M.42

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INTERMEDIATE CERTIFICATE EXAMINATION, 1990

MATHEMATICS – SYLLABUS A – PAPER 2 (300 marks)

FRIDAY, 8 JUNE – MORNING, 9.30 to 12.00

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

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

Mathematical tables may be obtained from the superintendent.

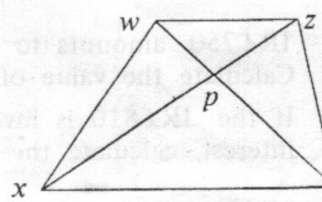
1. (i) 135% of a number is 92·07. What is 100% of the number ?

(ii) Find x if

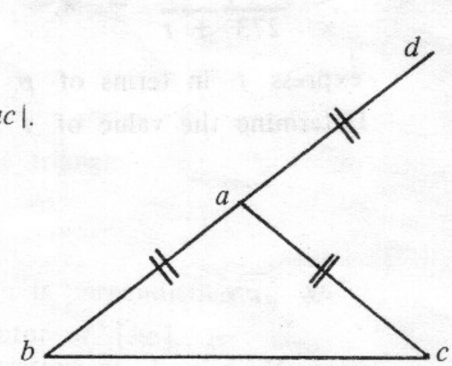
$$\frac{560}{0{\cdot}008} = 7 \times 10^{x}$$

(iii) The perimeter of a rectangle is 200 m.
If length : breadth = 7 : 3,
find the area of the rectangle.

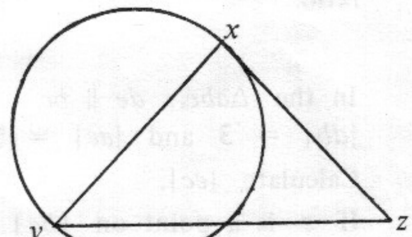
(iv) In the quadrilateral $wxyz$, $wz \parallel xy$.
Prove that the
area of Δpwx = area of Δpyz.



(v) abc is an isosceles triangle with $|ab| = |ac|$.
$[ba]$ is produced to d, so that
$|ad| = |ab|$.
By joining d to c, prove that
$|\angle bcd| = 90°$



(vi) A diameter of a circle is one of the equal sides of the isosceles Δxyz where $|xy| = |xz|$.
Prove that the circle bisects $[yz]$.



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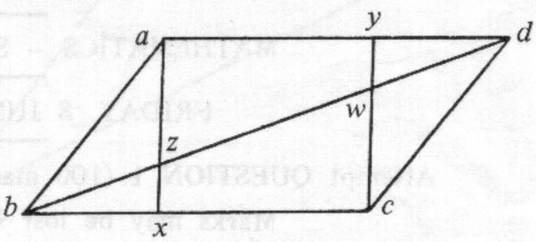
1. (vii) $abcd$ is a parallelogram and $ax \parallel yc$.
Prove that Δabz and Δcdw are congruent.



(viii) Under the axial symmetry in a line M, the point (1, 10) maps on to (−5, −2).
Find the slope of the line M.

(ix) Find the image of $a(3, 2)$ under $\overrightarrow{ka} \circ S_k$, where k is the origin.

(x) If $0 \leqslant A \leqslant 360°$, find the values of A for which $\cos A = 0$.

2. (a) IR£750 amounts to IR£810 after one year at $x\%$ per annum interest.
Calculate the value of x.
If the IR£810 is invested for a further year at $(2x)\%$ per annum interest, calculate the total it amounts to at the end of that year.

(b) If

$$\frac{pv}{273 + t} = k,$$

express t in terms of p, v and k.
Determine the value of t when $p = 233$, $v = 43$ and $k = 21{\cdot}5$.

$\frac{15}{20} = \frac{x}{3}$

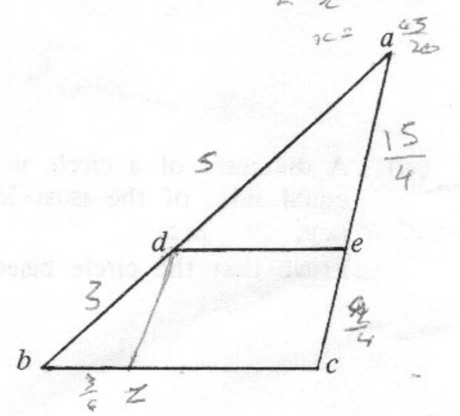
$20x = 45$

$x = \frac{45}{20}$ $\frac{9}{4}$

3. Prove that a line drawn parallel to one side of a triangle divides the other two sides in the same ratio.

In the Δabc, $de \parallel bc$, $|ab| = 8$, $|db| = 3$ and $|ae| = 3\frac{3}{4}$.
Calculate $|ec|$.
If z is a point on $[bc]$ such that $dz \parallel ac$, calculate the ratio

$$\frac{\text{area of } \Delta dbz}{\text{area of } \Delta abc}$$



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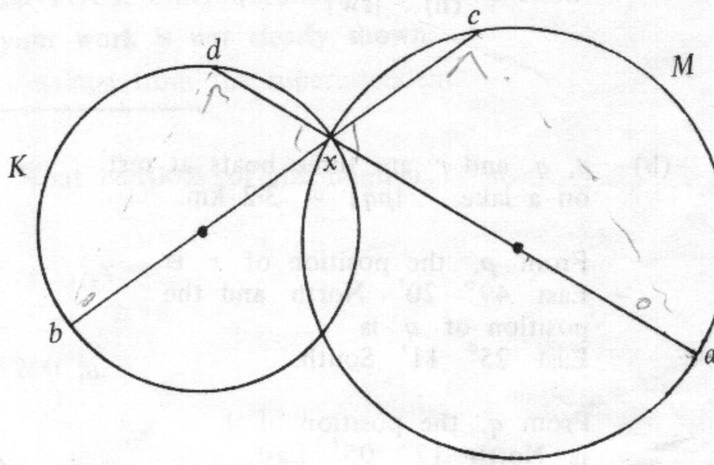
$\frac{\frac{1}{2}\times 1 \times 1}{\frac{1}{2}\times\frac{3}{8}\times\frac{3}{8}}$ $\frac{3}{8}$ $\frac{9}{64}$

4. Prove that the measure of the angle at the centre of a circle is twice the measure of an angle at the circle standing on the same arc.
Deduce that the angle in a semi-circle is a right angle.

Through x, a point of intersection of circles K and M, $[bc]$ and $[da]$ are drawn. $[bc]$ passes through the centre of K and $[da]$ passes through the centre of M.

Prove that a circle can be drawn through the points d, b, a and c.



$|Bx|^2 = |bd|^2 + |dx|^2$

$|ax|^2 = |cx|^2 + |CA|^2$

5. $a(2, 5)$, $b(4, 2)$ and $c(7, 4)$ are the vertices of a triangle.

Verify that $ab \perp bc$.

Find k, the mid-point of $[ab]$.

Find the equation of the line M through k which is perpendicular to ab.

The equation of the line L, the perpendicular bisector of $[bc]$, is $4y = -6x + 45$. Find t, the point of intersection of L and M.

Verify that $t \in ac$.

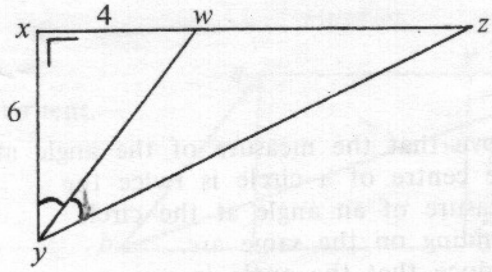
6. (a) In the right-angled triangle xyz, yw bisects $\angle xyz$.

$|xw| = 4$ and $|xy| = 6$.

Calculate

(i) $|\angle xyw|$

(ii) $|zw|$



(b) p, q and r are three boats at rest on a lake. $|pq| = 3{\cdot}2$ km.

From p, the position of r is East $49^\circ\ 20'$ North and the position of q is East $25^\circ\ 11'$ South.

From q, the position of r is North $17^\circ\ 05'$ East.

Calculate $|pr|$.