

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

JUNIOR CERTIFICATE EXAMINATION, 2001

MATHEMATICS - HIGHER LEVEL

MONDAY, 11 JUNE - MORNING, 9.30 to 12.00

PAPER 2 (300 marks)

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

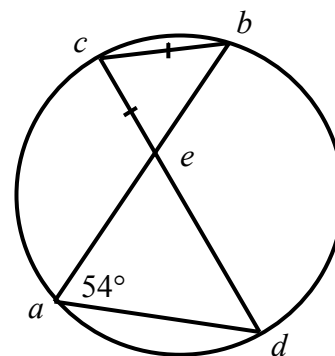
Marks may be lost if necessary work is not clearly shown.
Mathematics Tables may be obtained from the Superintendent.

1. (i) A sum of money is divided in the ratio 5 : 6. The smaller amount is IR€25. What is the total amount of money?
- (ii) A sum of money, invested at 6% per annum interest, amounted to IR€1590 after one year. What sum of money was invested?
- (iii) Three tennis balls, each of radius 3.5 cm, fit exactly into a cylindrical tube. Find, in terms of π , the volume of the tube.

- (iv) In the circle, the chords $[ab]$ and $[cd]$ intersect at the point e .

$$|\angle bad| = 54^\circ \text{ and } |cb| = |ce|.$$

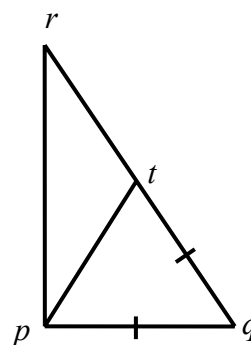
Find $|\angle cbe|$.



- (v) The triangle pqr has a right angle at p . The point t is on $[qr]$ such that $|qt| = |qp|$.

$$|qr| = 17 \text{ and } |pr| = 15.$$

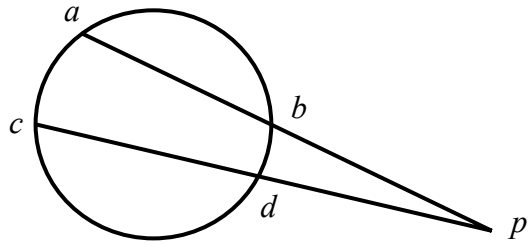
Find $|pq|$ and hence find $|tr|$.



- (vi) Two chords, $[ab]$ and $[cd]$, of a circle intersect externally at p .

$$|ab| = 7, |bp| = 9 \text{ and } |cp| = 18.$$

Find $|cd|$.



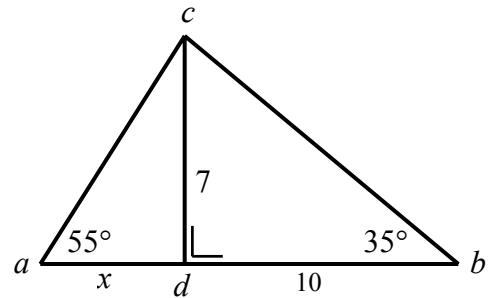
- (vii) In the diagram, $cd \perp ab$.

$$|\angle cbd| = 35^\circ \text{ and } |\angle cad| = 55^\circ.$$

$$|cd| = 7, |db| = 10 \text{ and } |ad| = x.$$

Show that the triangles cad and cdb are equiangular.

Hence, find x .



- (viii) Find the area of the triangle with vertices $(-3, 2)$, $(-1, -2)$ and $(3, 0)$.

- (ix) $(7, 3)$ is the mid-point of the line segment joining $(3, a)$ and $(b, 8)$. Find a and b .

- (x) $\sin A = 0.54$ and $0^\circ \leq A \leq 90^\circ$. Use the Tables to find the value of $\cos 2A$.

2. (a) A person earns a gross income of IR£494 and has tax-free allowances of IR£144. Tax is paid at 44% of taxable income.

- (i) Calculate the person's income after tax is paid.

The tax-free allowances are increased by IR£20 and the rate of tax is reduced to 42%.

- (ii) Calculate the increase in the person's income after tax is paid.

A second person with the same tax-free allowances and tax rate as in (ii) pays IR£105 in tax.

- (iii) Calculate the second person's gross income.

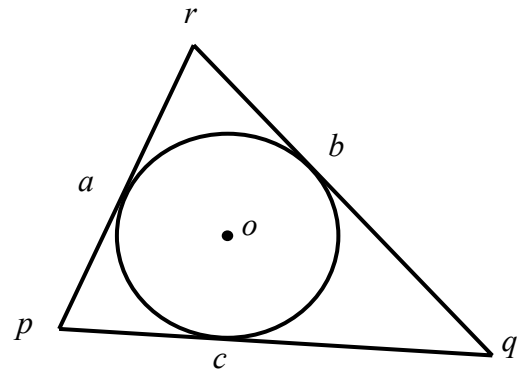
- (b) $a = u + v$ and $b = u - v$.

- (i) Express $a^2 - b^2$ in terms of u and v .

- (ii) Hence, or otherwise, evaluate uv when $a = 29$ and $b = 21$.

3. (a) Prove that any point on the bisector of an angle is equidistant from the arms of the angle.
- (b) The circle, centre o , is inscribed in the triangle pqr .

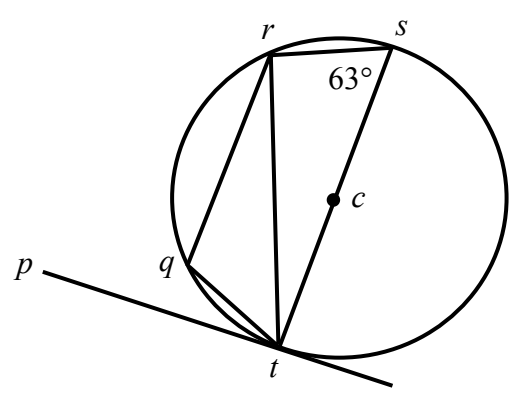
The circle touches the sides of the triangle at the points a, b and c .



- (i) Use the triangles poa and poc to prove that $|pa| = |pc|$.
- (ii) Hence, show that $|pq| - |pr| = |qb| - |rb|$.

4. (a) Prove that a line is a tangent to a circle at a point t on the circle if it is perpendicular to the diameter through t .

- (b) pt is a tangent to a circle of centre c .
 $[ts]$ is a diameter of the circle.
 r is a point on the circle such that $|\angle tsr| = 63^\circ$.



- (i) Find $|\angle ptr|$.
- q is a point on the circle such that $qr \parallel ts$.
- (ii) Find $|\angle trq|$.

5. The equation of the line L is $3x - 2y + 6 = 0$.
- Find the slope of L .
 - The point $(h, -3)$ is on the line L .
Find the value of h .
 - The line K passes through $(h, -3)$ and is perpendicular to L .
Find the equation of K .
 - K contains the point $(-1, -5)$.
Find the image of this point under S_L , the axial symmetry in L .
 - L and K cut the y -axis at the points p and q , respectively.
Calculate $|pq|$.

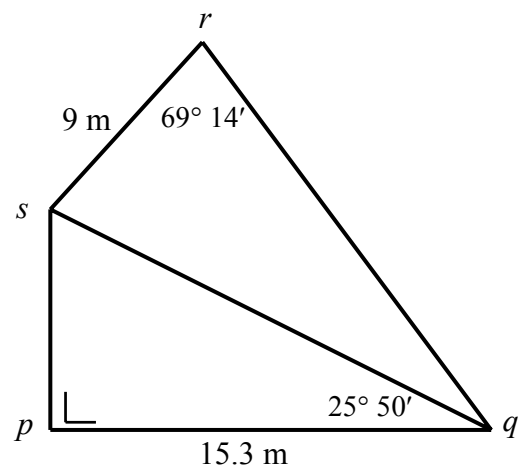
6. (a) Construct an angle A such that $\cos A = \frac{3}{5}$.

- (b) A garden $pqrs$ is in the shape of a quadrilateral.
 $|pq| = 15.3$ m, $|\angle pqs| = 25^\circ 50'$ and $|\angle qps| = 90^\circ$.

- (i) Find $|sq|$, correct to the nearest metre.

$|sr| = 9$ m and $|\angle qrs| = 69^\circ 14'$.

- (ii) Find $|\angle sqr|$, correct to the nearest degree.



- (c) abc is an isosceles triangle with $|ab| = |bc|$.
 $|\angle bac| = 65^\circ$.

- (i) Calculate $|\angle abc|$.

The area of the triangle is 38.3 cm².

- (ii) Find $|ab|$.

