

AN ROINN OIDEACHAIS
 INTERMEDIATE CERTIFICATE EXAMINATION, 1983

M.43(a)

MATHEMATICS - HIGHER COURSE - PAPER I (300 marks)

062953

FRIDAY, 10 JUNE - MORNING, 9.30 to 12.00

SECTION A (100 marks)

Examination Number

Attempt all questions. You should not spend more than 50 minutes on this section. Answer each question by writing one of (a), (b), (c), (d) in the box under each question number. If you wish to change an answer, cross out your first choice and write your new answer near the box. Mathematics tables may be obtained from the Superintendent.

THIS PAPER MUST BE ENCLOSED IN YOUR ANSWER BOOK

1. $\frac{250}{0.005} =$

- (a) 5×10^4 (b) 5×10^3 (c) 5×10^2 (d) 5×10

2. 7% of IR£10.36 in IR£ is

- (a) 0.7252 (b) 7.252 (c) 1.48 (d) 0.148

3. A speed of 1200 m per minute expressed in km per hour is

- (a) 0.02 (b) 0.2 (c) 7.2 (d) 72

4. The interest on IR£x for one year at y% per annum is

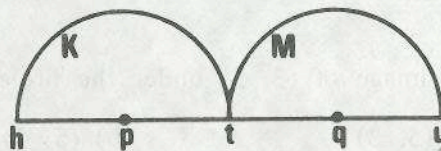
- (a) IR£ $\frac{100}{xy}$ (b) IR£ $\frac{xy}{100}$ (c) IR£ $\frac{x}{100y}$ (d) IR£ $\frac{y}{100x}$

5. The length of a rectangle is twice its width and its area is 32 cm². Its length in cm is

- (a) 2 (b) 4 (c) 8 (d) 16

6. K and M are two semi-circles of equal radii and having p and q as centres. M is the image of K under

- (a) S_t (b) \vec{hu}
 (c) $S_t \circ S_p$ (d) $S_q \circ S_p$

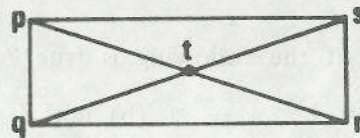


7. $(x, y) \uparrow (v, w)$ and $(v, w) \uparrow (h, k)$ and no two couples are collinear. Then

- (a) $(x, v) \uparrow (y, h)$ (b) $(x, y) \uparrow (k, h)$
 (c) $(k, h) \uparrow (y, x)$ (d) $(y, w) \uparrow (w, k)$

8. Which one of the following does not map the rectangle pqrs onto itself?

- (a) S_t (b) $S_t \circ S_t$
 (c) S_{pr} (d) $S_{pr} \circ S_{pr}$

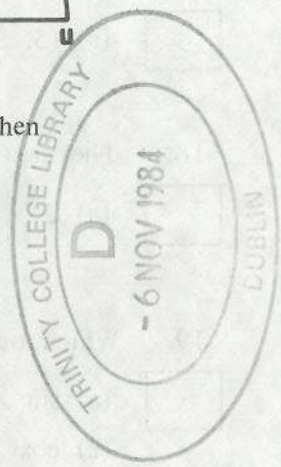


9. The composition of two axial symmetries in two parallel axes is

- (a) a rotation (b) a central symmetry
 (c) an axial symmetry (d) a translation

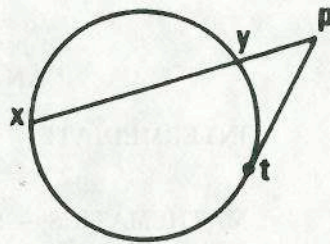
10. S_p is the central symmetry of the plane in the point p. Which one of the following is false?

- (a) $S_p \circ S_p = S_p$ (b) $S_p \circ S_p = I_{\Pi}$
 (c) $S_p^{-1} = S_p$ (d) $S_p \circ S_p^{-1} = I_{\Pi}$



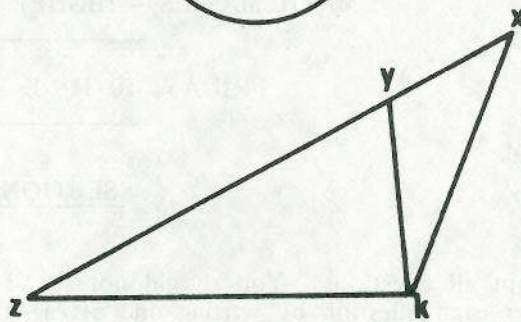
11. $|py| = 4$ and $|yx| = 12$. The length of the tangent, $|pt|$, to the circle is

- (a) 4 (b) $4\sqrt{3}$
(c) $8\sqrt{3}$ (d) 8



12. $|zy| : |yx| = 3 : 1$
and area of Δxzk is 100.
The area of Δxyk is

- (a) 25 (b) $\frac{100}{3}$
(c) 75 (d) $\frac{100}{8}$

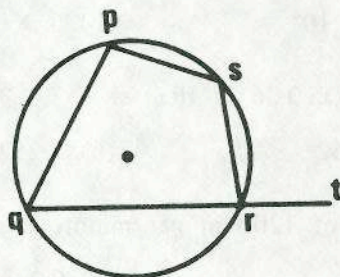


13. The bisectors of the three angles of any triangle meet at p . Then

- (a) p is equidistant from the three vertices
(b) p is equidistant from the three sides.
(c) p is equidistant from the midpoints of the three sides
(d) The perpendiculars from p to the sides bisect the sides.

14. Which one of the following is true ?

- (a) $|\angle qps| = |\angle srt|$
(b) $|\angle pqr| = |\angle psr|$
(c) $|\angle spq| + |\angle pqr| = |\angle srt|$
(d) $|\angle spq| + |\angle srt| = 180^\circ$.



15. The slope of the line $px = 5y + 6$ is $\frac{3}{5}$. The value of p is

- (a) 3 (b) -3 (c) $\frac{25}{3}$ (d) $-\frac{25}{3}$

16. The image of the line $x + 2y = 1$ under a central symmetry could be

- (a) $x + y = 1$ (b) $2x + y = 0$
(c) $2x - y = 0$ (d) $x + 2y = 0$

17. The image of $(3, 5)$ under the projection parallel to the y -axis on the line $x = y$ is

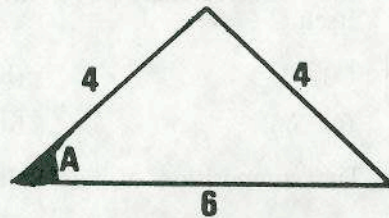
- (a) $(5, 3)$ (b) $(5, 5)$ (c) $(3, 3)$ (d) $(3, -5)$

18. The area of the triangle formed by the two axes and the line $x + y = 4$ is

- (a) 2 (b) 4 (c) 6 (d) 8

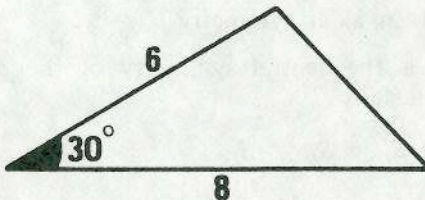
19. Which one of the following is true ?

- (a) $\sin A = 1$ (b) $\tan A = 1$
(c) $\cos A = \frac{2}{3}$ (d) no one of these answers is correct.



20. The area of the triangle is

- (a) 12 (b) $12\sqrt{3}$
(c) 24 (d) 48



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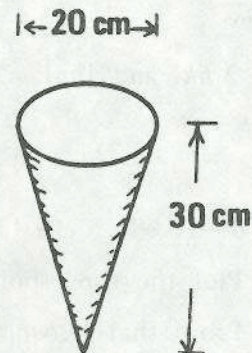
SECTION B (200 marks)

Attempt QUESTION 1 and THREE other questions (50 marks each)

Marks may be lost if all your work is not clearly shown

1. (a) The selling price of a car is IR£6500 which includes 25% VAT. Before being sold the 25% VAT was removed and replaced by 15% VAT.
Find:
- (i) the new selling price of the car
 - (ii) the cost to the customer if the salesman allowed a 10% discount on this new selling price.

- (b) A vessel is in the shape of a cone, as in diagram.
Milk from 44 cartons is to be transferred into vessels of this type.
If each carton contains $\frac{1}{2}$ litre of milk, calculate the number of vessels needed.
(Note: 1 litre = 1000 cm³.
Take $\pi = \frac{22}{7}$)

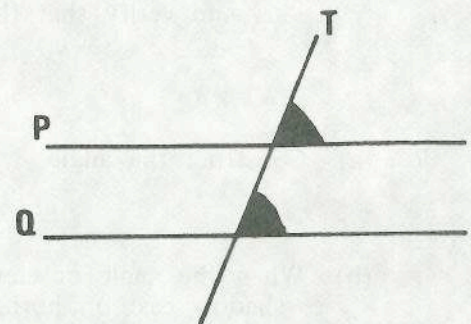


2. Prove that a translation maps a line onto a parallel line.

T is a line which cuts two parallel lines P, Q as in diagram. Prove that the marked angles are equal in measure.

Show with proof how to construct the bisector of a given angle.

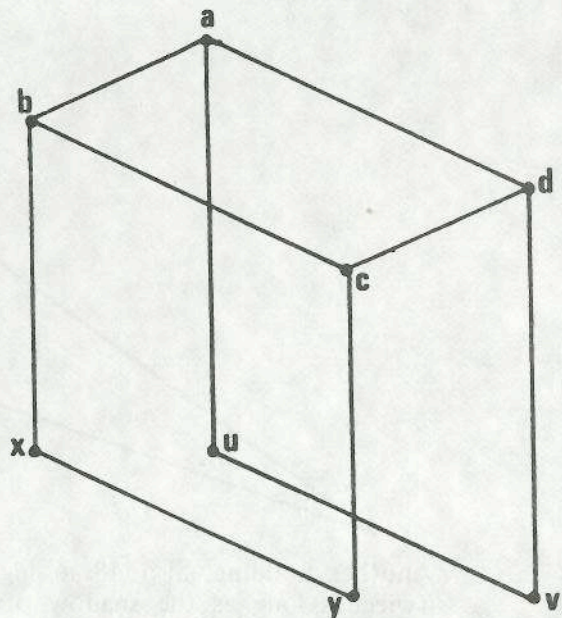
Prove that any point on this bisector is equidistant from the arms of the angle.



3. The diagram shows three parallelograms $abcd, bxyz, auvd$.
Taking the couples $(u, v), (a, d), (b, c)$
explain what is meant by:
"equipollence is a transitive relation"

Assume that $bx \parallel au$. Draw a line through x and u which cuts cy and dv at p and q , respectively.

Prove $(x, u) \uparrow (p, q)$.



4. (a) Prove that the angle in a semi-circle is a right-angle.
Hence inscribe the quadrilateral $xyzt$ in a circle given that
 $|\angle xyt| = 55^\circ$ $|\angle zxt| = 35^\circ$ $|\angle ytz| = 25^\circ$

- (b) In the Δpqr , the midpoint of the base $[qr]$ is m .
Prove

$$\text{area of } \Delta pqm = \text{area of } \Delta prm.$$

x is a point in the triangle such that
area of $\Delta xpq = \text{area of } \Delta xpr$.

Find the locus of x and prove your answer.

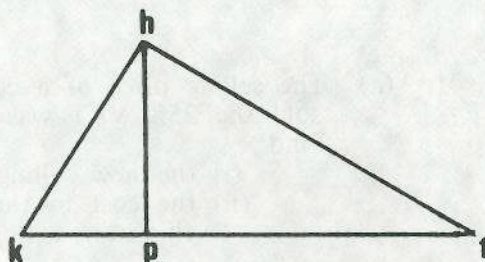
5. Prove that if two triangles are equiangular then the lengths of their corresponding sides are proportional.

In the Δhkt , $|\angle kht| = 90^\circ$ and $hp \perp kt$.

Prove that the two triangles hkp and hkt are equiangular and write down two ratios equal to

$$\frac{|ph|}{|pk|}$$

If $|ht| = 2|hk|$ and $|hp| = 4$, find the value of $|hk|$.



6. $a(0, 4)$, $b(-1, -1)$, $c(5, 3)$ are the vertices of a Δabc .

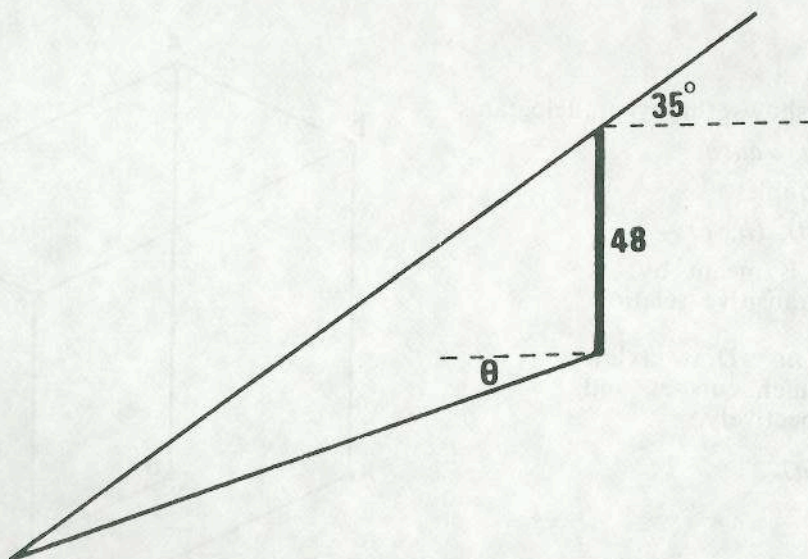
- (i) Plot the three points.
- (ii) Prove that $|\angle bac| = 90^\circ$.
- (iii) m is the midpoint of $[bc]$. Prove that $|ma| = |mb|$.
- (iv) Find the equation of the line through the origin which is parallel to ac and verify that this line meets the circumcircle of the Δabc at $(5, -1)$.

7. (a) Construct the angle A such that

$$5 \sin A = 4.$$

- (b) When the angle of elevation of the sun is 35° , calculate the length of the shadow cast on horizontal ground by a church 48 m high.

- (c)



Another building, also 48 m high, is built on sloping ground and its shadow is twice as long as the shadow of the church - both shadows being measured at the same time.

Calculate θ , the angle of depression of the ground to the horizontal.