

AN ROINN OIDEACHAIS

JUNIOR CERTIFICATE EXAMINATION, 1997

MATHEMATICS - HIGHER LEVEL - PAPER 2 (300 marks)

FRIDAY, 13 JUNE - MORNING, 9.30 to 12.00

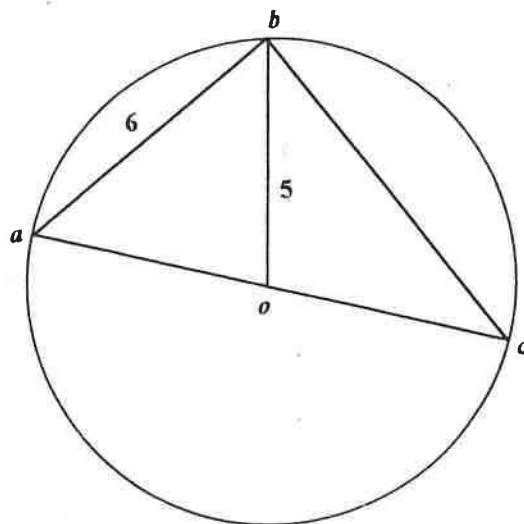
Attempt QUESTION 1 (100 marks) and FOUR other questions (50 marks each).

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

1. (i) One litre of water is added to four litres of milk in a container.
Calculate the percentage of water in the container.
- (ii) IR£105 was shared among three people in the ratio $1 : 2 : \frac{1}{2}$.
Calculate the smallest share.
- (iii) The volume of cone A is 72 cm^3 . Another cone B has the same height as cone A but the length of the radius of its base is twice that of cone A. Calculate the volume of cone B.

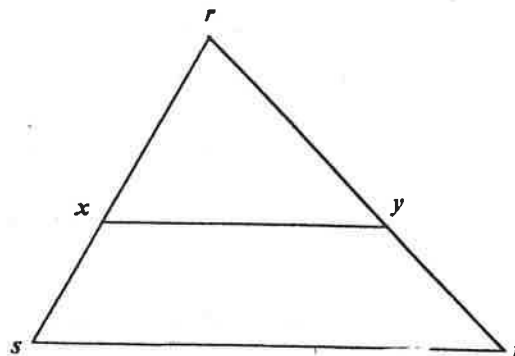
- (iv) The centre of the circle is o ,
 $|ab| = 6$ and $|bo| = 5$.

Find $|bc|$.



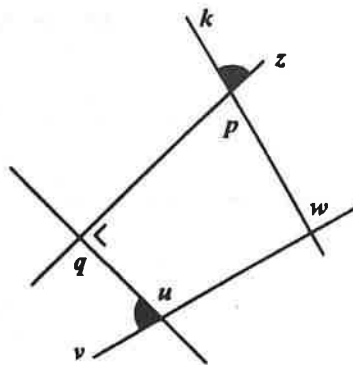
- (v) In the triangle rst , xy is parallel to st .

If $|xs| = 5$, $|yt| = 6$ and $|rs| = 12$,
find $|rt|$.



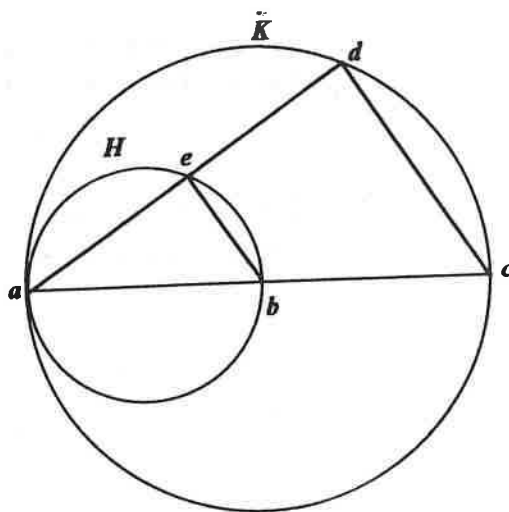
- (vi) In the diagram $qu \perp qp$
and $|\angle quv| = |\angle kpz| = 75^\circ$.

Prove that
 $vw \perp kw$.

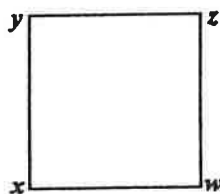


- (vii) The circles H and K have diameters
 $[ab]$ and $[ac]$, respectively.

Explain why eb is parallel to dc .



- (viii) $xyzw$ is a square. Construct the image
of the square under
 $S_x \circ S_w$.



- (ix) Calculate the area of the triangle formed by the x -axis,
the y -axis and the line $3x - y = 6$.
- (x) If $100 \cos 2A = 81$, use the Tables to find the measure of the angle A .

2. (a) An antique dealer bought three chairs at an auction. He sold them later for IR£301.60, making a profit of 16% on their total cost. Calculate the total cost of the chairs.

The first chair cost IR£72 and it was sold at a profit of 15%.
Calculate its selling price.

The second chair cost IR£98 and it was sold for IR£91.

Find the percentage profit made on the sale of the third chair.

- (b) If $y = \sqrt{x - 4} + 2$, express x in terms of y .

Then, find the value of x when $y = 2 + \sqrt{2}$.

3. Prove that any point on the bisector of an angle is equidistant from the arms of the angle.

Construct a triangle with sides of length 10 cm, 9 cm and 7 cm.

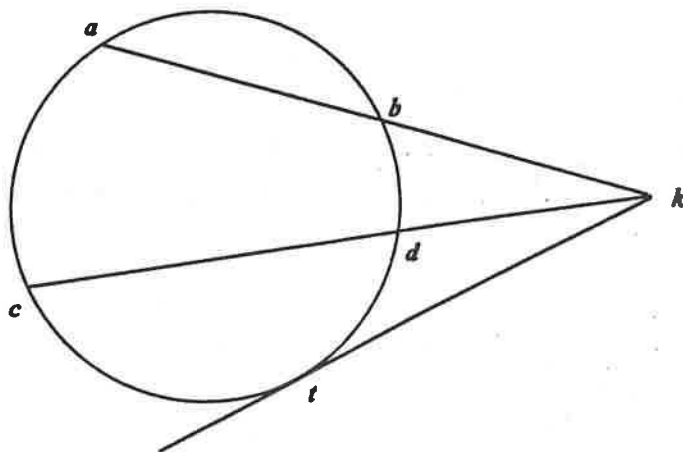
Construct the incircle of the triangle. Show all your construction lines clearly.

If r cm is the length of the radius of the circle, prove that the area of the triangle is $13r$ cm².

4. (i) a, b, c, d are points of the circle in the diagram. The lines ab and cd intersect at k , as shown.

Prove that

$$|ak| \cdot |kb| = |ck| \cdot |kd|.$$

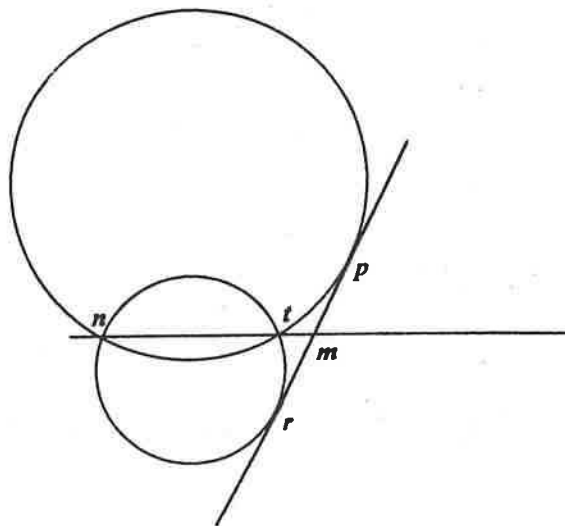


- (ii) From the point k a tangent is drawn to touch the circle at t . Deduce that

$$|ka| \cdot |kb| = |kt|^2.$$

- (iii) Two circles intersect at n and t . The line pr is a tangent to the circles at p and at r .

Prove that m is the midpoint of $[pr]$.



5. $a(-4, 0)$ and $b(2, 8)$ are two points and o is the origin.

(i) Find the slope of ab .

(ii) Find the co-ordinates of d , the midpoint of $[ab]$.

(iii) Calculate $|od|$ and show that o is twice as far from b as it is from d .

(iv) Find the equation of the line P which passes through d and which is perpendicular to ab .

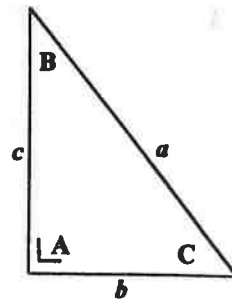
(v) If $4y + 3x = k$ is the image of the line P under the translation $(0,0) \rightarrow (6, -6)$, find the value of k .

6. (a) In the diagram, $b = 3$, $c = 4$ and $A = 90^\circ$.

Calculate l , the sum of the lengths of the three sides of the triangle. 41

Hence, find the value of k if

$$k \tan B = l.$$



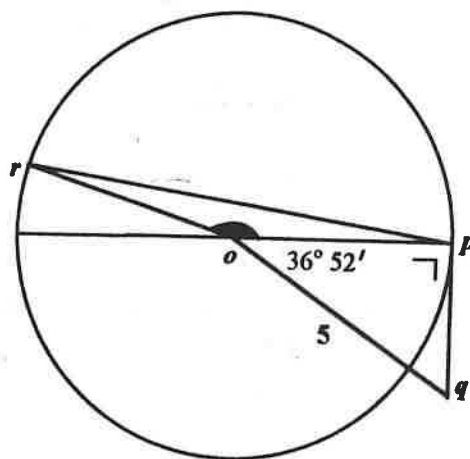
- (b) A circle with centre o contains the point p .

$\angle poq = 36^\circ 52'$, $\angle opq = 90^\circ$
and $oq = 5$.

Calculate op , the length of the radius of the circle. 6

r is another point on the circle and $\angle rop$ is obtuse, as shown.

If the area of triangle rop is 2.8 square units, find $\angle rop$. 10



- (c) x , y and z are three points on level ground.

From x the direction of y is North 45° East.

From x the direction of z is North 22.5° West.

z is due West of y .

$xy = 5$ m.

Copy the diagram into your answerbook and mark in z .

Calculate xz , correct to the nearest metre.

