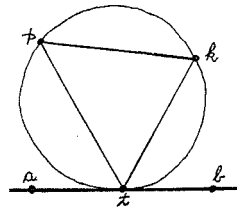
Deduce that the perpendicular bisector of a chord of a circle contains the centre of the circle.



9. ab is a tangent to a circle at t (see diagram) and $[tk]$ is a chord of the circle. Prove that

$$\angle ktb = \angle kpt$$

If $|tp| = |tk|$ prove $pk \parallel ab$.



10. Use your tables to find the value of

(i) $\sin 15^\circ$ (ii) $\tan 75^\circ$.

A small aeroplane taxiing for take-off travels along the runways $[tr]$ and $[rk]$ from the terminus t to a point k (see diagram).

If $rb \perp tb$, $tr \perp rk$,

$|rb| = 20$ metres, $\angle rtb$ measures 15° ,

$\angle rtk$ measures 75° , show that

$|tr| = 77$ metres, to the nearest metre, and find the total distance travelled by the aeroplane, correct to the nearest metre.

