


Prof. A. R. RAO GEOMETRY CONTEST

(Organised by "GUJARAT GANIT MANDAL" as a part of
"Pro. A. R. RAO SHATABDI VANDANA" year)

Date : 10-8-2008 Time : 11-00 am to 1-30 pm

- This question paper contains (3) Pages. Total Questions (6)
- It is not necessary to use ruler and compass to draw exact figure. To save time, rough sketches will do.

Q.1A) Each question contains two statements. Rewrite the full statements and mark (T) and (F) in brackets against the true and false statement respectively. One mark will be awarded if and only if both the statement (a) and (b) corresponding to the question have been correctly marked (T) or (F). Otherwise zero mark will be awarded. [10]

- (1) l, m, n are three lines in space $\left\{ \begin{array}{l} \text{(a) } l \parallel m, l \parallel n \therefore m \parallel n \dots\dots\dots \\ \text{(b) } l \perp m, l \perp n \therefore m \parallel n \dots\dots\dots \end{array} \right.$
- (2) l, m, n are coplanar lines $\left\{ \begin{array}{l} \text{(a) } l \parallel m, l \parallel n \therefore m \parallel n \dots\dots\dots \\ \text{(b) } l \perp m, l \perp n \therefore m \parallel n \dots\dots\dots \end{array} \right.$
- (3) (a) Diagonals of a rectangle and a square are congruent
(b) If diagonals of a quadrilateral are congruent then it is either a rectangle or a square...
- (4) (a) Diagonals of a rhombus or a square are perpendicular to each other
(b) If the diagonals of a quadrilateral are perpendicular then it is either a rhombus or a square..
- (5) (a) Correct value of π is $\frac{22}{7}$
(b) Correct value of π is 3.14
- (6) (a) If $\alpha + \beta = 180$, then α, β form a linear pair
(b) If $\alpha + \beta = 180$, then α, β are supplementary angles
- (7) P is inside $\angle ABC \therefore$
(a) P, A are on the same side of line BC
(b) P, B are on the same side of line CA

- (8) (a) If the points P, Q, R are on different lines then they are non-collinear
(b) If lines l and m are in different planes then the lines are skew lines
- (9) Two circles with centres A and B intersect in M and N ($M \neq N$)
(a) \overleftrightarrow{AB} bisects \overline{MN} (b) $\overleftrightarrow{AB} \perp \overline{MN}$
- (10) (a) If all the sides of a triangle are congruent then angles are also congruent.
(b) If all the sides of a quadrilateral are congruent then all the angles are also congruent.

Q.1B) Select proper choice and rewrite the statement after filling the gaps. [05]

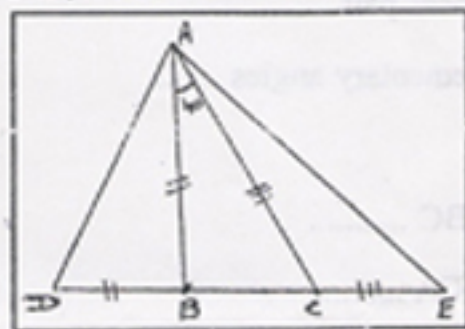
- (1) Intersection of $\angle A$ and $\angle B$ of $\triangle ABC$ is
 (a) Side AB (b) Side BC (c) Side CA (d) None of a, b, c
- (2) Intersection of two planes is
 (a) a line (b) line or a plane
 (c) line or empty set (d) line or plane or empty set
- (3) Set of points at a constant distance ($\neq 0$) from a given line is
 (a) A Circle (b) A line (c) Two lines (d) None of these
- (4) The diagonals of a quadrilateral are congruent \therefore The quadrilateral is
 (a) Trapezium (b) Isosceles Trapezium
 (c) Parallelogram (d) Rhombus
- (5) is not a cyclic quadrilateral.
 (a) Trapezium (b) Isosceles trapezium (c) Rectangle (d) Square

Q.2) Answer the following (It is not necessary to show method) [10]

- (1) -8 and x are the corresponding numbers to points P and Q on a number line. Write the least and maximum values of x , if $PQ \leq 10$.
- (2) P, Q, R are points, $PQ = 8$, $QR = 6$. Write the least and maximum value of PR.
- (3) State the type of the triangle whose orthocentre, circumcentre and incentre are colinear.
- (4) Find the length of the chord which is at a distance of 1.2 from the centre in a circle of radius 2.
- (5) In $\triangle ABC$ $D \in \overline{BC}$. I_1, I_2 are the incentres of $\triangle ACD$ and $\triangle ABD$. Find $m\angle I_1 D I_2$.

Q.3) Answer the following by calculating in 3 to 4 steps. [20]

- (1) Perimeter of a semi-circular garden is 72 metres. Find its radius (take $\pi = \frac{22}{7}$)
- (2) If the radius of the earth increases by one metre then the length of the equator will increase by how many kilometres? (Take $\pi = 3.14$)
- (3) In $\triangle ABC$, $m\angle A : m\angle B : m\angle C = 1 : 2 : 3$. Smallest side is of length 5. Find the length of the biggest side.
- (4) In $\triangle ABC$, A, P, G are respectively orthocentre, circumcentre, and centroid. $PG = 4$. Find its circum radius.
- (5) In the figure, in $\triangle ABC$ D, E are on line BC. $AB = BD$, $AC = CE$. If $m\angle BAC = 40$. Find $m\angle DAE$.

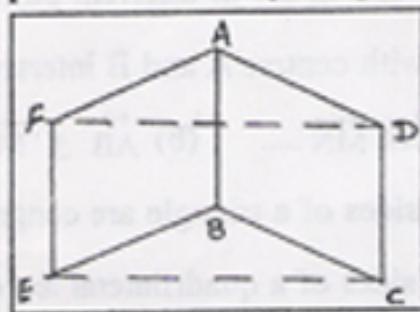


Q.4) Some hints are given for proving the following riders Complete the proof using the hints given. It is not necessary to write 'Data' and 'To prove'. Write only the proof. [15]

(A) Data : ABCD and ABEF are \square^m .

To Prove : ECDF is a \square^m

Proof : Hint : Prove that one pair of sides is parallel and congruent.



Prof. A. R.Rao



Popularly known as Raosaheb, Prof. A.R.Rao will be completing one hundred years of his active and fruitful life on September 23, 2008. One of the leading mathematicians of the country, Raosaheb worked as a Professor of Mathematics, first in Bahauddin College, Junagadh- where he spent more than a quarter of a century- and then in various other colleges of Gujarat. After his retirement from active teaching in 1976, Raosaheb joined the Vikram A. Sarabhai Community Science Centre(VASCSC) at Ahmedabad, as Professor Emeritus, where he continues to offer his services till today. Considered to be the father of nonformal mathematics in Gujarat, Raosaheb has established a Mathematics Laboratory at VASCSC, which is unique of its kind in the whole country. The laboratory is replete with fascinating mathematical models, games and puzzles, which not only help the students to understand mathematics better but which also help kindle interest in masses in the subject, considered dry and dull otherwise. It is this innovative concept of Mathematical Laboratory that won Raosaheb a number of awards for popularizing mathematics from state and national level organizations. While Geometry is his first love, Raosaheb is also interested in Number theory and Combinatorics. His book titled 'Brain Sharpeners' is a treasure of mathematical puzzles which are both challenging and captivating.

The September-October, 2007 issue of Suganitam has been entirely devoted to Raosaheb to celebrate his entering into the Hundredth Year. It will be an enjoyable reading giving glimpses of the life and work of the great mathematician.