SECTION – B

Question numbers 11 to 15 carry 2 marks each.

11. Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the co-efficients of the polynomial.

Ans. $p(x) = 6x^2 - 7x - 3$

$= (3x + 1)(2x - 3)$ 1 m

$\therefore$ Zeroes of p(x) are $\frac{3}{2}$ or $-\frac{1}{3}$ ½ m

Sum of zeroes = $\frac{7}{6} = \frac{3}{2} + \frac{-1}{3} = \frac{7}{6} \Rightarrow$ holds

Product of zeroes = $\frac{-1}{2} = \frac{3}{2}\left(\frac{-1}{3}\right) = \frac{-1}{2} \Rightarrow$ holds ½ m

Performance

Marks	N.A.	0	½	1	1½	2	Mean Score
Percentage	11	34	2	7	6	40	1.1

Quantitative Analysis

- 46% of the students answered the question almost correctly, while 45% were unable to answer.
- 9% committed some errors and could not score full marks.

Common Errors

- Many students did not rearrange the terms of the given polynomial and took b = – 3 and c = –7.
- Committed computational errors in factorizing.
- A good number of students did not verify the property of coefficients, so could not score full marks.

Suggested Remedial Measures

- Sufficient practice with more emphasis on properties of coefficients is needed.
- Writing the polynomial in standard form $ax^2 + bx + c$ needs to be emphasized.

12. Without using the trigonometric tables, evaluate the following :

$$\frac{11}{7}\frac{\sin 70^o}{\cos 20^o} - = \frac{4}{7}\frac{\cos 53^0 \operatorname{cosec} 37^o}{\tan 15^o \tan 35^o \tan 55^o \tan 75^o}$$

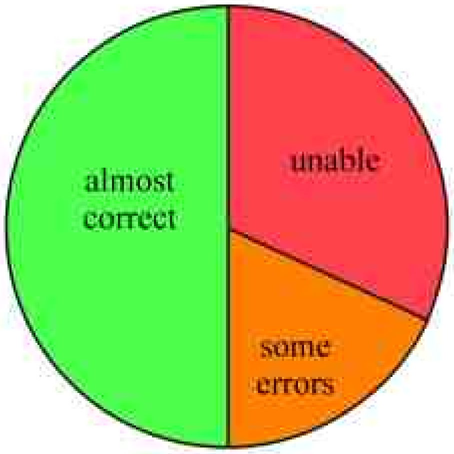
Ans. $\sin 70^o = \sin (90–20)^o = \cos 20^o$, $\cos 53^o = \sin 37^o$, $\tan 75^o = \cot 15^o$

and $\tan 55^o = \cot 35^o$ 1 m

$\therefore$ Given expression $= \frac{11}{7} \times 1 - \frac{4}{7} \times \frac{1}{1} = 1$ 1 m

Performance

Marks	N.A.	0	½	1	1½	2	Mean Score
Percentage	21	11	8	10	10	40	1.4



Quantitative Analysis

- 32% of the students were unable to answer the question, while 18% attempted partially or committed errors.
- 50% of the students gave almost proper or correct answer.

Common Errors

- Frequent errors were, e.g., cosec $(90^\circ - 53^\circ) = \cos 53^\circ$

  and $\tan 15^\circ = \tan(90^\circ - 15^\circ) = \cot 75^\circ$
- Computation errors were also quite frequent.

Suggested Remedial Measures

- Recognizing complementary angles and their relationships in trigonometric ratios need to be emphasized with the correct way of changing and writing.
- To avoid confusion, students may be advised to change only angles greater than 45° to their complementary angles which will be always less than 45° and change also the T-ratios accordingly.

13. For what value of p, are the points (2,1), (p, – 1) and (–1, 3) collinear?

Ans. A (2, 1), B (p, –1), C (–1, 3) will be collinear if area of the triangle formed by them is zero — ½ m

Area = $\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

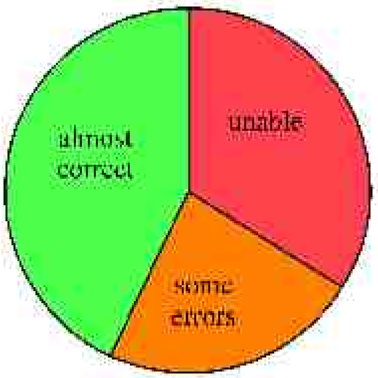
Here $x_1 = 2,\ x_2 = p,\ x_3 = -1,\ y_1 = 1,\ y_2 = -1,\ y_3 = 3$

or $0 = 2(-1-3) + p(3-1) - 1(1+1)$ — 1 m

or $0 = -8 - 2 + 2p \quad \Rightarrow \quad p = 5$ — ½ m

Performance

Marks	N.A.	0	½	1	1½	2	Mean Score
Percentage	7	27	1	22	3	40	1.2



Quantitative Analysis

- Only 43% of the students answered almost correctly, while 34% could not answer or scored zero.
- 23% answered with mistakes

Common Errors

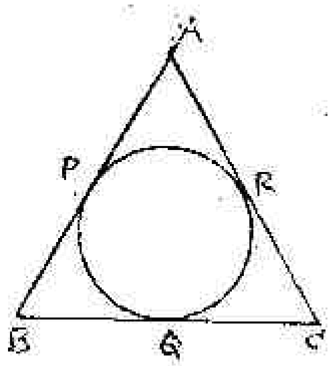
- Brackets were not properly used in writing the formula for Area of a triangle
- Some students used mid-point or distance formula and could not proceed.

Suggested Remedial Measures

- Writing the correct formula for area of a triangle, using and operating brackets properly, need to be emphasized.

14. ABC is an isosceles triangle, in which AB = AC, circumscribed about a circle. Show that BC is bisected at the point of contact.

Ans.



PA = AR, RC = QC, PB = BQ

$\Rightarrow$ AP + PB + CQ = AR + RC + BQ } 1 m

or AB + CQ = AC + BQ $\Rightarrow$ BQ = CQ (As AB=AC)

$\Rightarrow$ Q bisects BC } 1 m

Performance

Marks	N.A.	0	½	1	1½	2	Mean Score
Percentage	49	20	5	7	2	17	0.6

Quantitative Analysis

- Only 17% of the students could answer the question correctly while a high percentage (69%) of candidates were unable to answer, though the question was quite simple.
- 14% of the students answered it partially correct.

Common Errors

- Frequent error due to not understanding the term 'circumscribed' and hence not drawing the proper and correct figure was observed.
- Not identifying the property of common tangents to a circle from an external point.
- Not drawing logical conclusion but writing irrelevant steps.

Suggested Remedial Measures

- Emphasis should be given on recognizing the appropriate property to be used and logical steps to be taken.

OR

In Fig. 5, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90°$. If AD = 23 cm, AB = 29 cm and DS = 5 cm, find the radius (r) of the circle.

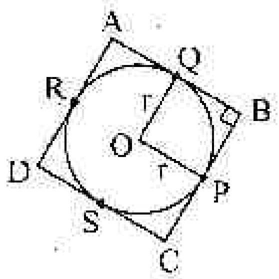


Fig. 5

It is given that AD = 23 cm, AB = 29 cm, DS = 5 cm

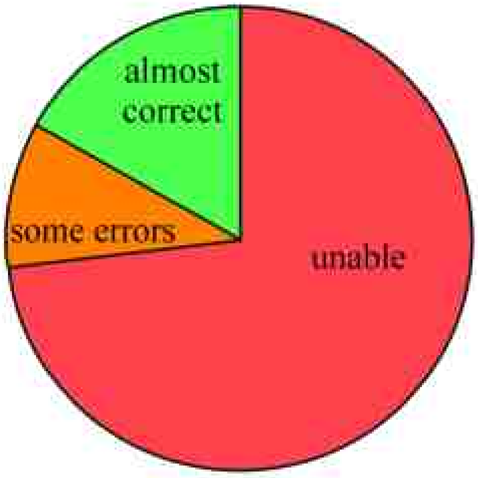
DS = DR = 5 cm $\Rightarrow$ AR = 18 cm = AQ $\Rightarrow$ QB = BP = 11cm ½ m

$\angle$ QBP = $\angle$ BPO = $\angle$ BQO = 90° $\Rightarrow$ OQBP is a square 1 m

$\Rightarrow$ OQ = r = 11 cm ½ m

Performance

Marks	N.A.	0	½	1	1½	2	Mean Score
Percentage	43	30	4	6	3	14	0.7



Quantitative Analysis

- Only 14% of the students could answer the question correctly and 73% were unable to answer the question, while 13% attempted it partially correct.

Common Errors

- Although the figure was given, the property of common tangents was not recognized and used logically to find BP and then radius r.

Suggested Remedial Measures

- Numerical problems are relatively easier. Only practice can enable the students to answer such problems.

15. A die is thrown once. Find the probability of getting

(i) a prime number

(ii) a number divisible by 2

Ans. (i) Prime numbers are 2, 3, 5 (Three in number)

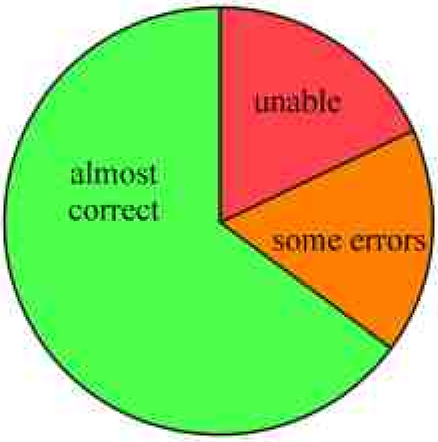
$\therefore$ P (a prime number) = $\frac{1}{2}$ 1 m

(ii) Even numbers are 2, 4, 6 (Three in number)

$\therefore$ P (an even number) = $\frac{1}{2}$ 1 m

Performance

Marks	N.A.	0	½	1	1½	2	Mean Score
Percentage	5	13	0	17	2	63	1.5



Quantitative Analysis

- Only 18% of the students were unable to answer the question, while 65% did it almost correctly.
- 17% attempted the question partially correct.

Common Errors

- Some students did not include 2 while counting prime numbers and failed to score any marks for the first part.

Suggested Remedial Measures

- Knowledge of prime, composite, odd, even and muliples in natural mumbers need to be given with special emphasis on special numbers 0, 1 and 2.

SECTION – C

Question numbers 16 to 25 carry 3 marks each.

16. Show that $5 - 2\sqrt{3}$ is an irrational number.

Ans. Let us assume that $5-2\sqrt{3}$ is rational

$\therefore$ $x = 5 - 2\sqrt{3}$, where x is a rational } ½ m

$\therefore$ $2\sqrt{3} = 5 - x$ or $\sqrt{3} = \frac{5-x}{2}$ .... (i) ½ m

As x is a rational, $5 - x$ is also rational

and so is $\frac{5-x}{2}$ } ½ m

As $\sqrt{3}$ is irrational } 1 m

$\therefore$ (i) presents a contradiction

$\therefore$ x is not rational } ½ m

i.e $5 - 2\sqrt{3}$ is irrational

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	4	12	3	11	6	18	4	42	2.0

Quantitative Analysis

- Good response, only 16% of the students were unable to answer the question, while 46% attempted almost correctly.
- 38% of the students committed minor or major mistakes.

Common Errors

- Many students used $\frac{p}{q}$ form but did not define $\frac{p}{q}$ properly.
- Computational errors were very frequent at arrving the result; e.g. writing

$$\sqrt{3} = -\left(\frac{p+5q}{2}\right) \text{ or } \left(\frac{5p-q}{2q}\right) \text{ for } \frac{5q-p}{2q}$$

- Did not justify that the above expression is rational

Suggested Remedial Measures

- More attention to be paid on correct computation with due attention to the proper sign while simplifying or transposing terms.

17. Find the roots of the following equation:

Ans. $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq -4, 7$

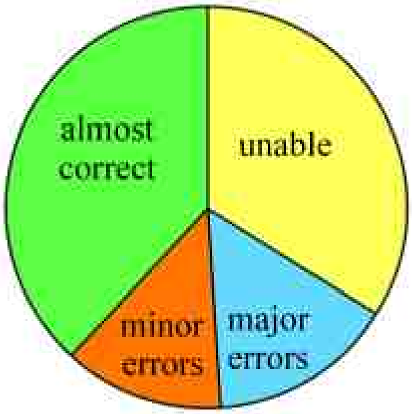
$\therefore$ 30 (x –7 –x –4) = 11 [(x + 4) (x – 7)] 1 m

$\Rightarrow x^2 - 3x + 2 = 0$ 1 m

$\Rightarrow x = 1, 2$ 1 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	23	11	10	5	7	6	0	38	1.9



Quantitative Analysis

- 34% of the students were unable to answer while 28% committed errors during simplification or transposing.
- Only 38% could answer the question correctly.

Common Errors

- Computational errors were quite frequent in simplification and transposition.
- Used the sign for = or vice vssa

- Writing x carelessly as n

Suggested Remedial Measures

- Rules of transposing terms in simplifying an equation to be emphasized.
- Students also make mistakes in opening and multiplying terms in a bracket. As such they need more guidance and attention.

18. Represent the following system of linear equations graphically. From the graph, find the points where the lines intersect y-axis:

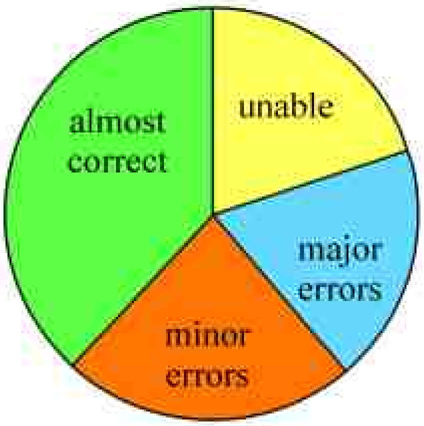
$$3x + y - 5 = 0;\ 2x - y - 5 = 0$$

Ans. Drawing the graphs of lines correctly ... 2 m

The lines intersect y – axis at (0, 5) and (0, – 5) 1 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	12	8	7	12	8	15	7	31	1.9



Quantitative Analysis

- 80% of the students attempted the question out of which 38% were almost correct.
- 42% committed some sort of mistakes in getting correct lines.

Common Errors

- Many students did not extend the lines to intersect y – axis to read the points of intersection.
- Some students gave only one point.

- Some students committed errors in changing the equations to y – form and calculated wrong points or fractional points.
- Graph was not properly labelled in some cases and neatly drawn.

Suggested Remedial Measures

- Drawing graphs to represent such linear equations is easy and does not require any previous knowledge. Only guidance can bring further improvement in performance.

19. The sum of n terms of an A.P. is $5n^2 - 3n$. Find the A.P. Hence, find its 10^{th} term.

Ans. $S_n = 5n^2 - 3n$

$S_{n-1} = 5\,(n-1)^2 - 3\,(n-1)$

$t_n = S_n - S_{n-1} = 5\left[n^2 - (n-1)^2\right] - 3\left[n - n + 1\right]$ } 1 m

$= 10n - 8$ ½ m

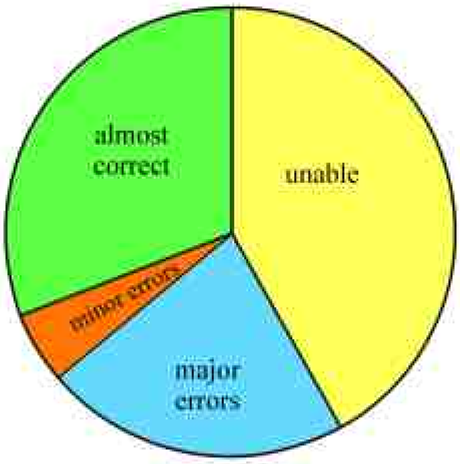
$\therefore\ t_1 = 2,\ t_2 = 12,\ t_3 = 22,$

$\therefore$ The A.P. is 2, 12, 22, ... } 1 m

$t_{10} = a + 9d = 2 + 9 \times 10 = 92$ ½ m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	22	20	12	10	3	2	1	30	1.5



Quantitative Analysis

- Only 31% of the students were able to answer the question properly and 42% failed to answer.
- 22% of the students committed major errors, while 5% committed minor ones.

Common Errors

- Students confused in understanding the sum of n terms and confused s_n with a_n.
- Computational errors were also frequent.

Suggested Remedial Measures

- Difference between s_n and a_n to be emphasized.

20. Prove that:

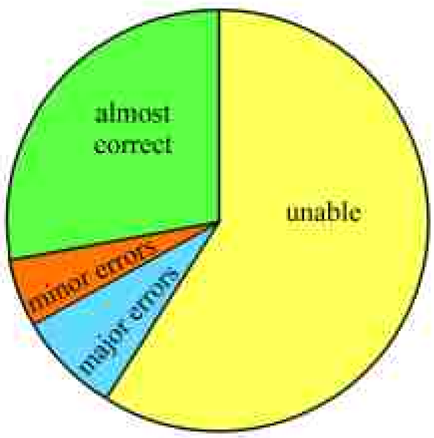
$$\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\operatorname{cosec} A - 1}{\operatorname{cosec} A + 1}$$

Ans. LHS = $\dfrac{\dfrac{\cos A}{\sin A} - \cos A}{\dfrac{\cos A}{\sin A} + \cos A} = \dfrac{1 - \sin A}{1 + \sin A}$ 2 m

$= \dfrac{\operatorname{cosec} A - 1}{\operatorname{cosec} A + 1} =$ RHS 1 m

Performance

Marks	N.A.	0	½	1	1½	2	2½	3	Mean Score
Percentage	44	15	3	5	5	0	0	28	1.8



Quantitative Analysis

- Only 28% of the students could answer the question correctly while 59% were unable to answer at all.
- 28% of the students did attempt the question but committed major mistakes and could not succeed.

Common Errors

- Students committed mistakes in interchanging trigonometric ratios and factorizing; e.g.

(i) $\cot A = \frac{1}{\cos A}$ or $= \frac{\sin A}{\cos A}$

(ii) $\frac{\cos A - \cos A \sin A}{\cos A + \cos A \sin A} = \frac{\cos A - (1 - \sin A)}{\cos A + (1 + \sin A)}$

Suggested Remedial Measures

- Clear understading of trigonometric ratios and their inter-relationship need to be emphasized.
- More practice in simplifying trigonometric expressions is desirable.

OR

Prove that:
(1 + cot A – cosec A) (1 + tan A + sec A) = 2

$$\text{LHS} = \left(1 + \frac{\cos A}{\sin A} - \frac{1}{\sin A}\right)\left(1 + \frac{\sin A}{\cos A} + \frac{1}{\cos A}\right)$$ ½ m

$$= \frac{[(\sin A + \cos A) - 1]\,[(\sin A + \cos A) + 1]}{\sin A \ \cos A}$$ ½ m

$$= \frac{(\sin A + \cos A)^2 - 1}{\sin A \ \cos A} = \frac{\cancel{1} + 2\sin A \cos A - \cancel{1}}{\sin A \ \cos A} \quad [\because \sin^2 A + \cos^2 A = 1]$$ 1+½ m

$$= 2 = \text{RHS}$$ ½ m