INTERMEDIATE CERTIFICATE EXAMINATION, 1982

MATHEMATICS - HIGHER COURSE - PAPER I (300 marks)

SECTION A (100 marks)

1. $(0{\cdot}01)^2 \times 1000$ is

(a) 0·1 (b) 1 (c) 10 (d) 100

2. IR£50 was invested for 2 years at 10% per annum compound interest. The interest for the second year in IR£ was

(a) 5 (b) 10·50 (c) 5·50 (d) 60·50

3. If 60% of a certain number is $\frac{x}{2}$, then 40% of the same number is

(a) $\frac{2x}{5}$ (b) $\frac{3x}{4}$ (c) $\frac{3x}{25}$ (d) $\frac{x}{3}$

4. Each edge of a cube measures 8 cm. The number of cubes of edge 2 cm that can be made from this cube is

(a) 8 (b) 16 (c) 32 (d) 64

5. 700 cm^3 in litres is

(a) 7·0 (b) 0·7 (c) 0·007 (d) 700

6. p is the centre of a couple (q, k) if

(a) $\frac{1}{2}|qk| = p$ (b) $(q, p) \uparrow (k, p)$

(c) $(q, p) \uparrow (p, k)$ (d) $|qp| = 2|qk|$

7. S_A is the axial symmetry in the line A. Which one of the following is false ?

(a) $S_A \circ S_A = S_A$ (b) $S_A \circ S_A = I_\Pi$

(c) $S_A^{-1} = S_A$ (d) $S_A \circ S_A^{-1} = I_\Pi$

8. The composition of two axial symmetries cannot be

(a) a central symmetry (b) a translation

(c) an axial symmetry (d) I_{Π}

9. S_p and S_q are central symmetries in the points p and q. Then $S_p \circ S_q$ is

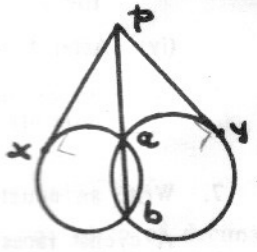
(a) $\overrightarrow{pq}$ (b) $\overrightarrow{qp}$ (c) $2\overrightarrow{pq}$ (d) $2\overrightarrow{qp}$

10. Which one of the following relations is not transitive ?

(a) $\{(h, k), (h, h)\}$ (b) $\{(h, k), (k, k)\}$

(c) $\{(h, k), (k, h)\}$ (d) $\{(h, h), (h, k), (k, k), (k, h)\}$

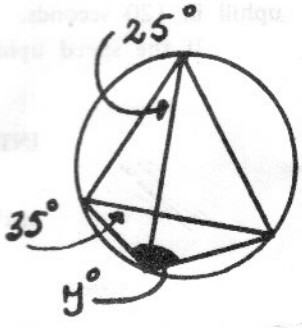
11. px and py are tangents. Which one of the following is false ?



(a) $|px| = |py|$ (b) $|pa| \cdot |pb| = |px|^2$

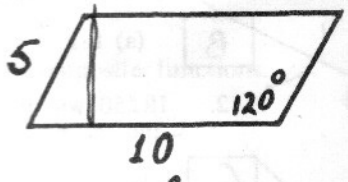
(c) $|pa| \cdot |pb| = |py|^2$ (d) $|pa| \cdot |pb| = |pb|^2$

12. The value of y is



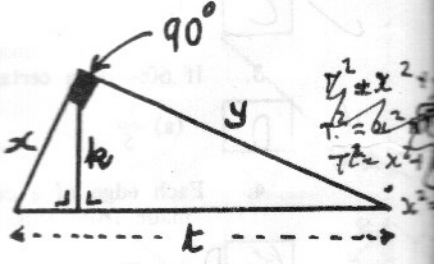
(a) 180 (b) 150 (c) 120 (d) 90

13. The area of the parallelogram is



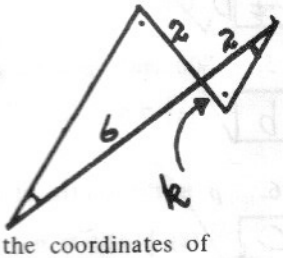
(a) 50 (b) $25\sqrt{3}$ (c) $\frac{100}{\sqrt{3}}$ (d) 25

14. Use the area of a triangle to show x equal to one of the following



(a) $\frac{ky}{t}$ (b) $\frac{kt}{y}$ (c) $\frac{yt}{k}$ (d) $\frac{yk}{t}$

15. The two triangles are similar. The value of k is



(a) 6 (b) 3 (c) $\frac{3}{2}$ (d) $\frac{2}{3}$

16. $[pq]$ is the diameter of a circle of centre (2, 1). If (−1, 2) are the coordinates of p, the coordinates of q are

(a) (5, 0) (b) (3, 0) (c) (5, 3) (d) (3, 3)

17. The image of (3, 4) under the translation defined by $(1, -1) \longrightarrow (-2, 0)$ is

(a) (0, 5) (b) (2, 5) (c) (2, 3) (d) (4, 3)

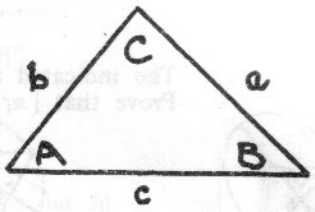
18. The slope of a line perpendicular to the line containing (0, 3) and (−2, 0) is

(a) $-\frac{2}{3}$ (b) $\frac{2}{3}$ (c) $\frac{3}{2}$ (d) $-\frac{3}{2}$

19. Using the usual notation, which one of the following is true ?

(a) $a \sin A = b \sin B$ (b) $a \sin B = b \sin A$

(c) $\sin A \sin B = ab$ (d) $ab \sin A = \sin B$



20. $\sin 60°$ is

C (a) not a real number (b) an irrational number

(c) a rational number (d) no one of these

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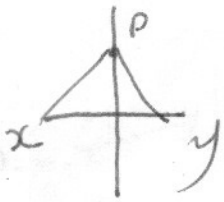
MATHEMATICS - HIGHER COURSE - PAPER I (300 marks)

SECTION B (200 marks)

1. (a) A car was bought for IR£6250. At the end of each year it loses 20% of the value it had at the beginning of that year. Calculate the total loss in the value of the car at the end of three years.

(b) A drinking straw is used to transfer milk from a carton to a cup. The straw, in the shape of a cylinder, is 10 cm long and has a diameter of 0·4 cm. The carton contains 0·1 litre of milk.
Taking $\pi = 3{\cdot}14$, calculate the least number of times the straw has to move between carton and cup if all the milk is transferred.

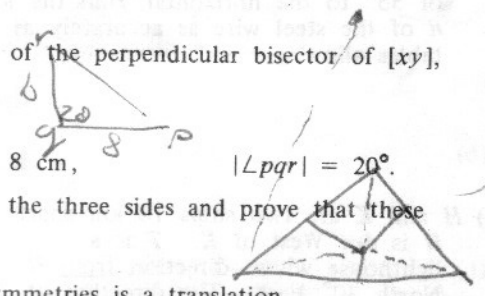


2. (a) $[xy]$ is a line segment. If p is a point of the perpendicular bisector of $[xy]$, prove that $|px| = |py|$.

(b) Construct the Δpqr given that

$|qr| = 6$ cm, $|qp| = 8$ cm, $|\angle pqr| = 20°$.

Construct the perpendicular bisectors of the three sides and prove that these bisectors meet at one point.



3. Prove that the composition of two central symmetries is a translation.

pqr is any triangle. Name the translation that is equal to

$S_p \circ S_q$

Find the point t such that

$S_t \circ S_r$

is this same translation and using $S_p \circ S_q = S_t \circ S_r$ show that

$S_p \circ S_q \circ S_r = S_t$.

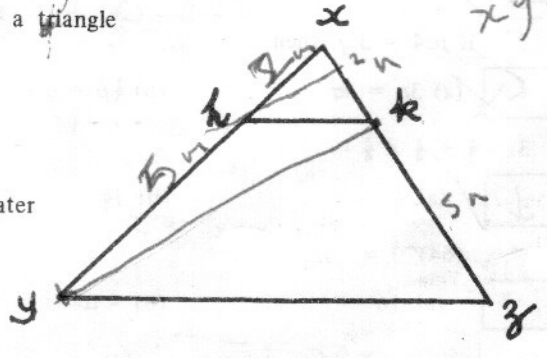
Deduce that

$S_p \circ S_q \circ S_r = S_r \circ S_q \circ S_p$.

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

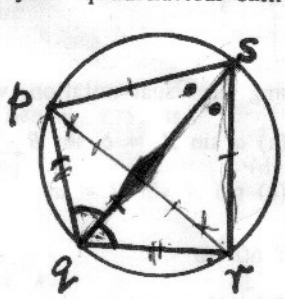
xyz is a triangle of area 14.
h is a point of $[xy]$ such that
$|xh| : |hy| = 2:5$
and $hk \parallel yz$.

Find how many times is the area of Δkyz greater than the area of Δkhy.

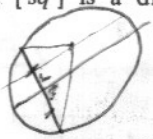


5. Prove that the angle at the centre of a circle is twice the angle at the circle standing on the same arc.

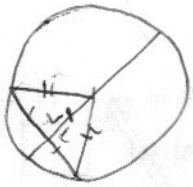
Deduce that the measures of the opposite angles in a cyclic quadrilateral sum to 180°.



The indicated angles in the diagram are equal.
Prove that $[sq]$ is a diameter of the circle.



6. p and q are two points having coordinates $(-1, 3)$ and $(3, 6)$, respectively.



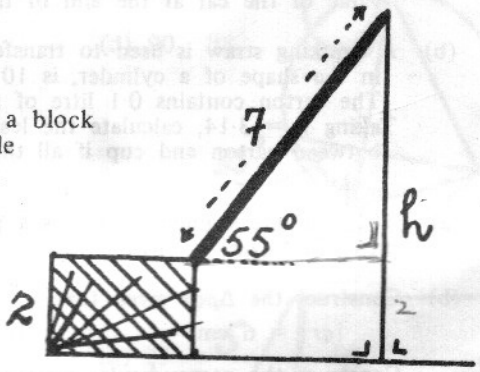
(i) Find the slope of pq
(ii) Find the equation of pq in the form $y = mx + c$
(iii) The line pq cuts the y-axis at k. Find the coordinates of k.
(iv) Find the areas of the two triangles opk and oqk, where o is the origin.
(v) Verify that area of Δopk : area of $\Delta oqk = |pk| : |kq|$.

7. (a) Construct an angle A such that

$$\tan A = 1\tfrac{1}{4}$$

(Use of tables not allowed).

(b) A crane is 7 m long and is supported on a block 2 m high. When the crane is at an angle of 55° to the horizontal, find the length h of the steel wire as accurately as the tables allow.



(c) H and K are two ships 10 km apart and H is due West of K. T is a lighthouse whose direction <u>from</u> H is North 30° East. The direction of T <u>from</u> K is North 50° West. Find to the nearest km the distance of T from each ship.