

**Suggestive Remedial Measures**

- Students are to be given practice to find whether in a particular question congruency of two triangles is required or similarity of two triangles is needed.
- To identify which angles are equal and then writing, which triangles are similar, has to given practice by taking examples.
- After writing two triangles as similar, correct ratio of sides is to be written, which needs a lot of care and understanding.

**SECTION D**

**Questions number 26 to 30 carry 6 marks each.**

26. A motor boat, whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

**Ans.** Let speed of stream be  $x$  km/hr.

$\therefore$  Speed of boat upstream =  $(18 - x)$  km/hour 1 m

Speed of boat downstream =  $(18 + x)$  km/hour

$$\frac{24}{18 - x} - \frac{24}{18 + x} = 1 \quad \text{2 m}$$

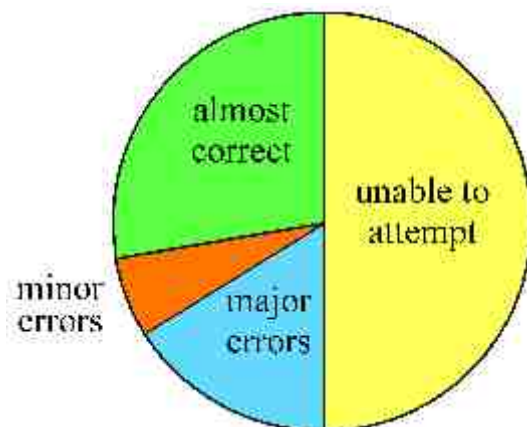
$\Rightarrow 24 [18 + x - 18 + x] = 18^2 - x^2$  or  $x^2 + 48x - 324 = 0$  1½ m

$\therefore (x - 6)(x + 54) = 0 \Rightarrow x = 6$ , [rejecting  $x = -54$ ] 1 m

$\therefore$  Speed of stream = 6 km/hr. ½ m

**Performance**

Marks	N.A.	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Mean Score
Percentage	25	25	4	8	–	4	–	4	–	1	1	–	–	28	2.5



### Performance Analysis

- A majority of students opted for this part but 50% of them could not score any mark due to irrelevant answer.
- 28% of the students who opted for this part could score almost full marks.
- 26% of the students gave partially correct answer with errors.

### Common Errors Committed by students

- A good number of students took as  
speed of stream =  $x$  km/hr  
 $\therefore$  speed upstream =  $(x - 18)$  km/hr, speed downstream =  $(x + 18)$  km/hr
- Some of the students took the total time as 1 hour as

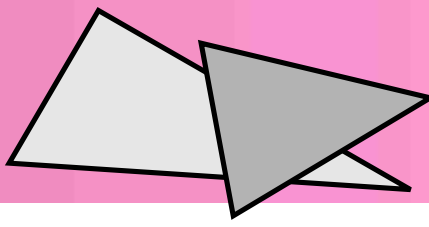
$$\frac{24}{18 - y} + \frac{24}{18 + y} = 1$$

Some took  $\frac{24}{18 + y} - \frac{24}{18 - y} = 1$  [Note that  $\frac{24}{18 + y} < \frac{24}{18 - y}$ ]

- Many students made computational errors.

### Suggestive Remedial Measures

- Translating a word problem to algebraic equations needs a lot of understanding, so sufficient number of simple examples should be given.
- Some students write  $(18 - y)$ ,  $(18 + y)$  as  $17y$ ,  $19y$  so sufficient practice is to given to minimise errors.



OR

Two water taps together can fill a tank in  $9\frac{3}{8}$  hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

**Ans.** Let smaller diameter pipe fill the tank in  $x$  hours

$\therefore$  Larger diameter pipe will fill in  $(x - 10)$  hrs.  $\frac{1}{2} + \frac{1}{2} = 1$  m

Thus we have  $\frac{1}{x} + \frac{1}{x-10} = \frac{8}{75}$  2 m

$75(2x - 10) = 8(x^2 - 10x)$  or  $4x^2 - 115x + 375 = 0$  1½ m

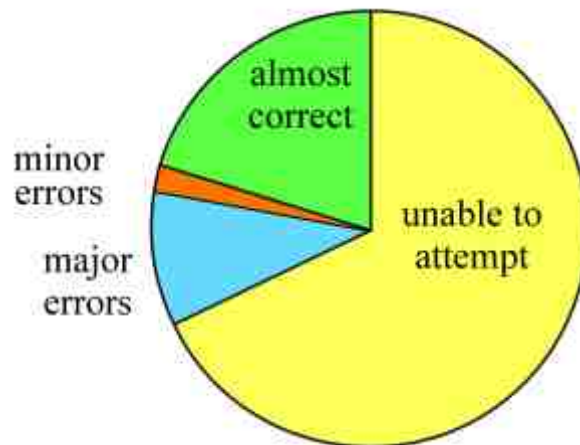
Solving to get  $x = 25$ , [rejecting  $x = \frac{15}{4}$ , as  $x > 10$ ] 1 m

$\therefore$  Smaller pipe fills in 25 hrs

and larger pipe fills in 15 hrs. ½ m

**Performance**

Marks	N.A.	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Mean Score
Percentage	50	18	2	5	–	–	–	–	2	–	–	–	–	23	3.0





### Performance Analysis

- Very few students opted for this option and out of those who opted this part 68% could not score any mark.
- Only 23% of those who attempted this part, could score full marks, while 9% of them committed errors & so could not score more than half of the marks.

### Common Errors Committed by students

- Time taken by tap of small diameter =  $x$  hrs  
 $\therefore$  time by tap of larger diameter =  $(x + 10)$  hrs. [in stead of  $(x - 10)$ hrs]
- Practice of finding workdone in 1 hour in such questions is not given so, students are writing as

$$\Rightarrow (x) + (x + 10) = 9\frac{3}{8}$$

### Suggestive Remedial Measures

- Sufficient practice of translating word problem to algebraic equations of different types should be given by taking simpler problems first.
  - Computational errors can only be minimised by giving more and more questions.
27. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.

Using the above, do the following :

The diagonals of a trapezium ABCD, with  $AB \parallel DC$ , intersect each other at the point O.

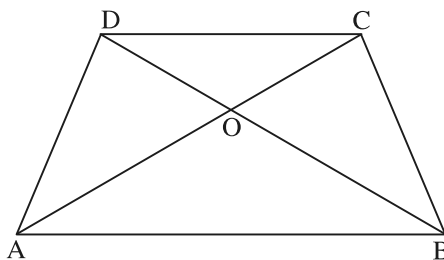
If  $AB = 2 CD$ , find the ratio of the area of  $\triangle AOB$  to the area of  $\triangle COD$ .

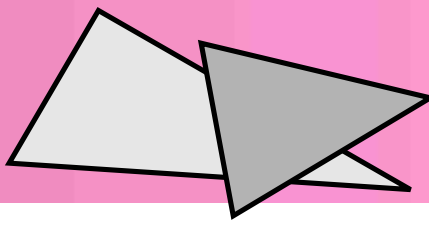
**Ans.** For correct 'Given', 'To Prove', 'Construction' and figure

$$\frac{1}{2} \times 4 = 2 \text{ m}$$

For Correct Proof

$$2 \text{ m}$$





## Performance Analysis of Students in Mathematics

$$\Delta AOB \sim \Delta COD \quad [AAA] \quad \frac{1}{2} \text{ m}$$

$$\therefore \frac{\text{ar}(\Delta AOB)}{\text{ar}(\Delta COD)} = \frac{AB^2}{CD^2} \quad 1 \text{ m}$$

$$= \frac{(2CD)^2}{CD^2} = \frac{4}{1} \quad \frac{1}{2} \text{ m}$$

### Performance

Marks	N.A.	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Mean Score
Percentage	18	5	–	–	–	5	5	5	4	22	–	5	2	29	4.3



### Performance Analysis

- 36% of the students who opted for this option scored almost full marks.
- 23% of the students could not score any mark.
- 15% of students committed major errors and so could not score more than 3 marks, while 31% could score 5 or more marks as there were minor errors.

**OR**

27. Prove that the lengths of the tangents drawn from an external point to a circle are equal.

Using the above, do the following:

In Figure 7, TP and TQ are tangents from T to the circle with centre O and R is any point on the circle. If AB is a tangent to the circle at R, prove that

$$TA + AR = TB + BR.$$

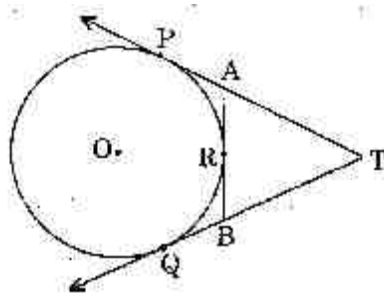


Figure 7

**Ans.** For correct 'Given', 'To Prove', 'Construction' and figure ½ × 4 = 2 m

For correct proof 2 m

TP = TQ and AP = AR, BR = BQ [Tangents to circle from an external point] ½ m

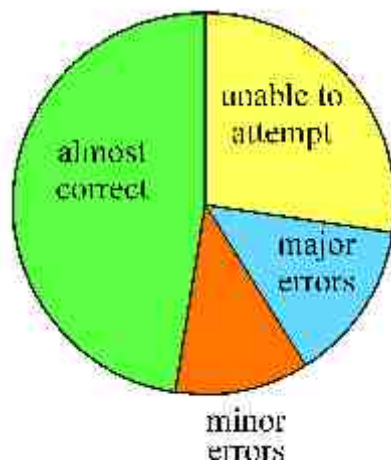
$$TP = TA + AP = TA + AR \quad \text{½ m}$$

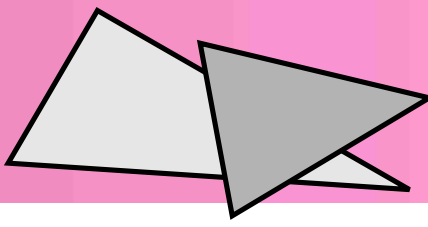
$$TQ = TB + BQ = TB + BR \quad \text{½ m}$$

Hence  $TA + AR = TB + BR$  ½ m

### Performance

Marks	N.A.	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Mean Score
Percentage	18	9	2	4	2	4	–	2	–	7	2	2	2	44	4.2





### Performance Analysis

- 48% of those who attempted, scored almost full marks.
- 27% of the students could not score any mark.
- 25% gave partially correct answer.

### Common Errors Committed by students (in both parts)

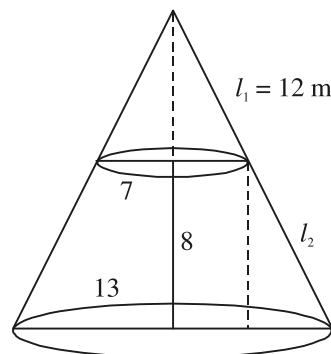
- Could not make correct figure, so no solution after that.
- Given, To Prove, Construction part not written by some of the students.
- Steps of proof not written in proper order with proper justification.
- Application of similarity results not proper.

### Suggestive Remedial Measures

- Stress must be made to draw correct figure after reading the statement.
- Given, To prove, construct etc must be specifically written, so sufficient practice should be given.
- Steps of proof with justification in order must be given enough practice.

28. A tent consists of a frustum of a cone, surmounted by a cone. If the diameters of the upper and lower circular ends of the frustum be 14 m and 26 m respectively, the height of the frustum be 8 m and the slant height of the surmounted conical portion be 12 m, find the area of canvas required to make the tent. (Assume that the radii of the upper circular end of the frustum and the base of surmounted conical portion are equal)

**Ans.**





Slant height ( $l_1$ ) of cone = 12m.

Slant height ( $l_2$ ) of frustum =  $\sqrt{8^2 + 6^2} = 10$ m

Surface area of cone =  $\pi (7) (12) = 84\pi \text{ cm}^2$

Surface area of frustum =  $\pi (7 + 13) 10 = 200\pi \text{ cm}^2$

$\therefore$  Area of canvas required =  $284\pi \text{ cm}^2$

or  $892.57 \text{ cm}^2$

1 m

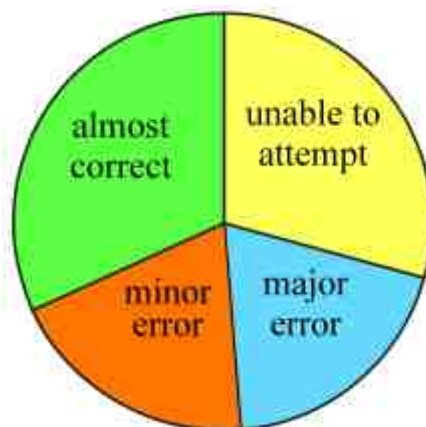
2 m

2 m

1 m

### Performance

Marks	N.A.	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Mean Score
Percentage	10	19	2	5	3	7	2	5	3	9	1	1	3	30	3.3



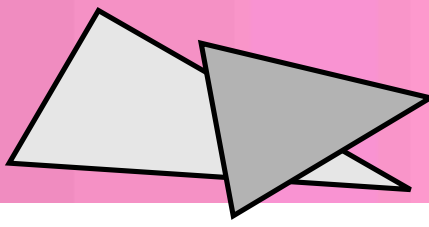
### Performance Analysis

- Only 33% of the students could get almost full marks while about 30% could not even attempt the question.
- 19% of the student committed major errors and so could not get even half of the marks, while another 19% gave partially correct answer with some errors.

### Common Errors Committed by students

- While finding the area of canvas required to make the tent, most of the students included the area of the base of the tent also.





So area =  $\pi r_1 \ell_1 + \pi \ell_2 (r_1 + r_2)$  has been taken wrongly

as 
$$= \pi r_1 \ell_1 + \pi \ell_2 (r_1 + r_2) + \pi r_1^2$$

- Many students took slant height as the vertical height. Some of other errors were:

slant height of frustum =  $\sqrt{h^2 + (r_1^2 - r_2^2)}$  in stead of  $\sqrt{h^2 + (r_1 - r_2)^2}$

- $\ell = \sqrt{(26^2 - 14^2) + 8^2}$  i.e. taking diameter in place of radius
- Some of the students could not identify whether to find the volume or surface area for the canvas.

### Suggestive Remedial Measures

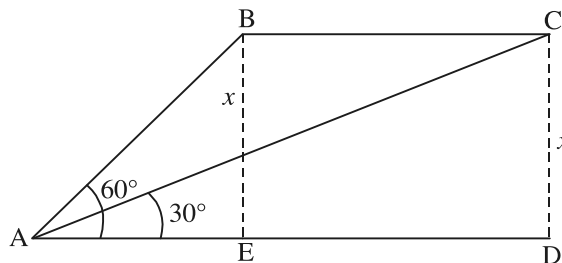
- Difference between diameter and radius, should be given practice while substituting in the formulae.
- In case of finding the area of canvas required, it should be understood that curved surface area is required.
- Sufficient practice of questions of mensuration should be given to minimise computational errors as the students could not differentiate between  $(r_1 - r_2)^2$  and  $r_1^2 - r_2^2$ .

29. The angle of elevation of a jet fighter from a point A on the ground is  $60^\circ$ . After a flight of 15 seconds, the angle of elevation changes to  $30^\circ$ . If the jet is flying at a speed of 720 km/hour, find the constant height at which the jet is flying.

[Use  $\sqrt{3} = 1.732$ ]

**Ans.** For correct Figure

1 m



Let constant height be  $x$  km.

$$BC = \frac{720}{60} \times \frac{15}{60} = \frac{180}{60} \text{ km.} = 3\text{km}$$

1 m



$$\text{In } \triangle ACD, \frac{AD}{x} = \cot 30^\circ = \sqrt{3}$$

$$\Rightarrow AD = \sqrt{3}x$$

$$\text{In } \triangle ABE, \frac{x}{AE} = \tan 60^\circ = \sqrt{3} \Rightarrow x = \sqrt{3} AE = \sqrt{3} [\sqrt{3} x - 3]$$

$$\therefore x = 3x - 3\sqrt{3} \Rightarrow x = \frac{3\sqrt{3}}{2} \text{ km.}$$

$$= \frac{3(1.732)}{2} = 2.598 \text{ km}$$

1 m

1½ m

½ m

1 m

### Performance

Marks	N.A.	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Mean Score
Percentage	15	22	1	8	5	5	4	5	2	8	2	3	1	19	2.7

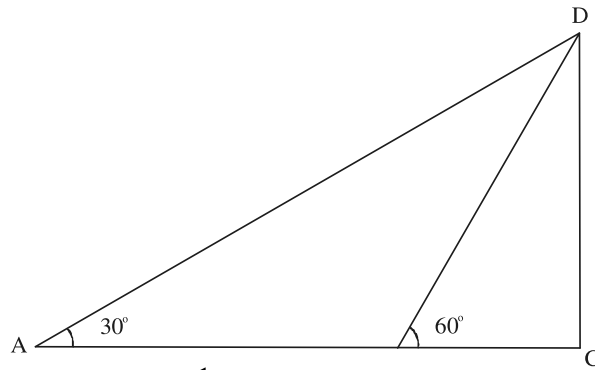
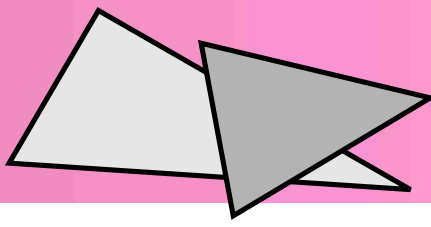


### Performance Analysis

- A good number of students (37%) did not attempt this question.
- Only 20% could get almost full marks.
- 15% of the students committed minor errors while 28% of them committed major errors & so could not get more than 3 marks.

### Common Errors Committed by students

- Many students could not translate the word problem to a correct diagram. Some of students made the following incorrect diagram.



- A few of them took  $\tan 60^\circ = \frac{1}{\sqrt{3}}$  and  $\tan 30^\circ = \sqrt{3}$ .
- From speed of 720 km/hr., the distance covered in 15 seconds could not be calculated correctly.
- Given value of  $\sqrt{3} = 1.732$  was not used.

#### Suggestive Remedial Measures

- Sufficient practice of making correct diagram from word problem by taking simple problems of one right triangle and then of two right triangles, should be taken.
- Values of trigonometric ratios e.g.  $\tan 60^\circ$ ,  $\tan 30^\circ$  etc should be correctly used, so sufficient practice should be given.
- Value of  $\sqrt{3}$  if given in the question, has to be used as such.

30. Find the mean, mode and median of the following data :

Classes	Frequency
0-10	5
10 - 20	10
20 - 30	18
30 - 40	30
40 - 50	20
50 - 60	12
60 - 70	5



**Ans.**

Classes:	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total	
Frequency ( $f$ )	5	10	18	30	20	12	5	100	½ m
Class Marks	5	15	25	35	45	55	65		½ m
$\frac{x_i - 35}{10} = (u_i)$	-3	-2	-1	0	1	2	3		
$f_i u_i$ :	-15	-20	-18	0	20	24	15	= 6	1 m
CF:	5	15	33	63	83	95	100		

$$\text{Mean} = \text{AM} + \frac{f_i u_i}{f_i} \times h = 35 + \frac{6 \times 10}{100} = 35.6 \quad 1 \text{ m}$$

Median class is 30-40 ½ m

$$\therefore \text{Median} = L + \frac{\frac{N}{2} - C}{f} \times h = 30 + \frac{50 - 33}{30} \times 10 = 35.67 \quad 1 \text{ m}$$

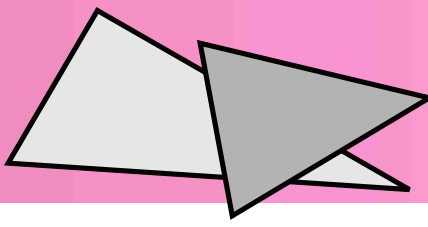
$$\begin{aligned} \text{Mode} &= 3 \text{ Median} - 2 \text{ Mean} \\ &= 3(35.67) - 2(35.6) = 35.81 \quad 1\frac{1}{2} \text{ m} \end{aligned}$$

[Mode = 35.45 by alternate method]

### Performance

Marks	N.A.	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	Mean Score
Percentage	2	5	3	4	4	5	4	7	4	8	9	10	4	31	4.1





### Performance Analysis

- Only 35% of the students could get almost full marks, while 93% tried to attempt.
- 27% of the students committed major errors and so could score less than 3 marks while 31% committed minor errors.

### Common Errors Committed

- Computational mistakes like  $25 - 35 = -15$  or  $45 - 35 = -15$

$$\sum f_1 x_1 = 3510 \text{ in place of } 3560 \text{ etc}$$

$$\frac{107}{3} = 38.33 \text{ and similar errors while operating } +, -, \times \text{ \& divide.}$$

- Wrongly taking the lower limit of modal class or median class.
- Incorrect formulae.

### Suggestive Remedial Measures

- While teaching, the calculation part is generally not completed, so students make the errors in exams. Sufficient practice should be given to complete the solution and find the answer.
- Sufficient practice, by taking different values of total frequency, should be given to select correct median class or modal class.