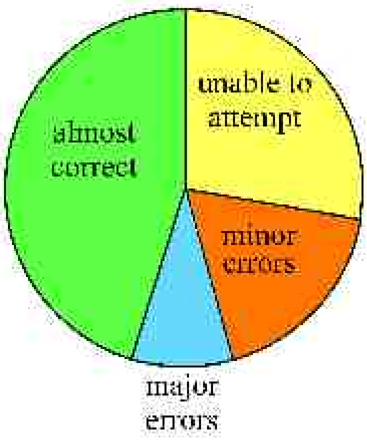
Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	10	18	5	13	5	4	2	43	1.8



Performance Analysis

- Only 45% of the students could give the correct solution of this question.
- Another 9% of the students got 1½ or 2 marks due to some minor mistakes.
- 18% of them got ½ or 1 mark as they made major errors.
- A good number of students (28%) could not attempt the question or gave irrelevent answer and so did not score any mark.

Common Errors Committed by students

- A large number of students had written correctly as

  $a_{4,} + a_{8,} = 24$ and $a_{6,} + a_{10,} = 44$

  used the formulae for the terms also correctly but made computational errors while solving for '*a*' and '*d*'
- A good number of students made mistake in understanding the language of the question, the sum of 4th and 8th term is 24 was written as $s_{4,} + s_{8,} = 24$ and then $s_{6,} + s_{10,} = 44$ so, used wrong formulae.
- A few got $a = -13$ and $d = 5$ correctly, but gave the terms as – 13, – 18, –23 or –13, 8, 3.
- A few students got $a = -13$ and $d = 5$ and left the question, half attempted.

Suggestive Remedial Measures

- Computational errors can only be minimised by giving sufficient practice of solving a system of linear equations.

- Sum of a few terms and the sum of first n terms are two different concepts and has to be made clear by taking different examples.
- Finding $a+d$, $a+2d$, ... etc when a and d are given has to be given practice by taking different positive and negative values of 'a' and 'd'.

19. Solve for x and y :

$$(a - b)\, x + (a + b)\, y = a^2 - 2ab - b^2$$

$$(a + b)\,(x + y) = a^2 + b^2$$

Ans. $(a-b)\,x + (a+b)\,y = a^2 - 2ab - b^2$

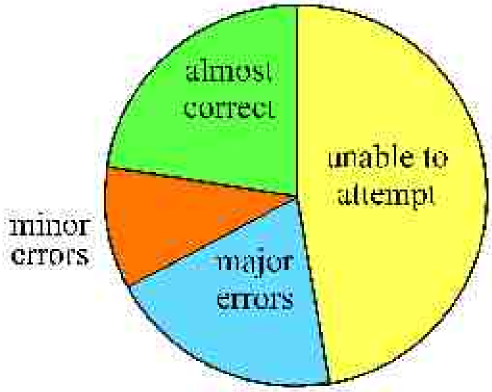
$(a+b)\,x + (a+b)\,y = a^2 + b^2$

Subtracting to get $-2bx = -2ab - 2b^2 \Rightarrow x = (a+b)$ 2 m

Substituting to get $y = -\dfrac{2ab}{a+b}$ 1 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	33	14	10	10	5	5	–	23	1.4



Performance Analysis

- Only 16% of the total students who attempted this question opted for this part and out of them only 23% could score full marks.
- 10% of those attempted, committed minor error white 20% committed major type of errors.
- 14% of these attempted gave irrelevent answer and so got no score.

Common Errors Committed by students

- Only a small number of students opted for this part and a majority of these who opted for this option made errors of the type :

  $(a - b)\ x + (a + b)y = a^2 - 2ab - b^2 \Rightarrow ax - bx + ay + by = a^2 - 2ab - b^2$

  $(a + b)\ (x + y) = a^2 + b^2 \quad \Rightarrow ax + bx + ay + by = a^2 + b^2$

  and could not reach at the answer.

Suggestive Remedial Measures

- Linear equations with cofficients as a, b etc are generally considered difficult by the students so, sufficent practice by elimination method and cross-multiplication method, has be given.

OR

Solve for x and y :

$37x + 43y = 123$

$43x + 37y = 117$

Adding the given two equations to get $80x + 80y = 240$ 1 m

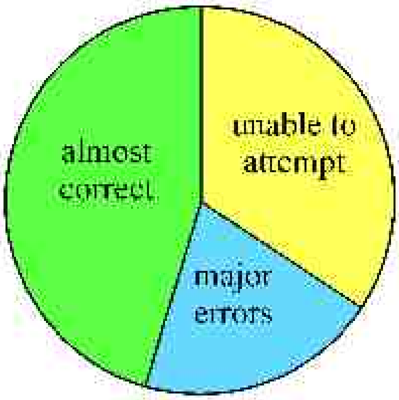
or $x + y = 3$ ...(*i*)

Subtracting to get $-6x + 6y = 6$ or $-x + y = 1$ ...(*ii*) 1 m

Solving (*i*) and (*ii*) to get $x = 1, y = 2.$ 1 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	8	26	3	17	–	–	1	45	1.7



Performance Analysis

- Most of the students opted for this part but 34% of them could not score any mark.
- 20% of those who attempted this part committed major errors and so could not score more than 1 mark.
- 46% of those who attempted this part scored almost full marks.

Common Errors Committed by students

A large number of students tried to solve this part, but the errors committed were as follows:

- Most of the students multiptied first equation by 43 and second equation by 37 and committed computational errors.
- Some tried the cross multiptication method and the again made errors in multiplying numbers like 123 with 43 and 117 with 37 etc.
- Some of those who gave correct answer by elimination method, wasted lot of their time, as comparred to special method.

Remedial Measures

- Questions requiring special techniques, has to be given sufficient practice to use these techniques as general methods if used in these questions will take a lot of time.

20. Prove that:

$$(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$$

Ans. LHS $= \sin^2\theta + \operatorname{cosec}^2\theta + 2 + \cos^2\theta + \sec^2\theta + 2$ 1 m

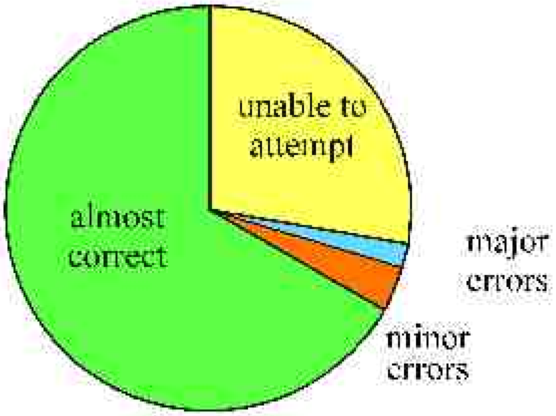
$= 4 + (\sin^2\theta + \cos^2\theta) + (1 + \cot^2\theta) + (1 + \tan^2\theta)$ 1 m

$= 4 + 1 + 2 + \cot^2\theta + \tan^2\theta$

or $= 7 + \tan^2\theta + \cot^2\theta$ 1 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	23	7	–	2	3	1	2	62	2.6



Performance Analysis

- Most of the students opted for this part but 30% of them could not score any mark due to irrelevent answer.
- 64% of those who attempted this part, completed correctly and scored almost full marks.
- Only 6% of those who attempted committed errors.

OR

Prove that:

$$\sin\theta\,(1+\tan\theta)+\cos\theta\,(1+\cot\theta)=\sec\theta+\operatorname{cosec}\theta$$

Ans. LHS $=\sin\theta\,(1+\tan\theta)+\cos\theta\left(1+\frac{1}{\tan\theta}\right)$ ½ m

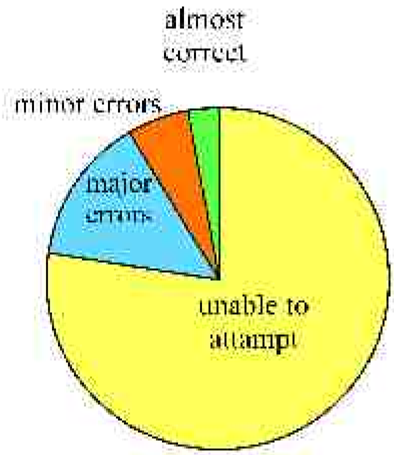
$=(1+\tan\theta)\left(\sin\theta+\cos\theta\cdot\frac{1}{\tan\theta}\right)$ 1 m

$=(1+\tan\theta)\left(\frac{\sin^2\theta+\cos^2\theta}{\sin\theta}\right)=$ 1 m

$=\operatorname{cosec}\theta+\sec\theta$ ½ m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	57	20	–	14	3	3	–	3	0.8



Performance Analysis

- A small number of students opted for this option and out of them 77% could not score any mark because of irrelevent answer.
- 14% committed major errors and so could not score more than 1 mark.
- Only 6% could score upto 2 marks and another 3% could score full marks.

Common Errors Committed by students

- Incorrect use of identity

$$\operatorname{cosec}^2\theta = 1 - \cot^2\theta$$

or $$\sec^2\theta = 1 - \tan^2\theta$$

- Made mistakes to convert one trigonometric ratio to other

$$\text{e.g. } \sec\theta = \frac{1}{\sin\theta}, \quad \operatorname{cosec}\theta = \frac{1}{\cos\theta}$$

Suggestive Remedial Measures

- Sufficient practice is to be given for correct use of identities

  e.g. $\sin^2\theta = 1 - \cos^2\theta$ but $\sec^2\theta \neq 1 - \tan^2\theta$
- Converting one trigonometric ratio to other has also to be made clear by taking different examples.
- Converting all trigonometric ratios in the form of sin and cos is less error prone.

21. If the point P(x, y) is equidistant from the points A(3, 6) and B(–3, 4), prove that $3x + y - 5 = 0$.

Ans. $PA = PB \Rightarrow PA^2 = PB^2 \Rightarrow (x-3)^2 + (y-6)^2 = (x+3)^2 + (y-4)^2$ 1½ m

$\therefore\ \ x^2 - 6x + 9 + y^2 - 12y + 36 = x^2 + 6x + 9 + y^2 - 8y + 16$ 1 m

or $12x + 4y = 20 \Rightarrow 3x + y - 5 = 0$ ½ m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	11	18	4	9	3	2	2	51	2.0

Performance Analysis

- Only half of the students could solve the question correctly and got full marks while 5% of them got 1½ or 2 due to minor mistakes.
- 13% of the student could get ½ or 1 mark only due to major errors.
- A good number of students (29%) could not solve the question.

Common Errors Committed by students

- A large number of students took P(x, y) as the mid point of AB, as it was written as equidistant from A and B.

  Some of them substituted the coordinates of mid point in the given relation to show that those coordinates satisfy the given equation.

- A good number of students had written

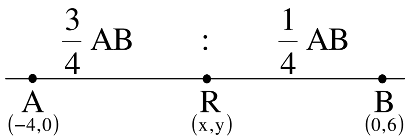
  $PA = PB \Rightarrow PA^2 = PB^2$ and used the distance formula correctly, but made computational errors.

- A few students only calculated distance AB.

Suggestive Remedial Measures

- Plotting the points A, B on graph paper and then finding the equidistant points can make the concept clear to the students.
- Sufficient practice is required to minimise computational errors.

22. The point R divides the line segment AB, where A(–4, 0) and B(0, 6) are such that $AR = \frac{3}{4}AB$. Find the coordinates of R.

Ans. 

Getting AR : RB = 3:1 ½ m

Let coordinates of R be (x, y)

$$\therefore \quad x = \frac{3\,(0)+1\,(-4)}{3+1},\ y = \frac{3(6)+1(0)}{3+1}$$ 1½ m

$$\Rightarrow \ x = -1,\ y = \frac{9}{2} \text{ i.e., coordinates of R are } \left(-1, \frac{9}{2}\right)$$ 1 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	14	30	7	10	3	6	–	30	1.4

Performance Analysis

- A majority (44%) of students could not attempt the question.
- 17% of the students could get only ½ or 1 mark as they committed major mistakes.

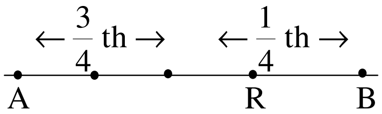
- 9% of the students committed minor mistakes and so could get 1½ or 2 marks. white 30% of the students got full marks.

Common Errors Committed by students

- A large number of students took AR = $\frac{3}{4}$ AB

  ⇒ R divides AB in the ratio 3:4

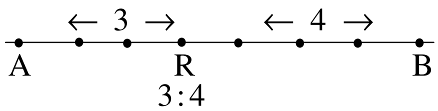
- A few students took R (x, y) and used distance formula for AR and AB but left as a relation in x and y.



Suggestive Remedial Measures

- Concept of ratio should be brought by drawing the line segment AB and dividing it in 4 equal parts (approximately) and then locating the position of R.

- If given ratio is $\frac{AR}{RB} = \frac{3}{4}$



then R divides AB in the ratio 3:4.

23. In Figure 5, ABC is a right-angled triangle right-angled at A. Semicircles are drawn on AB, AC and BC as diameters. Find the area of the shaded region.

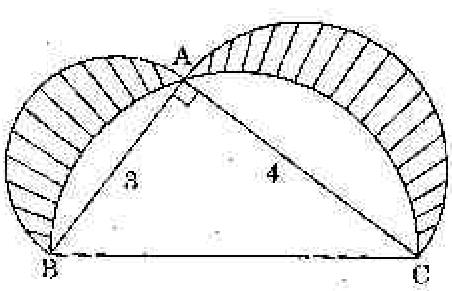


Figure 5

Ans. Getting BC= $\sqrt{3^2+4^2}$ = 5 ½ m

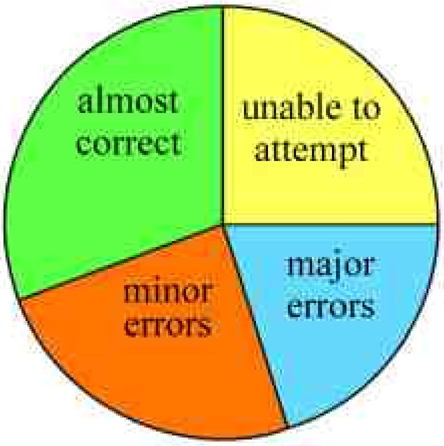
Required area $= \frac{1}{2}\pi\left(\frac{3}{2}\right)^2 + \frac{1}{2}\pi(2)^2 - \frac{1}{2}\pi\left(\frac{5}{2}\right)^2 + \frac{1}{2}.3.4$ $\left[4\times\frac{1}{2}\right]$ = 2 m

= 6 sq.units ½ m

Outside Delhi Region

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	13	12	7	13	12	12	3	28	1.5



Common Errors Committed by students

- Students visualised the given figure as

  Area of shaded region = Area of semicircle of diameter 3cm

  + Area of semicircle of diameter 4cm

  – Area of semicircle of diameter 5cm

  (not added the area of Δ ABC)

- A few students calculated the area of Δ ABC by taking BC = 5cm as base and 3cm as height.

$$\therefore \quad \text{area } \Delta\, ABC = \frac{1}{2} \times 5 \times 3 = \frac{15}{2} \text{ cm.}$$

- Some students did not write correct units.

Suggestive Remedial Measures

- Sufficient practice to find the shaded area in a given figure, should be given by taking various types of figures and by shading different areas.
- Units of length, area and volume, should be made clear to the students. Sufficient examples should be given and habit of writing the units should be developed.

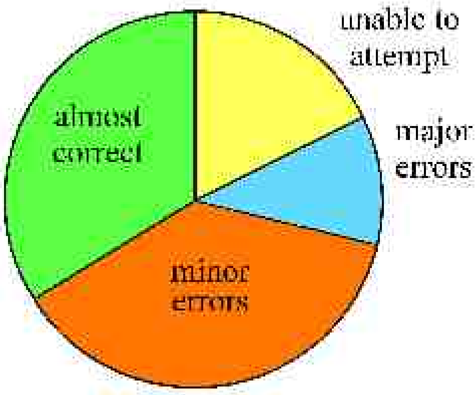
24. Draw a Δ ABC with side BC = 6 cm, AB = 5 cm and ∠ ABC = 60°. Construct a Δ AB′C′ similar to Δ ABC such that sides of Δ AB′C′ are $\frac{3}{4}$ of the corresponding sides of Δ ABC.

Ans. Constructing ΔABC correctly — 1 m

Constructing Δ AB′C′ similar to ΔABC, as per given conditions — 2 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	8	10	2	9	18	19	3	31	1.9



Performance Analysis

- Only 34% of the students could get 2½ or 3 marks.
- 37% of the students could get 1½ or 2m due to minor errors.
- 11% of the students committed major errors while 18% could not even attempt the question

Common Errors Committed by students

- Given scale factor was $\frac{3}{4}$ but many students took it as $\frac{4}{3}$ and constructed Δ AB′C′ bigger than Δ ABC.
- Many students could not draw paralled lines correctly using compass, while constructing the similar triangle.
- Majority of students did not understand the similarity of Δ ABC to Δ BAC or Δ ABC to A′ B C′

Suggestive Remedial Measures

- Difference between external division and internal division (i.e. scale factor $\frac{4}{3}$ or $\frac{3}{4}$) should be made clear by taking different examples.
- Practice has to be given for constructing

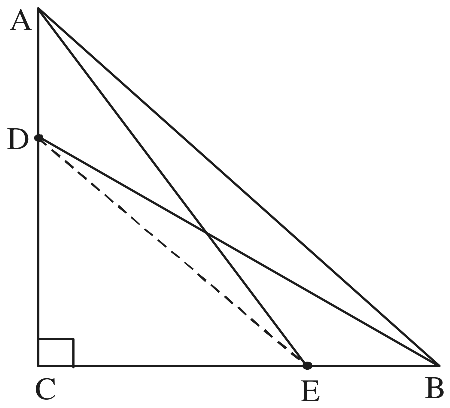
$\Delta AB'C' \sim \Delta ABC$ (i.e. common point A)

or $\Delta A'BC' \sim \Delta ABC$ (i.e. common point B)

and $\Delta A'B'C \sim \Delta ABC$ (i.e. common point C)

25. D and E are points on the sides CA and CB respectively of ΔABC right-angled at C. Prove that $AE^2 + BD^2 = AB^2 + DE^2$.

Ans.



In ΔACE, $AE^2 = AC^2 + CE^2$ 1 m

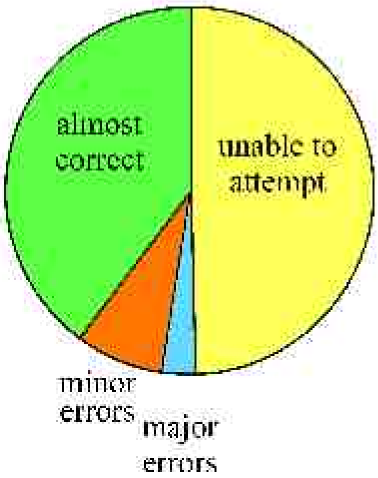
In ΔBCD, $BD^2 = BC^2 + CD^2$ ½ m

Adding to get $AE^2 + BD^2 = (AC^2 + BC^2) + (CE^2 + CD^2)$ 1 m

$= AB^2 + ED^2$ ½ m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	34	15	–	3	1	7	4	36	2.0



Performance Analysis

- Most of the students opted for this part but 49% of them could not score any mark.
- Only 40% could get almost full marks while 11% of them could get less than 2 marks due to errors.

Common Errors Committed by students

- Incorrect application of Pythagoras theorem & its converse.
- Could not identitfy the right triangles with AE, BD, DE and AB as hypotenuse & then using Pythagoras theorem and its converse.

Suggestive Remedial Measures

- Sufficient number of simple geometrical exercises should be given to gain confidence.
- Practice of using Pythagoras theorem and its converse should be given by taking different examples.

OR

In Figure 6, DB ⊥ BC, DE ⊥ AB and AC ⊥ BC. Prove that $\frac{BE}{DE} = \frac{AC}{BC}$

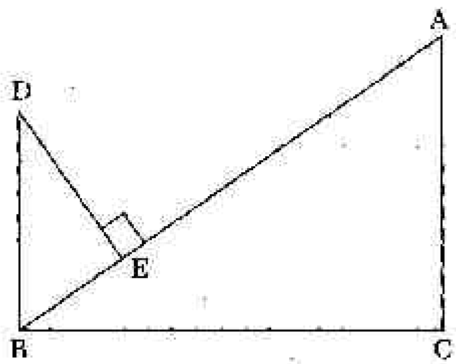


Figure 6

Ans. In Δs BDE and ΔABC, ∠BED = ∠ACB = 90° and

$$\angle DBE = \angle BAC \text{ (alt. } \angle s)$$

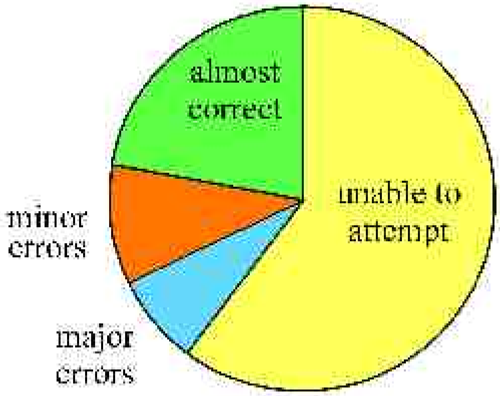
∴ $\Delta BDE \sim \Delta ABC$ (AA Similairty) 1½ m

∴ $\frac{BD}{AB} = \frac{DE}{BC} = \frac{BE}{AC}$ ½ m

or $\frac{DE}{BC} = \frac{BE}{AC} \Rightarrow \frac{AC}{BC} = \frac{BE}{DE}$ 1 m

Performance

Marks	N.A.	O	½	1	1½	2	2½	3	Mean Score
Percentage	48	13	–	8	6	4	2	19	1.7



Performance Analysis

- Most of the students opted for this part. Out of those who opted for this option, 61% did not score any mark.
- Only 21% could score almost full marks while the other 18% gave partially correct answer.

Common Errors Committed by students

- Unable to identify two similar triangles and to use the result of similarity.
- Students could not understand and write that

  $\angle DBA = \angle BAC$ (alternate angles)

  $\angle DEB = \angle ACB = 90^\circ$

- Writing similarity of two triangles ΔDBE ~ ΔBAC in other incorrect representations which leads to incorrect ratio of sides.