Government of Karnataka

QUESTION BANK FOR FIRST PUC

BASIC MATHEMATICS

(NEW SYLLABUS)

Subject Code : 75

DEPARTMENT OF PRE-UNIVERSITY EDUCATION

Sampige Road, 18th cross, Malleshwaram, Bengaluru-12

www.pue.kar.nic.in

I PUC BASIC MATHEMATICS
WEIGHTAGE GIVEN TO THE CURRICULUM

1. Knowledge   : 40% = 59 Mark
2. Understanding : 30% = 44 Mark
3. Applications : 20% = 29 Mark
4. Skill   : 10% = 15 Mark
                    Total   147 Mark

UNIT WISE WEIGHTAGE

Unit

I.   Algebra   : 40% = 73 Mark
II. Commercial arithmetic : 30% = 35 Mark
III. Trigonometry   : 20% = 14 Mark
IV. Analytical geometry   : 10% = 25 Mark
                              Total   147 Mark

INSTRUCTIONS TO QUESTION PAPER SETTERS:

1. **Part E :** 2 marks Question must be from chapters

    (i) Number theory   (ii) Averages.

2. **Part E :** 4 marks from chapters

    (i)   Sets, Relation and Functions
    (ii) Progressions
    (iii) Linear Functions
    (iv) Straight Lines.

3. The question paper consists of five **parts A, B, C, D & E.**

4. **Part A** carries 10 marks, **Part B** carries 20 marks, **Part C** carries 30 marks, **Part D** carries 30 marks and **Part E** carries 10 marks.

5. Write the question numbers properly as indicated in the question paper.

BLUE PRINT
I PUC BASIC MATHEMATICS
[NEW NCERT SYLLABUS 2013-14 ONWARDS]

Unit Chapter	Name of the Chapters	No. of Teaching Hours	1M	2M	3M	4M	5M	Total Marks
Unit I ALEGEBRA (64 Hours)								
1.	Number Theory	08	1(k)	3(k+k)+A	1(u)	-	-	10
2.	Sets, Relation and Functions	16	1(k)	1(k)	1(k)	1(u)	1(A)	15
3.	Theory of Indices	04	1(k)	1(u)	1(s)	-	-	06
4.	Logarithms	06	1(k)	-	1(u)	-	1(A)	09
5.	Progressions	12	1(k)	1(u)	1(k)	1(k)	1(u)	15
6.	Theory of equations	12	1(k)	2(s+s)	1(u)	-	1(A)	13
7.	Linear inequalities	06	-	1(u)	1(u)	-	-	05
	TOTAL							73
Unit II COMMERCIAL ARITHMETIC (28 Hours)								
8.	Simple interest and Compound interest	08	1(k)	-	1(k)	-	1(A)	09
9.	Annuities	06	1(u)	1(u)	-	-	1(A)	08
10.	Averages	04	-	1(u)	1(k)	-	-	05
11.	Percentage, profit/loss	06	1(u)	-	1(k)	-	1(A)	09
12.	Linear functions	04	-	-	-	1(k)	-	04
	TOTAL							35
Unit III TRIGONOMETRY (10 Hours)								
13.	Angles and Trigonometric ratios	06	1(k)	1(k)	-	-	1(k)	08
14.	Standard & Allied angles	04	1(u)	1(u)	1(s)	-	-	06
	TOTAL							14
Unit IV ANALYTICAL GEOMETRY (18 Hours)								
15.	Co-ordinate system in a plane	05	-	1(k)	1(u)	-	1(A)	10
16.	Locus and its equation	03	-	1(u)	-	-	-	02
17.	Straight Line	10	1(k)	-	1(u)	1(k)	1(s)	13
	Teaching hr/Total Marks	120	12	30	39	16	50	147

I PUC MODEL QUESTION PAPER-1

BASIC MATHEMATICS

Time : 3 hrs. 15 min   Marks : 100

Instructions :   1)   The question paper consists of five parts A, B, C, D & E.

2)   Part A carries 10 marks, Part B carries 20 marks, part C carries 30 marks, part D carries 30 marks and part E carries 10 marks.

3)   Write the question numbers propertly as indicated in the question paper.

PART - A

I. Answer any ten questions.   10×1=10

1. Find conjugate of $Z = 3 + 4i$.

2. If A = {5, 6} and B = {6, 5}, then find B × A.

3. Simplify: $\left(\dfrac{9}{4}\right)^{-3/2}$

4. Find the value of $\log_5 125$.

5. Find the 8th term of an A.P $-2, -4, -6 \ldots\ldots$

6. Form the quadratic equation whose roots are 2 and -3.

7. Find the interest on ₹ 1500 at 4% p.a. for 145 days.

8. Find the present value of an income of ₹ 3000 to be received forever if the rate of interest is 14% p.a.

9. Convert $\dfrac{1}{5}$ into percentage.

10. Convert 135° into radians.

11. If A = 45° then show that sin2A = 2sinA cosA.

12. If the slope of the line AB is $\dfrac{3}{4}$ and AB is parallel to CD then find the slope of CD.

PART - B

II. Answer any ten questions.   10×2=20

13. Find the numbers of divisors of 360.

14. If A = {1, 3, 5, 7, 9} and B = {2, 4, 6, 8, 10, 12}. Define a function, $f\colon$ A $\to$ B by $f(x) = x + 1$ $\forall x \in$ A, is the function one-one and onto?

1

15. Simplify: $\left(\dfrac{x^a}{x^b}\right)^{a+b} \cdot \left(\dfrac{x^b}{x^c}\right)^{b+c} \cdot \left(\dfrac{x^c}{x^a}\right)^{c+a}$.

16. Find the number which when divided by 36 and 40 leaves the same remainder 5.

17. Which element of the G.P 5, 10, 20....... is 80?

18. Find the nature of the roots of equation $4x^2 + 12x + 9 = 0$

19. If α and β are the roots of the equation $3x^2 - 6 + 420 = 0$ then find $\dfrac{1}{\alpha} + \dfrac{1}{\beta}$.

20. Solve $5x - 3 < 3x + 1$ when x is an integer and x is a real number.

21. What is the present value of an income of 3000 to be received forever if the interest rate is 14% p.a.

22. The angles of a triangle are in the ratio 2:3:4. Express them in degrees.

23. Find the value of $\sin^2 \dfrac{\pi}{6} + \cos^2 \dfrac{\pi}{3} - \tan^2 \dfrac{\pi}{4} + \cot^2 \dfrac{\pi}{4}$.

24. Find the equation of the locus of the point which moves such that its distance grom (1,2) is 3.

25. Find the value of x if the distance between $(x, 3)$ and $(4, 5)$ is 5 units.

PART - C

II. Answer any ten questions.   **10×3=30**

26. Prove that $\sqrt{2}$ is an irrational number.

27. Show that the relation is congruent to is an equivalence relation on a set T of triangles.

28. Solve: $2^{2x} - 6.2^x + 8 = 0$.

29. If $\log\left(\dfrac{a-b}{4}\right) = \log\sqrt{a} + \log\sqrt{b}$, show that $(a + b)^2 = 20ab$.

30. Find the sum of the following series: $6 + 66 + 666 + 6666 + \ldots\ldots\ldots n$ terms.

31. A number consists of two digits and whose sum is 3, if 9 is added to the number the digits get interchanged. Find the numbers.

32. Solve the linear inequalities graphically, $x + 3y \geq 3$, $2x + y \geq 2$, $x \geq 0$, $y \geq 0$

33. A sum of money was invested at compound interest. At the end of the first year, the interest was ₹125. At the end of the second year, it was ₹130. Find the sum invested and the rate of interest.

34. The average age of 10 students is 14 years. Among them the average age of 4 student is 12 years. Find the average of the remaining student.

35. Ram Singh purchased two camels for ₹18000 and ₹15000 respectively. He sold them at a loss of 15% and a gain of 19% respectively. Find the selling price of each of the camels. Also find the overall loss or gain percent.

36. If $\cot\theta = \dfrac{5}{2}$ and θ is acute. Then prove that $\dfrac{3\cos\theta + 2\sin\theta}{3\cos\theta - 4\sin\theta}$ is equal to $\dfrac{19}{7}$.

37. Find the points of trisection of the line joining (3,4) and (5,–2).

38. Find the equation of the line perpendicular to $3x - 2y + 1 = 0$ and passing through (1, –2).

PART - D

IV. **Answer any six questions.**   6×5=30

39. In a college with 500 students, 300 drink milk and 25 drink tea. Find how many drink (a) milk only, (b) tea only, (c) both milk and tea. Show the result with the help of a venn diagram.

40. Evaluate using log tables: $\dfrac{0.5634 \times 0.0635}{2.563 \times 0.125}$.

41. Find the sum of integers between 5 and 500 which are divisible by 13.

42. Find an integral root between –3 and 3 by inspection then using synthetic division solve the equation $x^3 - 2x^2 - 5x + 6 = 0$.

43. A person repayed his loan in ten equal annual instalments starting from the beginning of the first year. If each instalment was ₹6000 and compound interest charged was 12% per annum. Calculate the amount borrowed.

44. The difference between simple interest and compound interest on a certain sum of money invested for 3years at 6% p.a. is 110.16. Find the sum.

45. A watch is sold for ₹ 150, at a profit of 25%. At what price should it be sold in order to have 50% profit?

46. Find the ratio in which the line segment joining the points (4, 9) and (3, –6) divided by x-axis. Also find the co-ordinates of point of division.

47. Find the equation of locus of point which moves so that the distance from the points (3, 1) and (1, 3) are in the ratio 2:3.

48. Find the equation of the line passing through the points of intersection of lines $2x + 3y - 7 = 0$ and $5x + 6y + 8 = 0$ and the point (4, 3).

PART - E

V. Answer any ten questions.   **10×1=10**

49. (a) If $f(x) = x^2 - 3$, $g(x) = 2 + x$ find   (i) fog (0)

                                                 (ii) gof (1)   4

                                               (iii) fof (−1)

                                               (iv) gog (2)

   (b) A manufacture sells his product at ₹8.35/unit is able to sell his entire production his fixed

      cost is ₹2116 and his variable cost/unit is ₹7.20, find the   4

        (i) the level of production at which he can make a profit of ₹4600.

        (ii) the level of output at which he will incur a loss of ₹1,150.

        (iii) the breakeven level of production.

   (c) Find the number of digit in the integral part of $(5)^{28}$.   2

50. (a) Show that $3x - y + 4 = 0$, $2x - 7y - 5 = 0$ and $5x + 6y - 1 = 0$ are concurrent, also find the
       point of concurrence.   4

   (b) If $b+c$, $c+a$, $a+b$ are in H.P. Show that a^2, b^2, c^2 are in A.P.   4

   (c) If the product of two numbers is 216 and their LCM is 36. Find their HCF.   2

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SCHEME

PART-A

I. 1. $\overline{Z} = 3 - 4i$ 1m

2. $\{(6,5),(6,6),(5,5),(5,6)\}$ 1m

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

4. $\dfrac{4^{3/2}}{9} = \dfrac{8}{27}$ 1m

5. $T_8 = -16$ 1m

6. $(x - 2)(x + 3) = 0; \quad x^2 + x - 6 = 0$ 1m

7. $\dfrac{1500 \times \dfrac{145}{365} \times 4}{100} = 23.84$ 1m

8. ₹ 22,388   1m

9. 20%   1m

10. $\dfrac{3\pi}{4}$ 1m

11. $1 = 2 \times \dfrac{1}{\sqrt{2}} \, \dfrac{1}{\sqrt{2}}; \quad 1 = 1$ 1m

12. $\dfrac{3}{4}$ 1m

PART-B

II. 13.

```
2 | 360          360 = 2³ . 3² 5
2 | 180
2 | 90
3 | 45
3 | 15
    5
```
     1m

$T(n) = (1+2_1)(1+2_2)(1+2_3) = (1+3)(1+2)(1+1) = (4)(3)(2) = 24$ 1m

14. It is one-one   1m

It is not onto.   1m

15. $\left(x^{a-b}\right)^{a+b} . \left(x^{b-a}\right)^{b+a} . \left(x^{c-a}\right)^{c+a}$ 1m

$= x^{a^2-b^2+b^2-c^2+c^2-a^2} = x^0 = 1$ (1m+1m)

16. $36 = 2^2 \times 3^2$

     $40 = 2^3 \times 5$

     $LCM = 2^2 \times 3^2 . 5 = 360$ 1m

     Required number is $360 + 5$.   1m

17. $T_2 = a+d = 4$

     $a+ad = 20$ 1m

     $d = 2, \quad a = 2$

     $T_{15} = 30$ 1m

18. $b^2 - 4ac = 0$

     $80 = 52^{n-1}$ 1m

     $n = 5$.   1m

19. $\dfrac{1}{2} + \dfrac{1}{\sqrt{3}} = \dfrac{3}{2}$ 1m

20. $2x < 13$ 1m

     $x < \dfrac{13}{2} = 6.5$ integer $x = \{6, 5, 4, 3.....\}$ 1m

                    Real $x \in (-\infty, 6.5)$ 1m

21. $P_{\infty} = \dfrac{a}{i}$ 1m

      $= 21428.5$ 1m

22. $2x + 3x + 4x = 180°$

           $x = 20°$ 1m

     $40°, 60°, 80°$

23. $\left(\dfrac{1}{2}\right)^2 + \left(\dfrac{1}{2}\right)^2 - 1 + 1$ 1m

     $= \dfrac{1}{2}$ 1m

24. $PA = 3$ 1m

     $x^2 + y^2 - 2x + 4y - 4 = 0$ 1m

25. $d = 5$

     $\sqrt{(x-4)^2 + (2-5)^2} = 5$ 1m

     $(x-4)^2 = 25 - 9 = 16$

     $x - 4 = 4$ 1m

     $x = 0$

26. $\sqrt{2} = \dfrac{p}{q}$ part are co-prime   1m

$\sqrt{2}\, q - p$

$\Rightarrow\ 2q^2 - p^2$

$\Rightarrow$ 2 divides p^2 1m

$\Rightarrow$ 2 divides p

$\Rightarrow$ p is even

Let $p = 2k$

$2q^2 = 4b^2$ 1m

$\Rightarrow$ q is even

p and q both are even which is a contradiction $\sqrt{2}$ is irrational.

27. T.P.T R is reflexive   1m

      R is symmetric   1m

      R is transitive.   1m

28. $y^2 - 6y + 8 = 0$

    $(y - 4)(y + 2) = 0$ 1m

    $y = 4$ or $y = 2$ 1m

    $2^x = 4$ or $2^x = 2 \ \Rightarrow x = 2$ or $x = 1$ 1m

29. $\log\left(\dfrac{a-b}{7}\right) = \log\sqrt{ab}$ 1m

$a - b = 4\sqrt{ab}$ 1m

$(a - b)^2 = 16ab; \quad (a + b)^2 = 20ab$ 1m

30. $S_n = \dfrac{6}{9}[9 + 99 + 999 + \ldots\ldots n \text{ terms}]$ 1m

$S_n = \dfrac{7}{9}[(10 - 1) + (100 - 1) + \ldots\ldots\ldots]$ 1m

$= \dfrac{7}{9}\left[\dfrac{10(10^n - 1)}{10 - 1} - n\right].$ 1m

31. Number is $10x + y$

    $x + y = 3$ ..... (1)   1m

    $10x + y + 9 = 10y + x$ ..... (2)   1m

    $x = 1,\ y = 2$

    Number is 12.   1m

32.
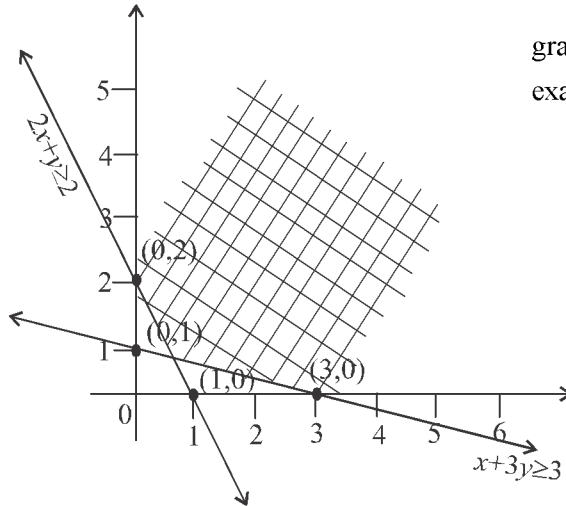
graph (2m)

exact plotting (1m)

33.

Amount	Change in interest	
125	5	1m
100	x	

$x = 4$ $\therefore$ rate of Interest = 4%   2m

$$I = \frac{Ptr}{100}; \quad P = \frac{I \times 100}{tr} = \frac{125 \times 100}{1 \times 4} = 3125$$

34. $14 = \dfrac{(12 \times 4) + (\bar{x}_2 \times 6)}{4 + 6}$ 1m

     calculation   1m

     getting $\bar{x}_2 = 15.33\,\text{yr}$ 1m

35. CP of camel = 18000

     $SP_1 = 15300$ 1m

     CP of 2nd camel = 15000

     $SP_2 = 17850$ 1m

     Total CP = 33000

     SP = 33,150.   1m

36. Profit = 150   1m

     Profit % $= \dfrac{150}{33000} \times 100 = 0.45\%$ 2m
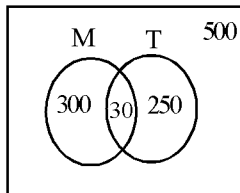
37.

$P = \left(\dfrac{11}{3}, 2\right)$ 2m

$Q = \left(\dfrac{13}{3}, 0\right)$ 1m

38. $\dfrac{3\cot\theta - 2}{3\cot\theta - 4}$ 1m

$\dfrac{3 \times \dfrac{5}{2} - 2}{3 \times \dfrac{5}{2} - 4} = \dfrac{9}{7}$ 2m

39.   2m

No. of students drink milk only = 250   2m

Tea only = 200   1m

Drink both = 50.

40. $\log x = \log 0.5634 + \log 0.0635 - \log 2.563 - \log 0.125$ 2m

$= \overline{1}.7508 + \overline{2}.8028 - 0.4087 - \overline{1}.0969$ 2m

$\log x = \overline{1}.048$ 1m

$x = 0.1117$.

41. $a = 13, \quad l = 494 - T_n$ 2m

$494 = 13 + (n - 1)13$

$n = 38$ 2m

$S_n = \dfrac{n}{2}(a + l)$ 1m

$S_n = \dfrac{38}{2}(13 + 494) = 9,633$

42. $x = 1$ is a root

$$\begin{array}{r|rrrr}
1 & 1 & -2 & -5 & 6 \\
  & 0 & 1 & -1 & 6 \\
\hline
  & 1 & -1 & -6 &
\end{array}$$ 1m

9

$x^2 - x - 6 = 0$

$x = -2$ or 3

roots are 1, –2, 3.   2m

43. $P = \dfrac{a[(1+1)^n - 1]}{i(1+i)^n}(1+i)$ 2m

$= \dfrac{6000[(1.12)^{10} - 1](1+0.12)}{0.12(1+0.12)^{10}} = 37969.2$ (2+2m)

44. SI $= 0.18x$ 1m

CI $= A = P(1+i)^n$ 1m

$= 1.191016x$ 1m

CI $= A - P = 0.191016x$ 1m

$x = 10{,}000$ 1m

45. C.P $= ₹100,$

S.P $= ₹125$

$\therefore$ at S.P $= 150$, C.P $= 120$ 2m

Again at 20% profit

S.P $= 150$, C.P $= 100$ 1m

$\therefore$ C.P $= \dfrac{120 \times 100}{100} = ₹100$ 2m

46. pt-on

x-axis mean $(x,0) \div (4,9)$ and $(3,-6)$ $r = 3/2$ in the ratio $m{:}n = r{:}1$ 2m

By Internal section formula

$(x,0) = \left(\dfrac{r(3) + 1(4)}{r+1}, \dfrac{r(-6) + 1(9)}{r+1} \right)$

Equate y-coordinate :

$0 = \dfrac{-6r + 9}{r+1}$ $\therefore 6r = 9$

$r{:}1 = \dfrac{3}{2}{:}1$ or $3{:}2$ 2m

$$x = \frac{3r+4}{r+1} = \frac{3(3/2)+4}{3/2+1} = \frac{9/2+4}{5/2} = \frac{17}{5}$$ 1m

the x-coordinate = (x, 0) = (17/5, 0).

47. Let Locus be : $p(x,y)$ Given $\dfrac{PA}{PB} = \dfrac{2}{3}$ 2m

    3PA = 2PB

    $$3\sqrt{(x-3)^2+(y-1)^2} = 2\sqrt{(x-3)^2+(y-1)^2}$$

    SBS

    $9[(x-3)^2 + (y-1)^2] = 4(x-3)^2 + (y-1)^2$

    $9x^2 + 9y^2 - 54x - 18y + 90 = 4x^2 - 4y^2 - 24x - 8y + 4$

    $5x^2 + 5y^2 - 30x - 10y + 50 = 0 \div 5$ 1m

    $\boxed{x^2 + y^2 - 6x - 2y + 10 = 0}$.

48. Pt. of Intersecting   2m

    $2x + 3y - 7 = 0 \times 2$

    $5x - 6y + 8 = 0 \times 1$

    $4x + \cancel{6y} - 14 = 0$

    $\dfrac{5x - \cancel{6y} + 8 = 0}{9x - 6 = 0}$; $x = 2/3$ 2m

    $2(2/3) + 3y - 7 = 0$

    $4/3 + 3y - 7 = 0$

    $3y = 7 - 4/3$ $\therefore 3y = 19/3$ 1m

    $y = 19/9$ $\therefore (x, y) = (2/3, 19/9)$.

49. (a) fog (0) = 1   1m

       gof (0) = 0   1m

       fof (−1) = 1   1m

       gog(2) = 6   1m

    (b) Profit = R(x) − C(x)   1m

          = (8.35x) − (7.20x + 2116) = C(x) − R(x)   2m

       BEP : R(x) = (x)

    (c) log (5)^{28} = 28 log(5) = 28(0.6990) = 19.572   1m

    $\therefore 19 + 1 = \boxed{20 \text{ digit}}$ 1m

50. Solving (1) and (3)

    and getting $x = -1$ and $y = 7$

    and substitute in (2)

    $2x + 7y - 5 = 0; \ 0 = 0$

    Lines are concurrent

    Point of concurrently $= (-1, 7)$.

(b) $\dfrac{1}{b+c}, \dfrac{1}{c+a}, \dfrac{1}{a+b}$ in A.P   1m

    getting $b^2 - a^2 = c^2 - b^2$ 2m

    $b^2 = \dfrac{a^2 + c^2}{2}$ 1m

(c) HCF $\times$ LCM $= a \times b$ 1m

$\therefore$ H.C.F $= \dfrac{216}{36} = \boxed{6}$ 2m

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I PUC MODEL QUESTION PAPER-2

BASIC MATHEMATICS

Time : 3 hrs. 15 min   **Marks : 100**

Instructions :   1) The question paper consists of five parts A, B, C, D & E.

2) Part A carries 10 marks, Part B carries 20 marks, part C carries 30 marks, part D carries 30 marks and part E carries 10 marks.

3) Write the question numbers propertly as indicated in the question paper.

PART - A

I. Answer any ten questions :   **10 × 1 = 10**

1. Give the canonical representation of 306.

2. Write all the possible subsets of B = {a, b}

3. Simplify : $\left(\dfrac{5x^3}{y}\right)^2$

4. Solve for x : $\log_{0.1} 10 = x$

5. Find the 11th term of the A.P. 3, 5, 7, 9, ...

6. Solve for x : $x + a\ (x + b)\ = ax + b$

7. Define Annuity.

8. Convert 18% to ratio.

9. Express $\dfrac{3\pi}{5}$ in degrees.

10. Find the value of cos(480°)

11. Write the formula to calculate effective rate of interest?

12. Find the slope of the line with inclination 60°.

PART - B

II. Answer any ten questions :   **10 × 2 = 20**

13. Find the HCF of 55 and 210.

14. Convert $\dfrac{1}{4+3i}$ in $a+ib$ form and write real and imaginary parts.

13

15. Find the domain and range of

    $R = \{(1,2), (1,3), (1,4), (1,5), (1,6), (1,7)\}$

16. Simplify : $\dfrac{2^{n+1} + 2^{n-1}}{2^n + 2^{n+2}}$

17. If 5th term is $\dfrac{1}{5}$ and seventh term is $\dfrac{6}{5}$ in H.P, find the 10th term in H.P.

18. Solve the equations by elimination method :

    $x + 2y = 4; 3x + y = 7$.

19. The sum of three consecutive numbers is 183. Find them.

20. Solve the inequality : $3x + 8 > 2$ when $x \in I$ and $x \in R$.

21. A math professor while retiring wants to institute a scholarship of ₹ 5,000 every year to the student scoring highest marks in I Basic maths annual exam. How much should he deposit if bank offer 5% p.a.

22. Prove that $\dfrac{1}{\sec A + \tan A} = \sec A - \tan A$

23. Prove that $\cos(287°) - \sin(17°) = 0$

24. Find the perimeter of the triangle formed by the points $(3,1)$, $(5,2)$ and $(-1, 2)$.

25. Find the equation of the locus of the point which moves such that the square of its distance from $(2, 3)$ is 3.

PART - C

III. Answer any ten questions :   **10 × 3 = 30**

26. Find the number which when divided by 16, 20 and 40 leaves the same remainder 4.

27. Define an equivalence relation with an example. Also give an example of a relation which is only symmetric.

28. If $a^x = b^y = c^z$ and $b^2 = ac$ show that $\dfrac{1}{x} + \dfrac{1}{z} = \dfrac{2}{y}$.

29. Prove that $\log_4 8 . \log_2 32 \log_{16} 4 = \dfrac{15}{4}$.

30. The sum of three numbers in A.P is 15 and their product is 105. Find the numbers.

31. If α and β are the roots of the equation, $2x^2 + 4x + 1 = 0$. Find the value of β

    a) $\alpha^2 \beta + \beta^2 \alpha$ b) $\alpha^{-2} + \beta^{-2}$.

32. Solve the system of linear inequation in 2 variable graphically

$x + 3y \geq 3,\ 2x + y \geq 2,\ x \geq 0, y \geq 0$

33. ₹16000 invested at 10% p.a. compounded semi-annually amounts to ₹18522. Find the time period of investment.

34. A bookseller bought 228 note boks at an average price of ₹ 8.50 in which 80 books he bought at ₹7.50 each and 84 books at ₹10.50 each. Find the price of the remainingbooks per unit.

35. By how much percent should the use of milk be increased if the price of the milk is decreased by 20% so that the expenditure remains changed.

36. Simplify : cos A + sin(270 + A) – sin (270 – A) + cos(180 + A).

37. Find the value of k if the distance between (2k, 5) and (–k, –4) is $\sqrt{90}$.

38. Find the value of a if the lines $x - 2y = 1$, $2x + y = 7$ and $ax - 5y = 4$ are concurrent.

PART - D

I. **Answer any six questions :**

39. Out of 85 students of class I PU, who took up a combined test in English and Hindi. If 63 students passed in both, 12 failed in English and 4 failed only in English, use Venn diagram to find how many a) failed in Hindi b) passed in English   c) passed in Hindi.

40. Using logarithm tables, find the value of $\dfrac{0.5679 \times 0.0789}{0.0073 \times 0.123}$

41. How many terms of the G.P $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{8}$............ will make the sum $\dfrac{63}{64}$.

42. A number consists of 2 digits whose sum is 4. If 18 is added to the number, the digits get interchanged. Find the number.

43. A sum of money amounts to ₹ 19500 in 5 years and ₹ 22,200 after 8 years, at the same rate of interest. Find the rate of interest and also the principal.

44. Find the present value of an annuity of ₹ 500 payable for 10 years hence when interest of 10% is compounded half yearly.

45. A merchant purchased 25 baskets of fruits at ₹2 per basket. The fruits of 5 baskets turned out bad and were thrown off. Find the selling price per basket if he wants 12½% profit.

46. If $x = ar \sin A \cos B, y = br \sin A \sin B, z = cr \cos A$ then prove that $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z^2}{c^2} = r^2$.

47. Find the equation of straight line which passes through the point of intersetion of $2x - 3y = 4$ and $2x + 2y = 1$ and perpendicular to $x + 4y = 8$.

48. Find the co-ordinates of the vertices of the triangle given the midpoints of sides are (4, –1) (7, 9) (4, 11).

15

PART - E

V. Answer any one question :   **1 × 10 = 10**

49. a) In a certain college with 500 students, 300 take milk and 250 take tea. Find how many take (a) milk only   (b) tea only   (c) both milk and tea.

    b) Find the image of the point (2, 4) on the line $x + y - 10 = 0$

    c) The HCF of two number is 16 and their LCM is 160. If one of the numbers is 64, find the other numbers.

50. a) Find the sum to n terms of the series : $0.7 + 0.77 + 0.777 + ... +$ n terms.

    b) The daily cost of production c for x unit of an assembly is given by x, $C(x) = 17.5 + 7000$

        (i) If each unit is sold for ₹ 30, then determine the minimum of unit that should be produced and sold to ensure no loss.

        (ii) If the selling price is reduced by ₹ 3/unit then what would be the BEP?

        (iii) If it is known that 500 unit can be sold daily what price/unit should be charged to guarantee no loss?

    c) The average score of 20 boys is 60% and average score of 30 girls is 70%. Find the combined average score.

*****

SCHEME

PART-A

I. 1.

$$2 \mid 306$$
$$3 \mid \underline{153} \quad 306 = 2 \times 3^2 \times 17$$
$$3 \mid \underline{51}$$
$$\underline{17}$$

(1 Mark)

2. $P = \{\{a\}, \{b\}, \{a, b\}\}$ (1 Mark)

3. $\dfrac{25x^6}{y^2}$ (1 Mark)

4. $x = -1$ (1 Mark)

5. $T_{11} = 23$ (1 Mark)

6. $x = b(1 - a)$ (1 Mark)

7. An annuity is a fixed sum paid at regular intervals of time under certain conditions.   (1 Mark)

8. $9/50$ (1 Mark)

9. $108°$ (1 Mark)

10. $-\dfrac{1}{2}$ (1 Mark)

11. $r = \left(1 + \dfrac{i}{q}\right)^q - 1$ (1 Mark)

12. Slope $= \sqrt{3}$ (1 Mark)

PART-B

II. 13. Division   (1 Mark)

    HC.F. = 5   (1 Mark)

14. $\dfrac{1}{4 + 3i} \times \dfrac{4 - 3i}{4 - 3i}$

    $= \dfrac{4}{25} - \dfrac{3}{25}i$ (1 Mark)

    Real part $\dfrac{4}{25}$ and Imaginary part $-\dfrac{3}{25}$ (1 Mark)

17

15. Domain – {1}   (1 Mark)

Range – {2, 3, 4, 5, 6, 7}   (1 Mark)

16. $\left.\dfrac{2^n\left[2+\dfrac{1}{2}\right]}{2^n\left[1+2^2\right]}\right\}$ (1 Mark)

$=\dfrac{5}{2}\times\dfrac{1}{5}=\boxed{\dfrac{1}{2}}$ (1 Mark)

17. In H.P. $T_5=\dfrac{1}{5},\ T_7=\dfrac{6}{5}$ (1 Mark)

In A.P. $T_5=5,\ T_7=\dfrac{5}{6}$ (1 Mark)

$\left.\begin{array}{l}T_{10}=\dfrac{25}{2}\ \text{(In A.P)}\\[3mm]T_{10}=\dfrac{2}{25}\ \text{(In H.P)}\end{array}\right\}$ (1 Mark)

18. $\left.\begin{array}{l}3x+6y=12\\3x+y=7\\(-)\ \ (-)\ \ (-)\\\hline\quad\ \ 5y=5\\\quad\ \ \boxed{y=1}\end{array}\right\}$ **(1m)** $\left.\begin{array}{l}x+2y=4\\6x+2y=14\\(-)\ \ (-)\ \ (-)\\\hline-5x=-10\\\boxed{x=2}\end{array}\right\}$ **(1m)**

19. $x+x+1+x+2=183$ (1 Mark)

$x=60$ (1 Mark)

$60, 61, 62$

20. $x>-2$ (1 Mark)

$x=\{-1, 0, 1, 2\ .....\}\in I$

$x\in(-2,\infty)$

21. $P_\infty=\dfrac{a}{i}\ \Rightarrow\ 1,00,000$ (1+1 Mark)

22. $\text{LHS}=\dfrac{1}{\sec A+\tan A}\times\dfrac{\sec A-\tan A}{\sec A+\tan A}$ (1 Mark)

18

$$\Rightarrow \frac{\sec A - \tan A}{\sec^2 A - \tan^2 A}$$ 　　　　　　　**(1 Mark)**

$$\Rightarrow \sec A - \tan A \text{(RHS)}$$ 　　　　　　　**(1 Mark)**

23. $\cos(270° + 17°) = \sin 17°$ 　　　　　　　**(1 Mark)**

$\sin 17° - \sin 17° = 0$ 　　　　　　　**(1 Mark)**

24.
A(3,-1)

C(-1,2)　　B(5,2)

$AB = \sqrt{13}$, BC = 6, CA = 5 　　**(1Mark)**
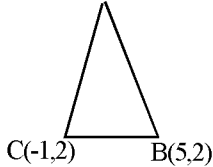
$\text{Perimeter} = \sqrt{13} + 11$ 　　**(1Mark)**

25. $(PA)^2 = 3$ 　　　　　　　**(1Mark)**

$x^2 + y^2 - 4x - 6y + 10 = 0$ 　　　　　　　**(1Mark)**

PART-C

26. L.C.M = 4×5×2×2

L.C.M = 80 　　　　　　　**(1+1Mark)**

∴ The number is 84. 　　　　　　　**(1Mark)**

27. Definition 　　　　　　　**(1Mark)**

= {(1,1) (2,2) (3,3)} 　　　　　　　**(1Mark)**

Ex　A = {1, 2}

　　R = {(1, 2) (2, 1)} 　　　　　　　**(1Mark)**

28. Let $a^x = b^y = c^z = K$

$a = K^{1/x}$, $b = K^{1/y}$, $c = K^{1/z}$

$b^2 = ac$

$K^{2/y} = K^{1/x} \cdot K^{1/z}$

29. $\dfrac{\log 8}{\log 4} \times \dfrac{\log 32}{\log 2} \times \dfrac{\log 4}{\log 16}$ 　　　　　　　**(1Mark)**

$$\Rightarrow \frac{3 \log 2 \times 5 \log 2}{\log 2 \times 4 \log 2} \Rightarrow \frac{15}{4}$$ 　　　**(1+1Mark)**

30. $\left. \begin{array}{r} a - d + a + a + d = 15 \\ a = 5 \end{array} \right\}$ 　　　**(1Mark)**

$\left. \begin{array}{r} (a-d)a(a+d) = 105 \\ d = \pm 2 \end{array} \right\}$ 　　　**(1Mark)**

The No's are 3, 5, 7 or 7, 5, 3.

31. $\left.\begin{array}{l}\beta + \propto \;=\; \dfrac{-b}{a} = -\dfrac{4}{2} = -2 \\[4mm] \propto \beta \;=\; \dfrac{c}{a} = \dfrac{1}{2}\end{array}\right\}$ (1 Mark)

   (a) $\propto \beta\left(\propto + \beta\right) = -1$ (b) 12   (1+1 Mark)

32.
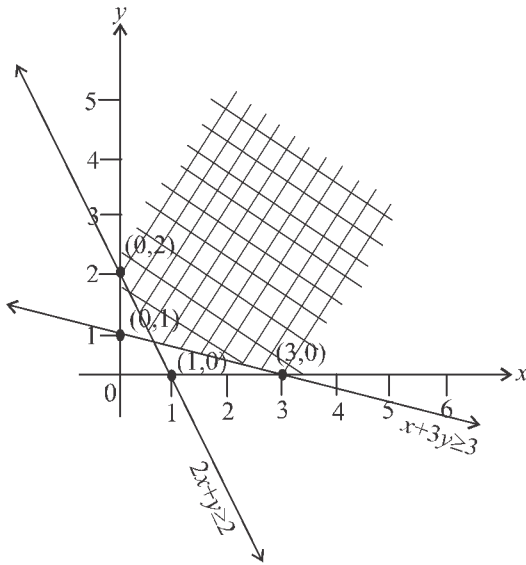
33. $18522 = 16000\left(\dfrac{1+0.1}{2}\right)^{2n}$ (1 Mark)

   $(1.05)^3 = (1.05)^{2n}$ (1 Mark)
   $n = 1.5$ yrs   (1 Mark)

34. $8.50 = \dfrac{80 \times 7.5 + 84 \times 10.5 + 64 \times x}{228}$ (1 Mark)

   $\left.\begin{array}{l}1938 = 600 + 882 + 64x \\[2mm] x = ₹\,7.125\end{array}\right\}$ (1 Mark)

35. Let price and quantity be 100 each
   Total expenditure = 10000   (1 Mark)
   New expenditure = 80, New quantity = y
   New expenditure = $80y$ (1 Mark)
          $\therefore$ $y = 125$

   Profit % = $\dfrac{25}{100} \times 100 = 25\%$ (1 Mark)

36. $\sin(270 + A) = \cos A$ **(1 Mark)**

    $\sin(270 - A) = \cos A$

    $\cos(180 + A) = \cos A$

    LHS cos A − cos A + cos A − cos A = 0   **(1 Mark)**

37. A($2x$, 5),   B = (− k − 4)   **(1 Mark)**

    AB = $\sqrt{90}$ **(1 Mark)**

    Simplification   **(1 Mark)**

    $k = \pm 1$ **(1 Mark)**

38. Gettting $x = 3$, $y = 1$ **(2 Mark)**

    Getting $a = 3$ **(1 Mark)**

PART-D

39. $n(H \cup E) = 85$
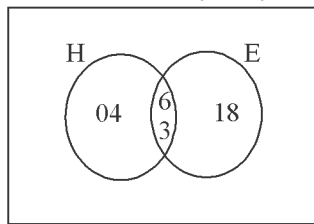
Venn diagram

    (a) 18 failed in Hindi   **(1m)**

    (b) 73 passed in English   **(1m)**

    (c) 67 passed in Hindi   **(1m)**

40. Let $\log x = \log\left[\dfrac{0.5679 \times 0.0789}{0.0073 \times 0.123}\right]$ **(1mark)**

    $\log x = \log 0.5679 + \log 0.0789$ **(1mark)**

             $\log 0.0073 - \log 0.123$ **(1mark)**

    $\log x = \bar{1}.7543 + \bar{2}.8971 - \bar{3}.8633 - \bar{1}.0899$

    $\log x = 1.6982$

       $x = $ Antilog $(1.6982) = 49.91$ **(1mark)**

41. $a = \dfrac{1}{2}$, $r\dfrac{1}{2} < 1$ **(1mark)**

    $S_n = \dfrac{63}{64}$, $n = ?$

$$S_n = \frac{a\left(1 - r^n\right)}{1 - r}$$ **(1mark)**

$$\frac{63}{64} = \frac{1}{4}\left(\frac{1 - \left(\frac{1}{2}\right)^n}{1 - \frac{1}{2}}\right)$$ **(1mark)**

$$\left.\begin{array}{l} 1 - \dfrac{63}{64} = \left(\dfrac{1}{2}\right)^n \\[2mm] \dfrac{1}{64} = \dfrac{1}{26} \end{array}\right\} \quad \boxed{n = 6}$$ **(1mark)**

42. Let 2 digits be x and y
∴ The number is $10x + y$

$$\left.\begin{array}{l} x + y = 4 \qquad \dots\dots(1) \\ 10x + y + 18 = 10y + x \\ 9x - 9y = -18 \\ (x - y) = -2 \qquad \dots\dots(2) \end{array}\right\}$$ **(1mark)**

     Solving (1) and (2)
     $x = 1, y = 3$ **(2mark)**
∴ The number is 13. **(1mark)**

43. $\left.\begin{array}{l} A_1 = 19500,\ n_1 = 5 \\ A_2 = 22,200,\ n_2 = 8 \end{array}\right\}$ **(1mark)**

$$\frac{A_1}{A_2} = \frac{P(1+i)^{n_1}}{P(1+i)^{n_2}}$$ **(1mark)**

$$\frac{19500}{22200} = \frac{(1+i)^5}{(1+i)^8}$$ **(1mark)**

→ Getting $i = 12.16\%$ **(3mark)**

44. $P = \dfrac{a[(1+r)^n - 1]}{r(1+r)}$ **(1mark)**

     where $r = \left(1 + \dfrac{i}{q}\right)^q - 1$ **(1mark)**

$$r = \left(1 + \frac{0.1}{2}\right)^2 - 1 = 0.1025$$ **(1mark)**

$$P = \frac{500[(1.1025)^{10} - 1]}{0.1025(1.1025)^{10}}$$ **(1mark)**

$$P = \frac{500 \times 1.6532977}{0.1025 \times 2.6532977}$$ **(3mark)**

P = ₹ 3039.5

45. C.P = ₹50 **(1mark)**
Given: Profit % = 12.5%

$$\text{Profit} = \frac{\text{Profit}}{\text{cp}} \times 100$$

$$\frac{12.5 \times 50}{100} = \text{Profit}$$ **(1mark)**

Profit = ₹ 6.25 **(1mark)**

To get profit as 12.5%

S.P should be 50+6.25 = 56.25 **(1mark)**

∴ Price per basket $= \dfrac{56.25}{20} = ₹\, 2.8125$ **(1mark)**

46. LHS

$x^2 + y^2 + z^2$

$\Rightarrow \dfrac{\not{a^2}\, r^2 \sin^2 A \cos^2 B}{\not{a^2}} + \dfrac{\not{b^2}\, r^2 \sin^2 A \sin^2 B}{\not{b^2}} + \dfrac{\not{c^2}\, r^2 \cos^2 A}{\not{c^2}}$ **(2mark)**

$\Rightarrow r^2 \sin^2 A\, [\cos^2 B + \sin^2 B] + r^2 \cos^2 A$ **(1mark)**

$\Rightarrow r^2 \sin^2 A\, (1) + r^2 \cos^2 A$ **(1mark)**

$\Rightarrow r^2(1) = r^2 (\text{RHS})$ **(1mark)**

47. $2x - 3y = 4$
            $2x + 2y = 1$
            $\underline{(-)\quad(-)\quad(-)}$
            $\quad\quad -5y = 3$
            $\quad\quad\quad y = \dfrac{-3}{5}$

$2x = \dfrac{11}{5} \Rightarrow x = \dfrac{11}{10}$ **(1 mark)**

Point of intersection

$\left(\dfrac{11}{10}, \dfrac{-3}{5} \right)$ **(2 mark)**

Any line $\perp^r$ to $x + 4y = 8$ is of the form $4x - y + K = 0$ **(1 mark)**

Since line is passing through $\left(\dfrac{11}{10}, \dfrac{-3}{5} \right)$

$\therefore \quad 4\left(\dfrac{11}{10} \right) - \left(\dfrac{-3}{5} \right) + K = 0$

$\Rightarrow \quad \boxed{K = -5}$ **(1 mark)**

$\therefore$ Required line is $4x - y - 5 = 0$.   **(1 mark)**

48. Let P be (2, 4) and Q(x, y) be its reflection on the $x - y - 10 = 0$.

    Let PQ cut the lien at R.

    R is midpoint of PQ

    $R = \left(\dfrac{x_1 + 2}{2}, \dfrac{y_1 + 4}{2} \right)$ **(1 mark)**

    Since R lies on $\quad x + y - 10 = 0$

    We have $\left(\dfrac{x_1 + 2}{2}, \dfrac{y_1 + 4}{2} \right) - 10 = 0$

    $\quad\quad\quad\quad x_1 + y_1 - 14 = 0$ **(1 mark)**

    Slope of $PQ = \dfrac{y_1 - 4}{x_1 - 2}$

    Using $M_1 \cdot M_2 = -1$ getting

$$x_1 - y_1 + 2 = 0 \qquad \text{(2mark)}$$

Solving (1) and (2)

$\therefore$ We get $x_1 = 6$ and $y_1 = 8$

$\therefore$ Image = Q(6, 8) **(1mark)**

PART-E

49. (a) n(M) = 300, n(T) = 250

n(M $\cup$ T) = 500 **(1mark)**

(i) n(M–T) = n(M) – n(M $\cap$ T)

= 300 – 50 = 250 **(1mark)**

(ii) n(T–M) = n(T) – n(M $\cap$ T)

= 250 – 50 = 200 **(1mark)**

(iii) n(M $\cap$ T) = n(M) + n(T) – n(M $\cup$ T)

= 300 + 250 – 500 = 50 **(1mark)**

(b) Let P (2, 4) and Q(x_1, y_1) be its reflection on the line $x - y - 10 = 0$ **(1mark)**

Let R cuts PQ at mid point.

$$R = \left(\frac{x_1 + 2}{2}, \frac{y_1 + 4}{2} \right) \text{lies on the line } x + y - 10 = 0$$

Slope of PQ = $\dfrac{y_1 - 4}{x_1 - 2}$ **(1mark)**

$m_1 \times m_2 = -1$ solving weight Q(x_1, y_1) = (6, 8)

(c) HCF = 16, LCM = 160,

$a = 64, b = ?$

$$\left. \begin{array}{l} \text{HCF} \times \text{LCM} = a \times b \\ 16 \times 160 = 64 \times b \end{array} \right\} \qquad \textbf{(1mark)}$$

$$b = \frac{16 \times 160}{64} = 40 \; ; \quad \boxed{b = 40} \qquad \textbf{(1mark)}$$

50. (a) S = 0.7 + 0.77 + 0.777 + ... n terms

S = 7[0.1 + 0.11 + 0.111 + ... n terms] **(1mark)**

S = 7[0.9 + 0.99 + 0.999 + ... + n^{th} terms]

$$S = \frac{7}{9}\left(1 - \frac{1}{10}\right) + \left(1 - \frac{1}{100}\right) + \left(1 - \frac{1}{1000}\right) + ... \text{ to } n^{th} \text{ terms}$$

(2mark)

$$S = \frac{7}{9}\left(1 + 1 + 1 + ... \text{ to } n^{th} \text{ terms}\right) - \left(\frac{1}{10} + \frac{1}{100} + \frac{1}{1000} + ... n^{th} \text{ terms}\right)$$

$$S_n = \frac{7}{9}\left[n - \frac{1}{9}\left(1 - \frac{1}{10^n}\right)\right]$$

                                                    (1mark)

(b) $C(x) = 17.5x + 7000$

    (i)   S.P = 30, $R(x) = 30x$

           $C(x) = R(x)$

           $17.5x + 7000 = 30x$

           $12.5x = 7000$

           $x = 560$ units   **(1mark)**

    (ii) $R(x) = 27x$

           $17.5x + 17000 = 27x$

           $9.5x = 7000$

           $x = 736.842$ units   **(1mark)**

    (iii) $x = 500$ (Given)

$$C(500) = 15750$$

$$\text{Price/ Unit} = \frac{15750}{500} = ₹31.5 \Bigg\}$$

                                                      (2mark)

(c) Combined average $= \dfrac{60 \times 20 + 30x}{20 + 30} = 0 = 66\%$ **(2 Mark)**

<div align="center">✵ ✵ ✵ ✵ ✵</div>

I PUC MODEL QUESTION PAPER-3

BASIC MATHEMATICS

Time : 3 hrs. 15 min   **Marks : 100**

Instructions :	1) The question paper consists of five parts A, B, C, D & E.
	2) Part A carries 10 marks, Part B carries 20 marks, part C carries 30 marks, part D carries 30 marks and part E carries 10 marks.
	3) Write the question numbers propertly as indicated in the question paper.

PART - A

I. Answer any ten questions :   **10 × 1 = 10**

1. Write the imaginary part of 3 – 7i.

2. If A = {2, 3, 5} find P(A)

3. Simplify : $\left(a^{\frac{1}{2}}\right)\left(a^x\right)^{\frac{1}{2}}$

4. Convert $\log_9 81 = 2$ into exponential form.

5. Find the 8th term of an A.P –2, –4, –6, ...

6. Solve for x : $3(x+5) - 25 = 9 + 2(x-7)$

7. Find the simple interest for 245 days for ₹ 6000 at 8% pa. simple interest.

8. Define perpetuity.

9. What percent if 7 paise of ₹ 75?

10. Convert 95° into radians.

11. If A = 30° verify sin^{2}A = 2sinAcosA

12. Find the slope of $3x – 8y + 7 = 0$.

PART - B

II. Answer any ten questions :   **10 × 2 = 20**

13. Find the number of all positive divisors of 672.

14. Find the LCM of 12, 21 and 24.

27

15. If $A = \{3,5,7\}$ $B = \{5,7,9\}$ $C = \{7,9,11\}$ find $(A \cap B \cap C) \times C$

16. Simplify $\dfrac{a^{m+n} . a^{2m-n}}{a^{m-n}}$

17. Which element of the G.P 5, 10, 20, is 80?

18. The sum of 6 times a number and 5 times the number is 55. Which is that number?

19. If α and β are the roots of the equations $3x^2 - 6x + 4 = 0$, find the values of (i) $\alpha^2 + \beta^2$ (ii) $\alpha^3 + \beta^3$

20. Solve $3x - 2 < 2x + 1 (x \in R)$ represent on the number line.

21. Write the formula of future value of annuity immediate and explain the terms.

22. Find the value of $\cos^2 30° + \cos^2 45° + \cos^2 60°$.

23. Find the centroid of the triangle with vertices (7, –3), (4, 6) (–11, –3).

24. Evaluate $\operatorname{cosec}(1305°)$.

25. A point P moves such that $PA^2 = 3PB^2$. If A = (5, 0) and B = (–5, 0). Find the equation of the locus of P.

<div align="center">

PART - C

</div>

III. Answer any ten questions :   **10 × 3 = 30**

26. Prove that $\sqrt{2}$ is an irrational number.

27. A relation R is defined on the set of integers R = $\{(x,y) : x - y$ is a multiple of non-zero integer 5$\}$ show that R is an equivalence relation on Z.

28. If $a^{\frac{1}{3}} + b^{\frac{2}{3}} + c = 0$ then show that $(a + b^2 + c^3)^3 = 27ab^2c^3$.

29. If $\log\left(\dfrac{a+b}{4}\right) = \dfrac{1}{a}[\log a + \log b]$ show that $(a-b)^2 = 12ab$.

30. If a, b, c are in G.P and $a^x = b^y = c^z$ show that x, y, z are in H.P.

31. Divide 36 into two parts such that the sum of the reciprocals is $\dfrac{1}{8}$

32. The value of a machinery depreciates every year by 20%. What would be the value of the machinery bought for ₹ 6250 at the end of 3 years.

33. Show that the points (1, –1) (5, 2) and (9, 5) are collinear.

34. A batsman's average score for a number of innings was 21.75 runs per innings. In the next three innings he scored 28, 34 and 37 runs. And his average for all the innings was revised by 1.125 runs. How many innings did he play?

<div align="center">28</div>

35. Solve the inequality $x + 3y \geq 3, 2x + y \geq 2$ graphically.

36. By selling a book a bookseller gets a profit of 10%. If he had bought it at 4% less and sold it for 6 more, he would have gained $18\frac{3}{4}\%$. What did it cost him?

37. If $\sin\theta = -\frac{3}{5}$ and lies in IV quadrant then prove that $\frac{3\tan\theta - 4\cos\theta}{4\tan\theta + 3\cos\theta} = \frac{109}{12}$.

38. Derive the equation of a line in two point form.

PART - D

I. Answer any 6 questions :

39. In a group of 150 people, 70 like cricket, 30 like hockey and cricket both. How many like hockey? Show the result using Venn diagram.

40. Evaluate $\dfrac{\sqrt{6.43} \times 0.5789}{(13.46)^{\frac{3}{2}}}$ using log table.

41. Find the sum of all integers between 60 and 400 which are divisble by 13.

42. Obtain a root of the equation $x^3 - 2x^2 - 2x + 3 = 0$ by inspection and hence solve the equation.

43. The difference between simple interest and compound interest on a certain sum of money invested for 3 years at 6% p.a. is 110.16. Find the sum.

44. How much should invest if you want to receive ₹ 5000 at the beginning of each year for the next 5 years if the compound interest is 16% p.a. compounded quarterly.

45. A person gives 50% of his salary to his wife, 40% of the remaining he spends on recreation,20% of the remaining hegives tohis daughter as pocket money and still saves 12,000. What is the person's income. Also find the amount he gives to his wife and daughter.

46. Prove that (1+cot A – cosecA) (1+tanA + secA) = 2.

47. Find the area of quadrilateral whose vertices are (1, 2), (6, 2), (5, 3), (3, 4).

48. Find the equation of the medians of the triangle whose vertices are A(2,3), B(–1, –4) C(5, –2).

PART - E

V. Answer any one question :   **1 × 10 = 10**

49. a) If $f(x) = 2x + 1$, $g(x) = x^2 + 2x + 1$ find   **(4)**

    (i) fog(1)   (ii) gof(1)   (iii) fog(–2)   (iv) gof(–2)   **(4)**

b) Find the sum to 'n' terms of the G.P $0.6 + 0.66 + 0.666 + ...$

c) If the product of two numbers is 216 and their LCM is 36. Find their HCF.   **(2)**

50. a) A confectioner makes and sells biscuit. He sells one pack of biscuit at ₹ 80. His cost of manufacturing is ₹ 40 per packet as variable cost and ₹ 3000 as fixed cost. Find the

(i) Revenue function (ii) Profit function (iii) Cost function (iv) Break even point.   **(4)**

b) Show that the straight line equations are concurrent if $2x - 3y = 7$, $3x - 4y = 13$,   **(4)**

$8x - 11y = 33$

c) The average age of 10 students is 6 years. The sum of the ages of 9 of them is 52 years. Find the age of 10th student.   **(2)**

$$\star\star\star\star\star$$

SCHEME
PART-A

I. 1. -7 (each one mark)

2. $P(A) = \{\{2\},\{3\},\{5\},\{2,3,5\},\varphi,\{2,3\},\{3,2\},\{2,5\}\}$

3. $a^{\frac{x+1}{2}}$

4. $9^2 = 81$

5. -16

6. $x = 5$

7. $\dfrac{PTR}{100} = 600 \times \dfrac{245}{365} \times \dfrac{8}{100} = 32.219$

8. Annuity received for forever is called Perpetuity.

9. 0.0933%

10. $95 \times \dfrac{\pi}{180} = \dfrac{19\pi}{36}$

11. $\sin(60°) = \dfrac{\sqrt{3}}{2},\ 2\sin 30° \cos 30° = \dfrac{\sqrt{3}}{2}$

12. $\dfrac{3}{8}$

PART-B

II. 13. $672 = 2^5 \times 3^1 \times 7^1$ (1 Mark)

$\begin{array}{r|l} 2 & 672 \\ 3 & 336 \\ 2 & 112 \\ 2 & 56 \\ 2 & 28 \\ 2 & 14 \\ & 7 \end{array}$ Number of positive divisors $= (1+\alpha_1)(1+\alpha_2)(1+\alpha_3) = 24$ (1 Mark)

14. $2 \times 2 \times 2 \times 3 \times 7 = 168$ $\begin{array}{r|l} 2 & 12,21,24 \\ 2 & 6,21,12 \\ 2 & 3,21,6 \\ 3 & 3,21,3 \\ & 1,7,1 \end{array}$ (1+1 Mark)

31

15. $A \cap B \cap C = \{7\}$　　　　　　　　　　　　　**(1 Mark)**

　　$(A \cap B \cap C) \times C = \{(7,7),(7,9),(7,11)\}$　　　　**(1 Mark)**

16. $a^{m+n+2m-n-m-n}$　　　　　　　　　　　　　　**(1 Mark)**
　　　　　　　　　　　　　　　　　　　　　　　　　　(1 Mark)

　　$\Rightarrow a^{2m-n}$

17. $80 = \dfrac{5\left[2^n - 1\right]}{2-1}, \quad n = 5$　　　　　　　　　**(1+1 Mark)**

18. $6x + 5x = 55, \quad x = 5$　　　　　　　　　　　**(1+1 Mark)**

19. $\alpha + \beta = 2, \; \alpha\beta = \dfrac{4}{3}$

　　$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta = (2)^2 - 2\left(\dfrac{4}{3}\right) = \dfrac{4}{3}$　　**(1 Mark)**

　　$\alpha^3 + \beta^3 = (\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta) = 0$　　　**(1 Mark)**

20. $x < 3$　　　　　　　　　　　　　　　　　　　　**(1 Mark)**

21. $F = \dfrac{a[(1+i)^n - 1]}{i}$　　　　　　　　　　　**(1 Mark)**

　　Explain the term　　　　　　　　　　　　　　　**(1 Mark)**

22. $\left(\dfrac{\sqrt{3}}{2}\right)^2 + (1)^2 + \left(\dfrac{1}{2}\right)^2$　　　　　　　　　**(1 Mark)**

　　$= \dfrac{3}{2}$　　　　　　　　　　　　　　　　　　**(1 Mark)**

23. $\left(\dfrac{7+4-11}{3}, \dfrac{-3+6-3}{3}\right) = (0,0)$　　　**(1+1 Mark)**

24. cosec $(3 \times 360 + 225)$　　　　　　　　　　　**(1 Mark)**
　　cosec $225 =$ cosec $(180 + 45)$　　　　　　　**(1 Mark)**
　　$= -$ cosec $45 = -\sqrt{2}$　　　　　　　　　　　**(1 Mark)**

25. $\perp^r$ from $3x - 5y + k = 0, \boxed{k = 7}$　　　　　**(1 Mark)**

　　$3x - 5y + 7 = 0$　　　　　　　　　　　　　　　**(1 Mark)**

32

PART-C

III.

26. $\sqrt{2} = \dfrac{p}{q}, q \neq 0$ **(1 Mark)**

     $2q^2 = p^2 \, (2 \text{ divides } p) \quad p = 2k$ where $k \, 9$ is an integer $p^2 = 4k$ **(1 Mark)**

     $\Rightarrow q$ is even·   **(2 Mark)**

27. (i) R - Reflexive

     $_x R_x \Rightarrow x - x$ is a multiple of 5, $\forall x \in z$ **(1 Mark)**

     (ii) Symmetric x **(1 Mark)**

     $5/-(x - y)$ **(1 Mark)**

     $\therefore \; 5/y - x$

  (iii) Transitive

     $5/x - y \quad \& \quad 5/y - z$ **(1 Mark)**

     $5/(x - y) + (y - z) \Rightarrow 5/x - z \Rightarrow (x, z) \in \mathrm{R}$ **(1 Mark)**

28. $a^{\frac{1}{3}} + b^{\frac{2}{3}} = -C$ **(1 Mark)**

    Cubing on both sides

    $\Rightarrow a^2 + b^2 + 3a^{\frac{1}{3}} b^{\frac{2}{3}} (-c) = -c^3$ **(1 Mark)**

    Again cubing $\Rightarrow \left(a^2 + b^2 + c^3\right)^3 = 27ab^2c^3$ **(1 Mark)**

29. $\log \dfrac{a + b}{4} = \log(ab)^{\frac{1}{2}}$ **(1 Mark)**

    $\left(\dfrac{a + b}{4}\right)^2 = ab$ **(1 Mark)**

    $a^2 + b^2 + 2ab = 16ab \Rightarrow (a - b)^2 = 12ab$ **(1 Mark)**

    $a^2 + b^2 + 2ab - 4ab = 16ab - 12ab$ **(1 Mark)**

30. a,b,c in G.P $\Rightarrow \dfrac{b}{a} = \dfrac{c}{b} \Rightarrow b^2 = ac$ **(1 Mark)**

$a^x = b^y = c^z = -k$

$\Rightarrow a = k^{\frac{1}{x}}, b = k^{\frac{1}{y}}, c = k^{\frac{1}{z}}$ $\therefore \ b^2 = ac$ **(1 Mark)**

$\Rightarrow \left(k^{\frac{1}{y}}\right)^2 = \left(k^{\frac{1}{x}}\right)\left(k^{\frac{1}{z}}\right) \Rightarrow \dfrac{2}{y} = \dfrac{x+z}{xz}$ **(1 Mark)**

31. $x + y = 36$ & $\dfrac{1}{x} + \dfrac{1}{y} = \dfrac{1}{8}$ **(1 Mark)**

$x = 24$, $y = 12$ **(1 Mark)**

32. $A = P(1-i)^n$ **(1 Mark)**

$A = 6250(0.8)^3 = 3200$ **(2+1 Mark)**

33. $\left.\begin{array}{l} \text{A B} = 5 \\ \text{B C} = 5 \\ \text{A C} = 10 \end{array}\right\}$ **2m**

AB + BC = AC   **(1 Mark)**

34. Total runs in 'x' innings = $21.75x$

New avg after 3 innings raised to = $21.75 + 1.125$
$= 22.875$ **(1 Mark)**

$\therefore$ Avg. run after $(x + 3)$ innings = $\dfrac{\text{Total runs}}{\text{Total no. of innings}}$ **(1 Mark)**

$22.875 = \dfrac{21.75x + 99}{x + 3}$

$x = 27 + 3 = 30$ **(1 Mark)**

35.
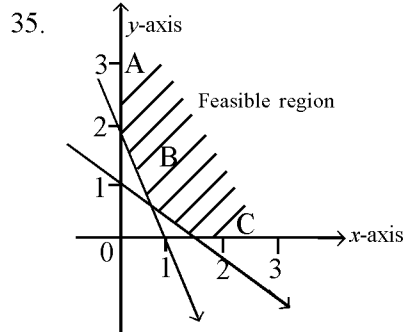
36. Let C.P = 'x', S.P = $\dfrac{110x}{100}$ **(1 Mark)**

If C.P is 4% less i.e. $x - \dfrac{4}{100} = \dfrac{96x}{100}$ **(1 Mark)**

C.P = S.P $\times \dfrac{100}{(100+\text{Profit})\%}$

$\therefore \dfrac{96x}{100} = \left(\dfrac{110x+600}{100}\right)\left(\dfrac{400}{475}\right)$

$\therefore \boxed{x = 150}$ **(1 Mark)**

37. $\tan\theta = -\dfrac{3}{4}$ $\cos\theta = \dfrac{4}{5}$ **(1 Mark)**

Simplification   **(1 Mark)**

Getting = $\dfrac{109}{12}$ **(1 Mark)**

38. Let A = (x_1, y_1) B = (x_2, y_2) P(x,y) **(1 Mark)**
A, P, B are collinear   **(1 Mark)**
Slope of AP = Slope of AB

$\dfrac{y - y_1}{x - x_1} = \dfrac{y_2 - y_1}{x_2 - x_1}$ **(1 Mark)**

PART-D

III.

39. $n(A) = 70$, $n(A \cap B) = 30$, $n(B) = ?$

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$ **(1 Mark)**

$150 = 70 + n(B) - 30$ **(1 Mark)**

$\boxed{n(B) = 110}$ A = Cricket;   B = Hockey   **(1 Mark)**

Venn Diagram   **(2 Mark)**
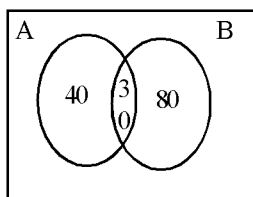
40. $\log x = \log(6.43)^{\frac{1}{2}} + \log 0.5789 - \log(13.46)^{\frac{3}{2}}$

    $\log x = 0.4041 + \bar{1}.7626 - 1.6935$ **(1 Mark)**

    $\log x = -1.5268$ **(1 Mark)**

    $x = A.L.(\bar{2}.4732)$ **(1 Mark)**

    $\therefore x = 0.0297$ **(1 Mark)**

41. $S_n = 65 + 78 + 91 + \ldots\ldots\ldots + 390$ **(1 Mark)**

    $390 = 65 + (n-1)13$ **(1 Mark)**

    $n = 26, \quad S_n = \frac{n}{2}(a+l)$ **(1 Mark)**

    $\therefore \boxed{S_n = 5915}$ **(2 Mark)**

42. $x = 1$
    $$1 \begin{array}{|cccc}
    1 & -2 & -2 & 3 \\
    0 & 1 & -1 & -3 \\
    \hline
    1 & -1 & -3 & \underline{|0}
    \end{array}$$ **(2 Mark)**

    $x^2 - 3x - 3 = 0$ **(1 Mark)**

    $x = \dfrac{1+\sqrt{13}}{2}, \dfrac{1-\sqrt{13}}{2}$ **(2 Mark)**

43. $S.I = 0.18x$ **(1 Mark)**

    $C.I = 1.191016x - x$ **(1 Mark)**

    $C.I = 0.191016x$ **(1 Mark)**

    $C.I - S.I = 110.16, \quad \boxed{x = 10,000}$ **(2 Mark)**

44. $i = \left[1 + \dfrac{0.16}{4}\right]^4 - 1 = 16.98$ **(1 Mark)**

    $P = \dfrac{A\left[(1+i)^n - 1\right](1+i)}{i(1+i)n} = \dfrac{5000\left[(1.1698)^5 - 1\right](1.1698)}{0.1698(1.1698)^5}$ **(2 Mark)**

    $= \dfrac{6963}{0.3719}, \quad P = 18,722.77$ **(2 Mark)**

45. Let amount be 'x'

Given to wife 50% of $x = \dfrac{x}{2}$

Amount remaining $= \dfrac{x}{2}$

Amount used for recreation $= 40\%$ of $x = \dfrac{x}{2} = \dfrac{x}{5}$ **(1 Mark)**

Remaining amount $= \dfrac{3x}{10}$

Amount given to daughter $= 20\%$ of $\dfrac{3x}{50} = \dfrac{3x}{50}$,

Remaining amount $= \dfrac{12x}{50}$ **(1 Mark)**

$12x = 12000 \times 50$

$\therefore x = 50,000$ **(1 Mark)**

Amount given to wife $= \dfrac{x}{2} = 25,000$ **(1 Mark)**

daughter $= 3000$

46. Writing in terms of sin and cos **(1 Mark)**
Taking LCM **(1 Mark)**
Solving **(2 Mark)**
Getting 2. **(1 Mark)**

47. $\dfrac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) \right]$

$\Delta ABC = \dfrac{1}{2}\left[1(2-3) + 6(3-2) + 5(1-6) \right]$

$\dfrac{1}{2}(-20) = (-10) = 10$ sq. units. **(2 Marks)**

$\Delta ACD = \dfrac{1}{2}\left(2(3-4) + 5(4-2) + 3(2-3) \right) = \dfrac{1}{2}[5]$

Total $= 10 + \dfrac{5}{2} = \dfrac{25}{2}$ **(1 Mark)**

48. Midpoint of B C $= (2, -3)$

Midpoint of AB $= \left(\dfrac{1}{2}, -\dfrac{1}{2} \right)$; Midpoint of AC $= \left(\dfrac{7}{2}, \dfrac{1}{2} \right)$

Eqn. of median AD $\rightarrow$ $\boxed{x - 2 = 0}$ **(1 Mark)**

Eqn. of median BE is $\rightarrow$ $\boxed{x - y = 3}$ **(1 Mark)**

Eqn. of median CF is $\rightarrow$ $\boxed{x + 3y + 1 = 0}$ **(1 Mark)**

PART-E

49. (a) (i) $f(4) = 9$ **(1 Mark)**

     (ii) $g(3) = 16$ **(1 Mark)**

     (iii) $f(1) = 3$ **(1 Mark)**

     (iv) $g(-1) = 2$ **(1 Mark)**

(b) $S_n = 6[0.1 + 0.11 + 0.111 + \ldots\ldots\ldots + n]$

$$S_n = \frac{6}{9}[0.9 + 0.99 + 0.999 + \ldots + n] = \frac{6}{9}[1 + 1 + 1 + \ldots + n] - \left(\frac{1}{10} + \frac{1}{100} + \frac{1}{1000} + \ldots\ldots + n\right) \quad \textbf{(1M)}$$

$$= \frac{6}{9}\left[n - \frac{\frac{1}{10}\left(1 - \frac{1}{10^n}\right)}{1 - \frac{1}{10}}\right] \quad \textbf{(1 Mark)}$$

(c) $\text{HCF} = \dfrac{ab}{\text{LCM}}$ **(1 Mark)**

$\text{HCF} = \dfrac{216}{36} = 6$ **(1 Mark)**

50. (a) R = Q $\times$ P = $80x$ **(1 Mark)**
     (b) $C(x) = 40x + 3000$ **(1 Mark)**
     (c) $P(x) = 40x - 3000$

     (d) $40x + 3000 = 80x \Rightarrow \boxed{X = 75}$ **(1 Mark)**

(b)
$$\begin{array}{rcl}
2x - 3y &=& 7 \\
3x - 4y &=& 7 \\
\hline
x = 11 \quad y = 5 & & \rightarrow(2 \text{ Mark})
\end{array}$$
     (2 Mark)

     proving concurrency

(c) Total age of 10 students = 60 yrs   **(1 Mark)**

(–) Total age of 9 students = 52 yrs   **(1 Mark)**

     10^{th}students age = 8 yr.

I PUC BASIC MATHEMATICS

(SUBJECT CODE: 75)

CHAPTERWISE QUESTIONS OF

1MARK, 3 MARK, 4 MARK, 5 MARK

AND 6 MARK

WITH DOMAIN, KNOWLEDGE, UNDERSTANDING,

APPLICATION AND SKILL

UNIT I - ALGEBRA

Number Theory

1

1m	2m	3m	4m	5m	Total
1(K)	3(1A+2A)	1	–	–	10

1 MARK QUESTIONS

1. Give the canonical representation of 96.
2. Give the canonical representation of 306.
3. Give the canonical representation of 5005.
4. Define prime number.
5. Define composite number.
6. If $Z_1 = 2 + 3i$, $Z_2 = 1 - i$. Find $Z_1 + Z_2$.
7. If $Z_1 = 6i + 3$, $Z_2 = i - 3$. Find $Z_1 - Z_2$.
8. Find the real part of $3 + 5i$.
9. Find the imaginary part of $\dfrac{2}{3} - \dfrac{4i}{5}$.
10. Find the imaginary part of $4 - i$.
11. Find the conjugate of $Z = 3 - 2i$.
12. Express $\dfrac{8}{125}$ as decimals.
13. Find the HCF of 16, 24, 48.

2 MARKS QUESTIONS

1. Find the number of divisors of $3^4 \times 5^3 \times 7^2$. **(1-Application, 2-Knowledge)**
2. Find the number of divisors of 1644.
3. Find the least integer divisible by 18 and 24.
4. If the product of two numbers is 216 and their LCM is 36.Find their HCF.
5. If the HCF of two numbers is 42 and their product is 52920. Find their LCM.
6. Find the largest integer which divides 105 and 315.
7. Find the LCM of $\dfrac{6}{7}, \dfrac{5}{14}, \dfrac{8}{21}$.

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8. Find the HCF of $\dfrac{8}{9}, \dfrac{32}{81}, \dfrac{16}{27}$.

9. Find the real and imaginary part of $6i - 2$.

10. Find LCM of 36, 40 and 48.

11. Find LCM of 30, 60 and 90.

12. Find HCF of 165, 225 and 435.

13. Find HCF of 60, 72 and 84.

14. Find real and imaginary part of $\dfrac{1}{4+3i}$.

15. Express $\dfrac{1+2i}{3-4i}$ in $a+ib$ form.

16. Find HCF of 55 and 210.

17. Find LCM of 48, 96 and 74.

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3 MARKS QUESTIONS

1. Find the number which when divided by 36, 40 and 48 leaves the same remainder 5.

2. Find the number which when divided by 16, 20 and 40 leaves the same remainder 4.

3. Find the greatest number which divides 39, 48 and 90 leaving remainder 6, 4 and 2 respectively.

4. Prove that $\sqrt{2}$ is irrational number.

5. Prove that $\sqrt{5}$ is irrational number.

6. Prove that $2+\sqrt{3}$ is irrational number.

7. Three bells call at intervals 30 sec., 40 sec., 50 sec. respectively. They start together. After how many minutes will next bell fall together.

8. The cost of a chair is ₹600 and the cost of a table is ₹900. Find the least sum of money that a person must posses in order to purchase a whole number of chairs or tables.

9. Three scales are 65cm, 85cm and 95cm is length. What is the length of the cloth that can be measured exact number of times using any one of these three scales.

10. Find the number of positive divisors and the sum of all positive divisors of 825.

11. Find the number of positive divisors and the sum of all positive divisors of 1024.

12. Find the number of positive divisors and the sum of all positive divisors of 960.

＊ ＊ ＊ ＊ ＊

Sets, Relations and Functions ⟨2⟩

1m	2m	3m	4m	5m	Total
1(K)	1(K)	1(K)	1(U)	1(K)	15

1 MARK QUESTIONS

1. If set A has 4 elements, how many elements will P(A) have? **(Knowledge)**
2. Convert to set builder form: A = {4, 8, 12 ....}
3. Convert to Roster form
   A = {x : x is a letter in the word 'ENGINEERING'}
4. If A = {1, 2} & B = {a, b} then find B × A.
5. If f: R → R is defined by $f(x) = 3x + 4$ then find $f\left(\dfrac{1}{3}\right)$.
6. If A = {1, 2, 3, 4, 5}, B = {1, 2, 3, 4, 5, 6, 7, 8}. Find A – B.
7. If f: R → R is defined by $f(x) = 3x - 5$ then find $f(-2)$.
8. If $f(x) = x + 1$ and $g(x) = x^2 + 1$ find fog(1).
9. If A = {1, 2, 3, 4, 5}, B = {1, 2, 3, 4} and R is a relation from A to B defined by R = {(x, y) : $y = 2x + 1$} find R.
10. If A = {1, 2, 3, 4, 5}. Find a relation from A to B defined by R = {(x, y) : $x > y$}.
11. A function $f(x)$ is defined as $f(x) = 2x + 1$. Find the value of $f(-3)$.
12. If R = {(1, a) (1, b) (2, a)} then find R^{-1}.
13. Define equivalence relation.
14. Give an example of a relation which is transitive but not reflexive and not symmetric.
15. If A = {2, 3}, B = {3, 4}. Find the number of relations that can be defined from A to B.

2 MARKS QUESTIONS

1. Represent "Set of prime numbers less than 20" in both roster form and set builder form. **(Knowledge)**
2. If A = {a, b, c}, how many elements will P(A) have? Write all the possible subsets of A.
3. If A = {a, b, c, d}, B = {d, e, f, g}. Find (A – B) × A.
4. If A × B = {(a, 1) (a, 2) (a, 3) (b, 1) (b, 2) (b, 3)}. Find A and B.
5. If $(2x + 4, 3x + y) = (8, 0)$. Find x and y.
6. If $(x + y, x - y) = (5, 1)$. Find x and y.

7. If $U = \{a, b, c, d, e, f, g\}$, $A = \{a, b, c, d\}$, $B = \{b, d, f, g\}$. Find $(A \cap B)'$.

8. If $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8, 10, 12\}$. Define a function f: $A \to B$ by $f(x) = x + 1$ $\forall x \in A$. Is the function one-one and onto.

9. If $A = \{x : x \in N \text{ and } x < 3\}$ and $B = \{x : x^2 - 16 = 0 \text{ and } x > 0\}$. Find $B \times A$.

10. If $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$, $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$. Verify $(A \cup B)' = A' \cap B'$.

11. Find the domain and range of $R = \{(1, 2) (1, 3) (1, 4) (1, 5) (1, 6) (1, 7)\}$.

12. If $f(x) = x - 1$ and $g(x) = 2x^2 - 3$. Find fog(2) and gof(2).

13. If $f(x) = x^3$. Find the value of $\dfrac{f(3) - f(2)}{3 - 2}$.

14. If $A = \{3, 5, 7\}$, $B = \{5, 7, 9\}$. Find $(A \cap B) \times (B - A)$.

15. If $A = \{1, 2\}$, $B = \{2, 3\}$, $C = \{3, 4\}$. Find $A \times (B \cup C)$.

16. If $A \times B = \{(-1, a) (-1, b) (-2, a) (-2, b) (3, a) (3, b)\}$. Find A and B.

17. If X and Y are two sets such that $X \cup Y$ has 50 elements, X has 28 elements and Y has 32 elements, how many elements does $X \cap Y$ have.

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3 MARKS QUESTIONS

1. A relation R on a collection of set of integers defined by $R = \{(x, y) : x - y$ **(Knowledge)** is a multiple of 3$\}$. Show that R is an equivalence relation on Z.

2. A relation R is defined on the set of integers by $R = \{(x, y): x - y$ is a multiple of 5$\}$. Show that R is an equivalence relation on Z.

3. Show that the relation 'is congruent to' is an equivalence relation. On a set T of triangles.

4. Let N be the set of natural numbers such that $R = \{(x, y): y = 3x + 4, x, y \in N\}$. Write the relation R, domain and range of the function.

5. Given, $A = \{2, 4, 6, 8\}$ and $R = \{(2, 4) (4, 2) (4, 6) (6, 4)\}$. Show that R is not reflexive, symmetric and not transitive.

6. Let $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$, $C = \{5, 6, 7, 8\}$. Verify $A \cup (B \cup C) = (A \cup B) \cup C$.

7. In a group of 65 people, 40 were found to like hockey, 10 like both tennis and hockey. How many like only tennis but not hockey? How many like tennis? Represent using venn diagram.

8. In a group of 65 people, 40 like cricket, 10 like hockey and cricket both. How many like cricket only and not hockey? How many like hockey?

9. Let $f = \{(1, 2) (2, 3) (3, 4)\}$ be a function from Z to Z where Z is the set of integers defined by $f(x) = ax + b$ $\forall$ some integers a and b. Determine a & b.

10. If $f(x) = x^2$ and $g(x) = x + 1$. Find (*i*) fog(x), (*ii*) gof(x), (*iii*) fof(x).

11. If $n(\cup) = 700$, $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$. Find $n(A' \cap B')$.

12. Find the domain and range of the function $f(x) = \dfrac{x^2 + 2x + 1}{x^2 - 8x - 12} x \in R$.

13. If R = {(x, y): $y = x^3$, x is a positive prime less than 10}. Find the relation R, domain and range of R.

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4 MARKS QUESTIONS

(Understanding)

1. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice.

2. Out of 50 people, 20 people drink tea, 10 take both tea and coffee. How many take atleast one of the two drinks.

3. Let A = {1, 2, 3, 4}, B = {3, 4, 5, 6}, C = {4, 5, 6, 7, 8}.

   Verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

4. Let A = {a, b, c}, B = {d}, C = {e}. Verify A × (B − C) = (A × B) − (A × C).

5. If A = {$x : x^2 - 7x + 12 = 0$}, B = {2, 4}, C = {4, 5}. Find (A − B) × (B − C).

6. If ℧ = {1, 2, 3, 4, 5, 6, 7, 8, 9}, A = {2, 4, 6, 8}, B = {2, 3, 5, 7}.

   Verify that (i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$.

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5 MARKS QUESTIONS

(Application)

1. In a survey it was found that 31 people like a product A, 36 liked a product B and 39 liked the product C. If 24 people liked products A and B, 22 people liked product C and A, 24 people liked products B and C, 18 liked all the three products, then find how many people liked product C only?

2. Let f = {(1, 1) (2, 3) (0, − 1)} be a function from Z to Z defined by $f(x) = ax + b$ for some integers a and b (i) Determine a and b, (ii) If $f(x) = 2x + 1$, $g(x) = x^2 + 2x + 1$. Find fog(2) and gof(3).

3. In a group of 150 people, 70 like cricket, 30 like hockey and cricket both. How many like cricket only and not hockey? How many like hockey? Show the result using Venn diagram.

4. Out of 250 people, 160 drink coffee, 90 drink tea, 85 drink milk, 45 drink coffee and tea, 35 drink tea and milk, 20 drink all the three. How many will drink coffee and milk?

5. In a survey of 100 persons it was found that 28 read magazine A, 30 read magazine B, 42 read magazine C, 8 read magazine A & B, 10 read magazine A and C, 5 read magazines B & C, while 3 read all the three magazines. Find how many read none of the 3 magazines. How many read only magazine C?

6. In a certain college with 500 students, 300 take milk and 250 take tea. Find how many take
   (a) milk only   (b) tea only   (c) both milk and tea.

* * * * *

Theory of Indices

1m	2m	3m	4m	5m	6m	Total
1(K)	1(U)	1(S)	–	–	–	06

(Knowledge)

1 MARK QUESTIONS

1. Simplify: $\left(7^3\right)^0 + \left(5^2\right)^0$.

2. Simplify: $\left(3^2\right)^0 + \left(5^3\right)^{\left(2^0\right)}$.

3. Simplify: $\left(a^0\right)^2 + \left(b^2\right)^0$.

4. Simplify: $\left(\dfrac{9}{4}\right)^{-\frac{3}{2}}$.

5. Simplify: $\left(\dfrac{16}{8}\right)^{\frac{1}{2}}$.

6. Simplify: $\left(\dfrac{5x^3}{y}\right)^2$.

7. Simplify: $\left(\dfrac{27x^2}{y^2}\right)^{\frac{1}{3}}$.

8. Simplify: $\left[\left\{\sqrt[4]{x^2}\right\}^4\right]^{\frac{1}{2}}$.

9. Simplify: $\left[\left(3x^2\right)^{\frac{1}{2}}\right]^3$.

10. Simplify: $\left(\dfrac{3}{2}\right)^2 \cdot \left(\dfrac{2}{3}\right)^{-\frac{1}{2}}$.

2 MARKS QUESTIONS

(Understanding)

1. Simplify: $\dfrac{2^{n+1} + 2^{n-1}}{2^n + 2^{n+2}}$.

2. Simplify: $\dfrac{3^{n-1} + 3^{n+2}}{3^n + 3^{n+2}}$.

3. Simplify: $\dfrac{a^{2m-n} \cdot a^{4m+2n}}{a^{5m+3n}}$.

4. Simplify: $\dfrac{2^{7b-2a} \cdot 8^{2a-b}}{16^{a+b}}$.

5. Simplify: $\dfrac{(7)^{\left(3^0\right)} + \left(5^0\right)^4}{\left(3^2\right)^0 + \left(2^2\right)^1}$.

6. Simplify: $\dfrac{x^{4m-n} \cdot x^{3m-n}}{x^{8m+9n}}$.

7. Prove that: $\left(x^{b-c}\right)^a \cdot \left(x^{c-a}\right)^b \cdot \left(x^{a-b}\right)^c = 1$.

8. Simplify: $\left(\dfrac{x^a}{x^b}\right)^{a+b} \left(\dfrac{x^b}{x^c}\right)^{b+c} \left(\dfrac{x^c}{x^a}\right)^{c+a}$.

9. Simplify: $2\left(3^{-2}\right)+\left(\dfrac{1}{4}\right)^{-2}+3^{0}.$

10. Simplify: $\dfrac{2^{b}\left(2^{b+2}\right)^{2}}{2^{b+3}.4^{b}}.$

3 MARKS QUESTIONS

(Skill based)

1. Prove that $\left(\dfrac{x^{a+b}}{x^{b-c}}\right)^{a-c}\left(\dfrac{x^{b+c}}{x^{c-a}}\right)^{b-a}\left(\dfrac{x^{c+a}}{x^{a-b}}\right)^{c-b}=1.$

2. Simplify: $\left(\dfrac{x^{b}}{x^{c}}\right)^{\frac{1}{bc}}\cdot\left(\dfrac{x^{c}}{x^{a}}\right)^{\frac{1}{ca}}\cdot\left(\dfrac{x^{a}}{x^{b}}\right)^{\frac{1}{ab}}.$

3. If $a^{x}=b^{y}=c^{z}$ and $b^{2}=ac$ show that $\dfrac{1}{x}+\dfrac{1}{z}=\dfrac{2}{y}.$

4. If $a^{x}=b,\ b^{y}=c,\ c^{z}=a$ show that $xyz=1.$

5. Simplify: $\dfrac{x^{-1}}{y^{-1}+x^{-1}}+\dfrac{x^{-1}}{y^{-1}-x^{-1}}.$

6. Simplify: $\dfrac{y^{-1}}{x^{-1}+y^{-1}}+\dfrac{y^{-1}}{x^{-1}-y^{-1}}.$

7. If $l^{x}=m^{y}=n^{z}=p^{w}$ and $lm=np$ show that $\dfrac{1}{x}+\dfrac{1}{y}=\dfrac{1}{z}+\dfrac{1}{w}.$

8. If $9^{x}=5^{y}=45^{z}$ show that $z(x+y)=xy.$

9. If $2^{\frac{1}{a}}=17^{\frac{1}{b}}=\left(68\right)^{\frac{1}{c}}$ show that $2a+b=c.$

10. If $a=5^{x},\ b=5^{y},\ c=5^{z}$ and $ab=c^{2}$ prove that $x+y=2z.$

11. If $a^{x}=bc,\ b^{y}=ca$ and $c^{z}=ab$ show that $xyz=x+y+z+2.$ **(Skill)**

12. If $abc=1$, then prove that $\dfrac{1}{1+a+b^{-1}}+\dfrac{1}{1+b+c^{-1}}+\dfrac{1}{1+c+a^{-1}}=1.$

13. Show that $\sum\dfrac{1}{1+x^{a-b}+x^{a-c}}=1.$

14. If $x^{\frac{1}{3}}+y^{\frac{1}{3}}+z^{\frac{1}{3}}=0$, then show that $(x+y+z)^{3}=27xyz.$

15. If $a^{\frac{1}{3}}+b^{\frac{2}{3}}+c=0$ then show that $(a+b^{2}+c^{3})^{3}=27ab^{2}c^{3}.$

16. If $x=4^{\frac{1}{3}}+4^{-\frac{1}{3}}$ prove that $x^{3}-12x-17=0.$

17. Solve for x: $2^{2x}-6.2^{x}+8=0.$

18. Solve for y: $5.5^{2y}-26.5^{y}+5=0.$

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Logarithms $\diamond$ 4

1m	2m	3m	4m	5m	Total
1(K)	–	1(U)	–	1(A)	9

1 MARK QUESTIONS

(Knowledge)

Express the following in logarithmic form.

1. $2^4 = 16$
2. $5^3 = 125$
3. $5^{-2} = 0.04$
4. $2^{-3} = \dfrac{1}{8}$

5. $9^2 = 81$
6. $6^2 = 36$
7. $2^{-5} = \dfrac{1}{32}$
8. $3^4 = 81$

9. $6^{-3} = \dfrac{1}{216}$
10. $10^2 = 100$

Express the following in exponential form.

11. $\log_5 25 = 2$
12. $\log_{10} 0.01 = -2$
13. $\log_2 \tfrac{1}{2} = -1$
14. $\log_3 27 = 3$

15. $\log_4 16 = 2$
16. $\log_2 0.625 = -4$
17. $\log_7 49 = 2$
18. $\log_2 16 = +4$

19. $\log_3 \tfrac{1}{3} = -1$

20. Find the value of $\log_2 8$.

21. Find the value of $\log_{\sqrt{3}} 27$.

22. Find the value of $\log_4 16$.

23. Solve for 'x' : $\log_x 625 = 4$.

24. Solve for 'x' : $\log_{0.1} 10 = x$.

25. Solve for 'x' : $\log_x 81 = 3$.

26. Solve for 'x' : $\log_x 48 = 3$.

27. Solve for 'x' : $\log_{\sqrt{3}} 81 = x$.

3 MARKS QUESTIONS

(Understanding)

1. Find the value of $\log\left(\dfrac{9}{8}\right) + \log\left(\dfrac{4}{9}\right) + \log\left(\dfrac{16}{4}\right)$.

2. $\log\left(\dfrac{12}{15}\right) + 2\log\dfrac{6}{8} + \dfrac{1}{3}\log\dfrac{8}{27}$.

3. Find the value of $\log\dfrac{9}{5} + \log\dfrac{15}{9} - \log\dfrac{3}{2}$.

4. Find the value of $2\log\left(\dfrac{4}{7}\right) + \log\left(\dfrac{16}{49}\right)$.

5. Prove that $\log_{bc} a = \dfrac{\log_b a}{1 + \log_b c}$.

6. Prove that $\left(\dfrac{1}{\log_b a}\right)\left(\dfrac{1}{\log_a b}\right) = 1$.

7. Prove that $\log\sqrt{\dfrac{a}{b}} + \log\sqrt{\dfrac{b}{c}} + \log\sqrt{\dfrac{c}{a}} = 0$.

8. If $\log_k x + \log_k y + \log_k z = 0$, show that $xyz = 1$.

9. Find the number of digits in the integral part of 5^{20}.   **(Knowledge)**

10. Find the number of digits in the integral part of 3^{55}.

11. Find the number of digits in the integral part of 7^{44}.

12. Find the number of zeros between the decimal point and the first significant figure in (Part E) $(0.5)^{55}$

13. $(0.32)^{28}$ 14. $(0.73)^{46}$ 15. $(0.9)^{55}$

16. Prove that $\log_4 8.\log_2 32.\log_{16} 4 = \dfrac{15}{4}$.   **(Understanding)**

17. Prove that $\log_y x^3.\log_x z^6.\log_z y^4 = 72$.

18. Prove that $\dfrac{1}{\log_2 4} + \dfrac{1}{\log_8 4} + \dfrac{1}{\log_{16} 4} = 4$.

19. Show that $X^{\log y - \log z}.Y^{\log z - \log x}.Z^{\log x - \log y} = 1$.

20. Solve: $\log x + \log(x + 1) = \log 6$.

21. Solve: $\log x + \log(x + 2) = \log 15$.

22. Solve: $\log_2 x + \log_4 x = 3$.

23. If $x = \log_2 9$, $y = \log_9 7$, $z = \log_7 4$, show that $xyz = 2$.

24. If $x = \log_4 9$, $y = \log_9 5$, $z = \log_5 8$, find the value of xyz.

25. Prove that $\dfrac{1}{\log_{a^2 b^2}(abc)} + \dfrac{1}{\log_{b^2 c^2}(abc)} + \dfrac{1}{\log_{c^2 a^2}(abc)} = 4$.

26. If $\log_a(bc) = x$, $\log_b(ca) = y$, $\log_c(ab) = z$. Show that $\dfrac{1}{x+1} + \dfrac{1}{y+1} + \dfrac{1}{z+1} = 1$.

27. If $m^2 + n^2 = 20mn$, show that $2\log(m + n) = \log2 + \log11 + \log m + \log n$.

28. If $m^2 + n^2 = 17mn$, show that $2\log(m - n) = \log15 + \log m + \log n$.

29. If $\log\left(\dfrac{a-b}{4}\right) = \log\sqrt{a} + \log\sqrt{b}$ show that $(a + b)^2 = 20ab$.

30. Solve for x: $\log_9 x + 2\log_{27} x + 3\log_3 x = 25$.

31. Solve for x: $2\log_2 x + 3\log_4 x + 5\log_8 x = 62$.

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5 MARKS QUESTIONS

1. Using log table find the value of $\dfrac{614.78 \times 3.434}{2.123}$.

2. Using log table find the value of $\dfrac{\sqrt{8.43} \times 0.6289}{(14.893)^{\frac{3}{2}}}$.

3. Using log table find the value of $\dfrac{734.82 \times \sqrt{256.3}}{3489.3}$.

4. Using log table find the value of $\dfrac{0.5392 \times 62.42}{926.34}$.

5. Using log table find the value of $\dfrac{\sqrt{14.5} \times \sqrt[3]{8.571}}{(16.751)^{\frac{2}{3}}}$.

6. Using log table find the value of $\dfrac{(452.3)^{\frac{2}{3}}}{904.8 \times 26.13}$.

7. Using log table find the value of $\dfrac{0.5269 \times 0.0123}{428.9}$.

8. Using log table find the value of $\dfrac{946.8 \times 0.023}{0.0453}$.

9. Using log table find the value of $\dfrac{4523.1 \times 724.3}{826.1 \times 264.46}$.

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Progressions ⟨**5**⟩

1m	2m	3m	4m	5m	6m	Total
1(K)	1(U)	1(K)	1(U)	1(U)	–	15

1 MARK QUESTIONS

1. Find the 13th term of the A.P. $\dfrac{1}{3}, \dfrac{2}{3}, 1, \ldots\ldots$ **(Knowledge)**

2. Find the 30th term of the A.P. $-2, -5, -8, \ldots\ldots\ldots$

3. Find the value of K, if $\dfrac{3}{5}$, K, $\dfrac{13}{5}$ are in A.P.

4. Find the 7th element of the G.P. $\sqrt{2}, 2, 2\sqrt{2}, \ldots\ldots$

5. Find the 9th element of G.P. $0.3, 0.6, 1.2, \ldots\ldots$

6. If $\dfrac{5}{2}$, K, 10 are in G.P. then find the value of K.

7. Find the sum to infinity of the G.P. $1, \dfrac{1}{2}, \dfrac{1}{4}, \ldots\ldots$

8. Find the sum to infinity of the G.P. $3, -1, \dfrac{1}{3}, \dfrac{-1}{9}, \ldots\ldots$

9. Write the formula for general term and sum to 'n' terms of an A.P.

10. Write the formula for general term and sum to 'n' terms of an G.P.

11. Find the 10th element (term) of H.P. $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{6}.$

12. Find 'x', if $\dfrac{1}{3}$, x, $\dfrac{3}{2}$ are in H.P.

13. Find the 7th element of a H.P. $\dfrac{1}{\sqrt{2}}, \dfrac{1}{2\sqrt{2}}, \dfrac{1}{3\sqrt{2}}, \ldots\ldots$

2 MARKS QUESTIONS

1. Find the 7th term of an A.P. whose first term is 6 and 12th term is 72.   **(Understanding)**

2. Find the sum of the following A.P. $\frac{3}{2}$, 2, $\frac{5}{2}$, ... to 18 terms.

3. Find the sum of the A.P. 1.1, 1.3, 1.5, ... to 20 terms.

4. If the 3rd term of an A.P is 11 and 10th term is 32. Find the A.P.

5. If the 3rd term of an A.P is –11 and 14th term is –44. Find the 20th term.

6. How many terms of an A.P. 2, 3, 4, 5, 6 .... amount to 230?

7. Which term of an A.P. $\frac{1}{2}$, 1, $\frac{3}{2}$............ is 5?

8. Is 8 is the term of an A.P. $\frac{1}{3}$, $\frac{4}{3}$, $\frac{7}{3}$, ...?

9. If $a = 1$, $d = 7$, $T_n = 64$, then find n and S_n?

10. If the second term of the G.P. is 6 and 5th term is 162, then find the G.P.

11. Which element of the G.P. 4, 6, $\frac{18}{2}$, ... is $\frac{81}{4}$?

12. How many terms of the G.P. $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, ... will make the sum $\frac{63}{64}$?

13. Find the sum of 6 terms of the G.P. 1, 3, 9, ...

14. Find the sum of 8 elements of the G.P. –2, 4, –8, ...

15. If the 3rd term of a H.P is $\frac{1}{7}$ and 5th term is $\frac{1}{11}$, then find the 7th term.

16. If a, b, c are in G.P. and $a^x = b^y = c^z$, show that x, y, z are in H.P.

17. If the pth element of an H.P. is q and q^{th} element is p, show that $(pq)^{th}$ element is 1.

18. Insert 4 arithmetic mean between 5 and 10.

19. Insert 3 geometric mean between –4 and –64.

20. Insert 3 harmonic mean between $\frac{1}{4}$ and $\frac{1}{12}$.

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3 MARKS QUESTIONS

1. Find the three numbers in A.P. whose sum is 18 and their product is 210.   **(Knowledge)**

2. Find the three numbers which are in A.P. whose sum is 12 and the sum of their cubes is 408.

3. Find the four numbers which are in A.P. whose sum is 20, and the product of whose extremes is 16.

4. The sum of four numbers which are in A.P is 28 and 10 times the least number is equal to 4 times the greatest number. Find the numbers.

5. The sum of n elements of an A.P. 21, 23, 25, ... is 384. Find the number of terms and the last term.

6. How many terms of an A.P –5, –7, –9, ... will make the sum –140?

7. Find the sum of all even numbers from 20 to 120.

8. Find the three numbers in G.P. whose sum is $\dfrac{31}{5}$ and their product is 1.

9. The third element of a G.P. is twice the second element and the fifth element is 32. Find the G.P.

10. Find the three numbers in G.P. whose sum is $\dfrac{13}{3}$ and product of the extremes is 1.

11. The first term of a G.P. exceeds the second term by $\dfrac{1}{2}$ and the sum to infinity is 2. Find the G.P.

12. The sum to infinity of a geometric series is 6 and the sum of first two terms is $\dfrac{9}{2}$. Find the first term and the common ratio.

13. The sum of an infinite G.P. whose common ratio is less than one is 32 and the sum of the first two terms is 24. Find the G.P.

14. If $b + c, c + a, a + b$ are in H.P. Show that a^2, b^2, c^2 are in A.P.

4 MARKS QUESTIONS

(Understanding)

1. The first and last term of the G.P is 3 and 96 respectively, sum to n terms is 189. Find the common ratio and the number of terms.

2. Find the sum to n terms of the G.P. 4 + 44 + 444 + ...

3. Find the sum to n terms of the G.P. 7 + 77 + 777 + ...

4. Find the sum to n terms of the G.P. 0.6 + 0.66 + 0.666 + ...

5. Find the sum to n terms of the G.P. 0.5 + 0.55 + 0.555 + ...

6. The first and the last elements of a G.P. are 4 and 128 respectively, and the sum is 252. Find the common ratio and the number of terms.

7. The sum of an infinite G.p. whose common ratio is less than one, is 32, and the sum of the first two terms is 24. Find the G.P.

5 MARKS QUESTIONS

(Understanding)

1. Find the sum of all even integers between 30 and 426.

2. Find the sum of all integers between 100 and 300, which are divisible by 9.

3. Find the sum of all integers between 60 and 400, which are divisible by 13.

4. Find the sum of all numbers between 50 and 200, which are divisible by 11.

5. Mr. Sambhav buys a used bike for ₹18,000. He pays ₹12,000 cash and agrees to pay the balance in annual instalments of ₹500 plus 10% interest on the unpaid amount. How much will the bike cost him?

6. A person buys every year Bank's cash certificate of value exceeding the last year's purchase by ₹500. After 15 years, he finds that the total value fo the certificates purchased by him is ₹82,500. Find the value of the certificates purchased by him.

    (a) in the first year   (b) in the tenth year

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Theory of Equations 6

1 MARK QUESTIONS

1. Solve for x: $x + a(x + b) = ax + b$.   (Knowledge)
2. Solve for x: $7x - 5[x - \{7 - 6(x - 3)\}] = 3x + 1$.
3. Form the quadratic equation whose roots are 1, 2.
4. Form cubic equation whose roots are –1, 4, 6.
5. Find the nature of the roots of $6x^2 - 5x + 2 = 0$.
6. Solve: $b(b + x) = a^2 - ax$.
7. Solve: $\dfrac{x}{2} + \dfrac{2x}{3} = \dfrac{7}{2}$.
8. Solve: $2(7 + x) - 10 = 16 - 2(x - 24)$.
9. Solve: $3(x - 2) - (x - 1) = 7(x - 1) - 6(x - 2)$.
10. Solve: $3(x + 5) - 25 = 9 + 2(x - 7)$.
11. Find the nature of the roots of $2x^2 + 8x + 9 = 0$ without solving.

2 MARKS QUESTIONS

1. Solve: $x + \dfrac{3x - 5}{4} = 2 + \dfrac{6x - 8}{5}$.   (Skill)
2. Solve the equations $x + 2y = 1$ and $3x - 2y = 5$ by elimination method.
3. Solve by formula method: $x^2 - 4x + 3 = 0$.
4. Solve by factorization method: $x^2 - 3x - 10 = 0$.
5. Solve the simultaneous equations $10x - 9y = 12$ and $3x - 9y = 17$ by substitution method.
6. Solve simultaneous equations $2x + y = 14$ and $3y = 33 + x$ by rule of cross multiplication.
7. Solve $x + 2y = 7$ and $2x - y = 4$ by comparision method.
8. The sum of 6 times a number and 5 times the number is 55. Which is that number?
9. Find two numbers whose sum is 64 and difference is 16.
10. The sum of two consecutive numbers is 23, find them.
11. Solve $2x(4x - 1) = 15$ by formula method.

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3 MARKS QUESTIONS
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1. The sum of three consecutive numbers is 186. Find them.   **(Understanding)**

2. Divide 25 into two parts that the sum of the reciprocals is $\dfrac{1}{6}$.

3. Two numbers are in the ratio 7:5 and their difference is 12. Find the numbers.

4. If α and β are the roots of the equation $2x^2 + 5x + 5 = 0$ then find the values of

   (i) $\dfrac{1}{\alpha} + \dfrac{1}{\beta}$ (ii) $\dfrac{1}{\alpha^2} + \dfrac{1}{\beta^2}$ (iii) $\dfrac{\alpha}{\beta} + \dfrac{\beta}{\alpha}$

5. If α and β are the roots of the equation $2x^2 - 10x + 5 = 0$. Find the value of

   $$\left(\dfrac{\alpha}{\beta^2} + \dfrac{\beta}{\alpha^2}\right) + 2\left(\dfrac{\beta}{\alpha} + \dfrac{\alpha}{\beta}\right) - 12\alpha\beta.$$

6. If α and β are the roots of the equation $3x^3 - 6x + 4 = 0$. Find the values of the following

   (a) $\alpha^2 + \beta^2$ (b) $\dfrac{\alpha}{\beta} + \dfrac{\beta}{\alpha}$

7. Find the quotient and the remainder obtained by dividing $3x^2 - 4x^2 + 2x + 1$ by $x - 3$.

8. Find an integral root between −3 and 3 by inspection and then using synthetic division find the quotient of $x^3 + 2x^2 - 11x - 12$ and also the remainder.

9. Find the quotient and remainder obtained by dividing $4x^3 + 3x^2 - 2x - 1$ by $(x + 1)$.

10. Find the quotient and remainder when $x^4 + 10x^3 + 39x^2 + 76x + 65$ is divided by $x + 4$.

11. Nine tables and eight chairs cost ₹456/-. Eight tables and nine chairs cost ₹462/-. Determine the cost of each table and of each chair.

12. Two sisters have their annual income as 5:8, while their annual expenditures are in the ratio 3:5, if they save ₹1000 and ₹1200 per annum respectively. Find their incomes.

13. Divide ₹110 into two parts so that 5 times of one part together with 6 times of the other part will be equal to ₹610.

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5 MARKS QUESTIONS

(Application)

1. A number consists of two digits and whose sum is 3, if 9 is added to the number the digits get interchanged. Find the numbers.

2. Two brothers have their annual income as 8:5, while their annual expenditures are in the ratio 5:3 if they save ₹1200/- and ₹1000/- per annum. Find their incomes.

3. Three years ago father was 4 times as old as his son and after 5 years he will be three times as old as his son. Find their present ages.

4. A sum of two numbers is 21. If the larger is divided by the smaller, the quotient is 2 and the remainder is 3. Find the numbers.

5. Find an integral root between –3 and 3 by inspection and then using synthetic division. Solve the equation $x^3 - 2x^2 - 5x + 6 = 0$.

6. A certain two digit number is 4 times the sum of the digits. If 18 is added to the number, the digits get interchanged. Find the number.

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Linear Inequalities 7

1m	2m	3m	4m	5m	6m	Total
–	1(U)	1(K)	–	–	–	5

2 MARKS QUESTIONS

1. Solve $7x + 3 < 5x + 9$ and represent the solution on number line. **(Understanding)**

2. Solve $\dfrac{3x-4}{2} > \dfrac{x+1}{4} - 1$, $x \in R$ and represent the solution on number line.

3. Solve $\dfrac{x}{3} + \dfrac{x}{2} + x < 11$, $x \in R$ and represent the solution on number line.

4. Solve $\dfrac{3(x-2)}{5} \leq \dfrac{5(2-x)}{3}$, $x \in R$

5. Solve: $3x - 7 > 2(x - 6)$ and $6 - x > 11 - 2x$, $x \in R$.

6. Solve: $2x + 3 \geq 18$ and $3x + 1 \leq 12$, $x \in R$.

7. Solve: $\dfrac{x}{3} > \dfrac{x}{2} + 1$, $x \in R$

8. Solve $3(1 - x) < 2(x + 4)$, $x \in R$ and represent on number line.

3 MARKS QUESTIONS

(Knowledge)

1. The marks obtained by a student of class in first and second term are 62 and 48 respectively. Find the minimum marks he should get in the annual examination to have an average of atleast 60 marks?

2. Find all pair of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.

3. Find all the pairs of consecutive even pair of number both of which are larger than 5, such that their sum is less than 28.

4. The longest side of a triangle is 3 times the shorter side and the third side is 2 cm shorter than the largest side. If the perimeter of the triangle is atleast 61 cm. Find the minimum length of the shortest side.

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5. Find all pair of consecutive even integers which are greater than 5 and their sum must be less than 23.

6. How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% of acid content. (Water contains 0% of acid).

7. A solution is to be kept between 68°F and 77°F. What is the rangein temperature in degree celsius (C) if the celcius / Fahrenheit conversion formula is given by F = 9/5C + 32?

8. Solve: $3x + 4y \leq 12$ and $2x + y \geq 6$ graphically.

9. Solve: $x + 2y \leq 8$ and $2x + y \leq 8$ graphically.

10. Solve the system of linear inequation graphically $2x + y \geq 8,\ x + y \geq 10$.

11. Solve the system of linear inequation graphically $3x + 4y \geq 12,\ 4x + y \geq 8$.

12. Solve the system of linear inequation graphically $x + y \leq 6,\ x + y \leq 4$.

13. Solve the system of linear inequation graphically $2x - y < 1,\ x - 2y < -1$.

14. Solve the system of linear inequation graphically $x + y \geq 5,\ x - y \leq 3$.

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UNIT II - COMMERCIAL ARITHMETIC

Simple Interest and Compount Interest ◇8◇

1m	2m	3m	4m	5m	6m	Total
–	1(K)	1(K)	–	1(A)	–	10

1 MARK QUESTIONS

1. Find the interest on ₹1,500 at 4% p.a for 145 day.   (Knowledge)
2. What is the simple interest for 245 days for ₹6000 at 8% p.a simple interest.
3. What is the simple interest on ₹650 for 14 weeks at 6% p.a?
4. Priya invested ₹6,000 for 3 years and received ₹1,080 as interest. Find the rate of interest.
5. What principal will amout to ₹46,000 in 7 years at 12% p.a?

2 MARKS QUESTIONS

1. In what time will the simple interest on ₹500 at 6% be equal to the interest on ₹540 for 8 years at 5%?
2. If the simple interest on a certain sum of money after $6\frac{1}{4}$ years is $\frac{3}{8}$ of principal, what is the rate of interest p.a?
3. If 500 amounts to ₹725 at 9% simple interest in sometime. What will ₹600 amount to at 11% in the same time.
4. A certain sum of money amounts to ₹24,200 in 2 years at 10% compound interest. Find the sum.
5. On what sum will the compound interest at 5% p.a. for two years compounded annually be ₹1640?
6. If the nominal rate is 13% and frequency of computing interest is once in 4 months. Find the effective rate of interest.

3 MARKS QUESTIONS

1. The simple interest on a certain sum of money is $\frac{4}{25}$ th of the sum and the rate percent equals the number of years. Find the rate of interest.
2. A sum of money doubles itself in 12 years, 6 months. In how many years will it triple itself?
3. The difference between simple interest received from two diferent sources on ₹2500 for 3 years is 375. Find the difference in their rate of interest.
4. Find the compound interest on ₹6000 for 3 years at 5% p.a. If interest is calculated half-yearly.

60

5. ₹16000 invested in 10% p.a compounded semi-annually amounts to ₹18522. Find the time period of investment.

6. The cost of refrigerator is ₹27,000. If it depreciates at the rate of 8%, find its value after 4 years.

7. In 2010 the population of a town was ₹2,70,000. If the rate of increase is 45 per thousand of the population, find the estimated population for the year 2025.

8. The population of a town was ₹40,000. If the annual birth rate is 8% and death rate is 2%. Calculate the population after 3 years?

5 MARKS QUESTIONS

1. If a certain sum of money is doubled in 8 years at a given simple interest. In how many years will it be four times?

2. A sum was put at simple interest at a certain rate for 4 years. If it had been put at 2% higher rate it would have fetched ₹56 more. Find the sum.

3. A lent ₹5000 to B for 2 years and ₹3000 to C for 4 years on simple interest at the same rate and received ₹2200 in all from both of them as interest. Find the rate of interest.

4. A person invested an amount of ₹12,000 at the rate of 10% p.a S.I and another amount at the rate of 20% p.a S.I. The total interest earned at the end of one year is eqal to 14% of the total amount invested. Find the total amount invested.

5. A sum of money placed at compound interest doubles itself in 4 years. In how many years will it amount to eight times.

6. A sum of money invested at compound interest amounts in 2 years to ₹4410 and in 3 years to ₹4630.5. Find the rate of interest and the original sum.

7. If ₹2000 amounts to ₹2315.25 at compound interest in 3 years, find the rate of interest.

8. Find the compound interest on ₹7500 at 14% for 4½ years while interest is calculated half yearly.

9. The bacteria in a culture grew by 8% in the first hour decreases by 8% in the second hour, and again increases by 7% in the third hour. If at the end of the third hour the count of bacteria is 12170 thousands, find the original count (in thousands) of bacteria in sample.

10. A machine worth of ₹12000 is depreciated at the rate of 10% a year. It was sold eventually as waste metal for ₹200. Find the number of years the machine was in use.

11. The scrap value obtained by a selling a machine after 10 years of purchase is 19660.8. If the machine depreciated at the rate of 20% p.a. Find the cost at which the machine was purchased 10 years ago.

12. A person borrows a certain sum of money at 3% p.a. simple interest and invests the same at 5% p.a. compound interest compounded annually. After 3 years he makes a profit of ₹1082. Fidn the amount he borrowed.

13. If the difference between simple interest and compound interest for 3 years at 2.5% p.a is ₹625, find the sum invested.

14. A person borrowed 65,000 at 8% p.a S.I for 4 years and lent out the money for 10% C.I for 4 years. How much did the person gain?

15. A person invested equal amounts, one at 6% S.I and other at 5% C.I. If the former earns ₹437.5 more as interest at the end of two years. Find the total amount invested.

* * * * *

Annuities

1m	2m	3m	4m	5m	6m	Total
1(U)	–	1(U)	–	1(A)	–	9

1 MARK QUESTIONS

1. Define annuity.
2. Define perpetuity.
3. Define annuity due.
4. What is the present value of an income of 3,000 to be received forever if the interest rate is 14% p.a.

2 MARKS QUESTIONS

1. A schlorship of ₹2,000 every year has to be instituted. How much should be invested today if theinterest rate is 8% p.a.?

2. Find the future value of an annuity of ₹5,000 at 12% p.a for 6 years.
3. Find the present value of an annuity of ₹500 at 6% p.a for 7 years.
4. Find the present value of an annuity due of 8000 for 5 years at 5% p.a.
5. Find the future value of an annuity of ₹2,000 for 6 years, if the payment is made at the beginning of each year, interest rate being 10% p.a.

4 MARKS QUESTIONS

1. If person wants ₹25,000 after 8 years, how much should he invest in an annuity due each year at 6% p.a?
2. Find the present value of an annuity of ₹2,000 payable at the beginning of each quarter for the next 3 years if the rate of interest is 4% p.a compounded quarterly.
3. What is the present value of ₹2,000 receivable for 20 years, if the annuity is deferred for 10 years if the interest rate is 10%?
4. Find the present value of an annuity of ₹2,500 payable at the end of each 6 months for 5 years if money is worth 10% converted semi annually.

5 MARKS QUESTIONS

1. A person wants to buy a house after 5 years when it is expected cost 50 lakhs. How much should be saved annually if her savings earn a compound interest of 12 percent.

2. Mr. Ashok has 20 more years to retire. He decides to save some money for his retirement. If he saves ₹9000 every year, how much will he have when he retires if the interest rate is 18% p.a?

3. A father wants to send his child for higher studies after 15 years. He expects the cost of higher studies to be 1,00,000. How much should he save annually to have 1,00,000 after 15 years if interest rate is 12% p.a?

4. Vani decides to save ₹10,000 every six months for the next 5 years and deposit it in a bank which offers 7% p.a interest compounded half yearly. How much will vani have in her account after 5 years?

5. Mrs. Arpan deposits 4,00,000 on retirement in a bank which pays 10% p.a interest. How much can be drawn annually for a period of 10 years?

6. Find the present value of annuity of ₹3000 for 12 years at 6% p.a computed half yearly.

7. Uma bought a TV costing ₹21000 by making a down payment of 5000 and agreeing to repay the balance amount in equal annual payments for five years. How much would be each payment if the interest rate is 14% p.a?

8. Ayush purchases a car for ₹5,50,000. He gets a loan of ₹5,00,000 at 15% p.a from a bank and balance amount he pays as down payment. He has to pay whole amount of loan in 12 equal monthly installments. Find the money he has to pay at the end of everymonth.

9. How much should you invest today at 8% p.a compound interest computed quarterly so that you get ₹3000 every 3 months for the next 7 years.

10. Sharan borrows a sum of ₹2,00,000 and promises to repay in 20 equal annual installments at the beginning of each year. What is the annual installment to be paid if the interest rate is 16% computed quarterly.

11. A person purchases a house for ₹25 lakhs with ₹5 lakhs as down payment. The rest of the amount he loans from a bank which offers 16% p.a. C.I and has to repay the loan in 20 equal annual installments. If the first installment is paid at the end of the third year, find how much he has to pay each year.

12. What is the present value of an perpetuity of ₹5000 to be received forever if the first receipt occurs at the end of the sixth year from now. Interest rate being 8% p.a? [Hing: d = 5 use perpetuity formula].

* * * * *

Averages ⟨10⟩

1m	2m	3m	4m	5m	Total
–	1(U)	–	–	1(U)	7

1 MARK QUESTIONS

1. In a class of 10 students, the marks obtained in mathematics are 88, 71, 35, 30, 46, 92, 67, 53, 76 and 28. What is the average marks?

2. The rainfall in a week in Bangalore are 18mm, 25mm, 20mm, 9mm, 30mm, 10mm, 5mm. Find the average rainfall.

3. The weight of 6 men are 90 kg, 70.5 kg, 56 kg, 45.5 kg, 85 kg and 78 kg. Find average weight.

4. The heigh tof 10 girls in dance class are 90 cm, 95 cm, 100 cm, 98 cm, 102 cm, 110 cm, 105 cm, 97 cm, 102 cm, 99 cm. Find the average height.

5. The age of 10 boys in a class are 4.3, 4.4, 4, 4.2, 4.3, 4.5, 4.7, 4.6, 4.5 and 4.8 years. What is the average age?

6. The average age of 10 boys in a class is 13 years. What is the sum of their ages?

2 MARKS QUESTIONS

1. The average age of 7 member of a family is 18 years. If the head of the family is excluded the average age of the ret of the member would fall to 13 years. What is the age of the head of the family?

2. The average marks of 15 students of a class is 45. A student also has securred 50 marks leaves the classroom. Find the average marks of the remaining 14 students.

3. The average age of 10 students is 6 years. The sum of the ages of 9 of them is 52 years. Find the age of 10th student.

4. The average age of 12 boys is 8 years. Another boy 21 years. Join the group. Find the average of the new group.

5. The average score of 20 boys is 60% and average score of 30 girls is 70%. Find the combined average score.

6. The average height of a group of people is 6 feet. 10 more people are added with an average height 5 feet. Find the average height of the group of people consisting of 60 people.

7. Ram and Rahim went up a hill at a speed of 20 kmph and both of them came tumbling down the same distance at a speed of 30 kmph. Find the average speed for the round trip.

8. Ramesh has 4 Kannada, 5 English, 6 Maths books. Each Kannada book cost ₹8.50, English ₹10.50 and Maths ₹15.00. Find the average cost per book of all 3 subjects.

9. 5 kg of sugar at the rate of ₹15/kg, 8 kg of wheat at the ₹22/kg, 7 kg of rice at ₹35/kg and 4 kg of oil at ₹85/kg. What is the average price/kg of all commudity.

10. The average weight of 12 girls in a class is 4 feet and the average height of 8 boys is 5 feet. Find the combined average height of both girls and boys.

11. The average score of 35 girls is 80 and the average score of boys is 68. find the average score of both boys and girls together.

12. Thirty five boys and sixty five girls are tested for their numerical abilities. The boys have an average score of 80% and the girls score an average of 90%. Calculate the average score of boys and girls combined.

13. A train runs at a speed of 28 kmph for 4 hours at 30 kmph for 5 hours and the remaining 40 kms in 1 hour. What is the total distance and what is the average speed/hr.

14. Rekha purchased 3 varieties of cooking oil, 5 kg of oil at 100/kg & 6/kg of oil at ₹110/kg & 9/kg of oil at ₹120/kg. what is the average price of the oil/kg.

15. The profit of a business firm for the 5 years are ₹17,598, ₹20,703, ₹10,085, ₹23,375 and ₹16,315. Find the average profit.

16. The average marks of a group of students is 50. Another group of 15 students have an average marks of 60. What is the average marks of 80 students.

17. The average weight of 10 boys is 30 kg. If a 11th boy is added the average weight increased by 2 kg. find the weight of 11th boy.

18. A survey in a village shows the following results.

No. of mens	Avg. weight in kg
1st batch 15	50
2nd batch 20	55
3rd batch 25	60
4th batch x	65
5th batch 10	70

If the combined average of all the batch is 60 kg. Find the value of 'x'?

19. The average age of 10 students is 14 years. Among them the average age of 4 student is 2 years. Find the average of the remaining students.

20. The average weight of a group of 35 people is 47.5 kg. If 36th person is added to the group. The average weight increased by 0.5 kg. What is the weight of the 36th person?

3 MARKS QUESTIONS

1. The average age of Ashok and Abdul is 45 years. The average of Abdul and Anthony is 50 years and the average age of Anthony and Ashok is 35 years.Find the age of Abdul, Ashok and Anthony.

2. A book seller bought 228 note books at an average price of ₹8.50 in which 80 books he bought at ₹7.50 each and 84 books at ₹10.40 each. Find the price of the remaining books per unit.

3. Of a number of persons donating to a charity 10 persons gave ₹99 each, 25 give ₹50 each, 33 gave ₹25 each. 46 gave 10 each and rest gave ₹5 each. It was found that the average donation is ₹20/-. How many donors are there?

4. A painter works 8 hrs on monday, 9 hrs on tuesday, 7½ hrs on wednesday, 7½hrs on thursday, 6 hrs on friday and 10 hrs on saturday. He is paid on hourly wagesat the rate of ₹8.50. What is his average daily earning.

5. Calculate the average daily wages earned by 100 workers in a factory using the following data.

Daily wage	$70-80$	$80-90$	$90-100$	$100-110$	$110-120$
No. of workers	18	7	23	44	8

6. A merchant buys two types of chalk powder A and B at ₹5.70 and ₹6.40 per kg respectively. He mixes them in the proportion 4.3 and sells the mixture at ₹7.20/kg. What is his profit and profit %?

7. A train travels at an average speed of 50 mph for 40 minutes and then travels at an average of 80 mph for the next 30 minutes. Find the average speed of the entire distance travelled.

8. A farmer walks from village A to village B at the speed 10 kmph and returned back in 15 kmph. Find his average speed of the entire journey.

9. The average weight of a group containing 25 persons is 70 kg. 5 persons with an average weight 63 kg leave the group and 4 persons with weight 72 kg, 78 kkg, 70 kg and 73 kg joins the group. Find the average weight of the new group.

10. The average weight of 40 students is 163 cms. On a particular day 3 students A, B and C were absent and the average of the 37 students was found to be 162 cms. If A and B have equal heights and the height of 'C' be 2 cms less than that of A. Find the heights of A, B and C.

11. A dental clinic purchased a certain number of chairs at an average price of ₹190 each. The average price of 30 chairs was ₹175 and that of the remaining chairs was ₹200/-. Find the total number of chairs the clinic purchased.

12. Ramesh bought 4 shirts in a discount sale. the average price of the shirt being ₹150, the average price of two polyster shirts is ₹170. Of the price of the two remaining cotton shirts is in the ratio 7:6. Find the price of the cheapest cotton shirt.

13. Calculate the arithmetic average mark from the following data.

Marks	45	75	60	55	93
No. of workers	11	10	15	12	2

14. The average height of a group of boys and girls is 38 kg. the average weight of the boys is 42 kgs and that of the girls is 33 kg. If the number of girls is 20. Find the number of boys.

15. 3 test in Economics, 2 in Kannada, 4 in Accounts and 5 in English are conducted. The average mark scored by Mr. Suresh in Economics is 60, in Kannada 56 and that of account is 45. If the average marks of all the test taken together is 48. Find the average marks scored by him in English.

5 MARKS QUESTIONS

1. Rajhamsa bus covers the distance of 360 km between Bengaluru and Chennai in 5 hrs 45 min with a stoppage of 10 min for coffee and tiffin and a stoppage of 3 min at Bannerghatta Bus Stop and 2 stoppages of 5 min each at hosur and Dharampuri bus stop respectively. What is the average speed of the bus?

2. Govind bought 11 bags in the wholesale market at an average price of ₹450 each. In which the price of 7 leather bags was ₹575 each. The price of the remaining 4 cotton bags all in the increasing arithmetic progression having the price of the costliest cotton bag was ₹300/-. Find the price of the cheapest cotton bag.

3. An aeroplane flies once round a square whose side is 100 km long taking the first at 100 kmph, second at 200 kmph, third at 300 kmph and the fourth at 400 kmph. Find the average speed of the plane in its flight along the square.

4. Mr. Raju purchased 17 english books in a discount sale, the average price of the book being ₹53. The average price of 11 english books is ₹71. If the average price of 6 different english story books from an increasing arithmetic progression with the last book price being ₹25. Find the price of the cheapest english story book?

5. The average of A and B are 18 years that of B & C is 17 years. And that of C and A is 20 years. What is the ages of A, B and C?

6. Ten years ago the average age of the family of 4 members were 24 years. Two children have been born. The average age of the family is same as tody. What is the present age of two children assuming that the children's age differ by 2 years?

7. An exporter of coffee powder mixes 60 kg of superior grade coffee at ₹300/kg and 40 kg of low grade at ₹180/kg. He would like to add a profit margin of 20% on his cost. What will be the price of the mixed coffee powder.

8. The average weight of a group of boys and girls is 38 kg. the average weight of the boys in 42 kg and that of the girls is 33 kg. If the number of boys is 25. Find the number of girls.

9. The average age of 10 students in a class increases by 4.8 months. When a boy of age 6 years is replaced by a new boy. What is the age of the new boy.

10. A batsman average score for a number of innings was 21.75 runs per innings. In the next three innings he scored 28, 34 and 37 runs. And his average for all the inning was revised by 1.125 runs. How many inning did he play.

11. A batsman find that by getting out for a duck (0 runs) in the 11th inning of his test matches. His average of the previous 10 inning decreased by 5 runs. What is the average after the 11th innings?

12. Find the total wage earned per month by 564 workers in a factory given the following information; 38 workers get ₹8.5 to 12.5, 46 workers get ₹12.5 to 16.5, 120 workers get ₹16.5 to 20.5,360 workers get ₹20.5 to 24.5 daily wages (assuming that a month has 30 days and all the day they work?)

(Hint: Take the value $\dfrac{8.5+12.5}{2}$ = ₹10.5/day for 38 workers and so on)

13. A batsman finds that by scoring a century in the 11th innings of his test matches he has bettered his average of the previous ten innings by 5 run. What is the average after the 11th innings.

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Percentage, Profit and Loss ⟨11⟩

1m	2m	3m	4m	5m	6m
1(U)	–	1(K)	–	1(A)	9

1 MARK QUESTIONS

1. Convert the following into percentage. **(Understanding)**

   (a) $\dfrac{6}{7}$ 　2. $\dfrac{3}{4}$ 　3. $\dfrac{5}{7}$ 　4. $\dfrac{13}{12}$ 　5. $\dfrac{6}{13}$ 　6. $\dfrac{15}{4}$

2. Convert the following into fractions.
   7. 85% 　8. 35% 　9. 49% 　10. 53% 　11. 79% 　12. 69%

3. Convert the following into ratio.
   13. 19% 　14. 28% 　15. 36% 　16. 45% 　17. 18% 　18. 68%

4. Convert the following into percentage.
   19. 1:5 　20. 3:7 　21. 9:2 　22. 6:7 　23. 5:3 　24. 9:2

5. Convert the following into decimal.
   25. 25% 　26. 42% 　27. 53% 　28. 73% 　29. 69% 　30. 78%

6. Convert the following into percentage.
   31. 0.42 　32. 0.57 　33. 0.64 　34. 0.28 　35. 0.88 　36. 0.93

37. Find 12½ of 1 hour 40 minutes.
38. Find 14% of 1 hour 28 minutes.
39. What percent is 68 km of 140 km?
40. What percent is 36 m of 58 km?
41. What percent is ₹78 of ₹28?
42. What percent is 12 paise of ₹58?
43. If a company makes a profit of 10,000 by selling goods worth ₹25,000. Find the profit percentage.
44. If a person makes a profit of ₹1200 by selling a watch worth ₹6000. Find the profit percentage.
45. By selling a mobile at ₹12,500 the profit made is ₹500. What is the cost price of the mobile?
46. Find the value of a house in the purchase of which the broker was paid 2.5% brokerage which amounted to ₹85,000.
47. Find the value of a machine in the purchase of which the broker was paid 2% brokerage which amounted to ₹1,30,000.
48. A person bought a cycle for ₹3000. For what price should he sell it to gain 10%?
49. A person bought a computer for ₹9000. for what price should he sell it to gain 8%?

3 MARKS QUESTIONS
(Knowledge)

1. A's income is 10% more than B's. How much is B's income less than A's.

2. A's income is 15% less than B's. How much is B's income more than A's.

3. The original price of a watch was ₹3500. It was decreased by ₹800. what is the percentage decrease of the price of the shirt?

4. While taking measurement a tailor write 36 instead of 26. what is the percentage error?

5. Rohit received a scholarship of ₹3500 in 2013 and ₹7800 in 2014. Find the percentage increase.

6. The admission in the college for the year 2016 was 1200 students and in 2017 is 14900. Find the percentage increase.

7. the sales of a company was ₹3500 in May and ₹30,000 in june. Find the percentage decrease.

8. When 35% of a number is added to 38, the result is the number itself. Find the number.

9. Bhavya and Divya score 78% and 82% in an examination. If the difference in their marks is 48. Find the maximum marks.

10. Vishal gets ₹45,000 after getting an increase of 10% of his salary. What is his original income?

11. The price of a motor cycle was decreased by 22% to 3900. What was the original price of the motor cycle.

12. A student has to score 50% marks to pass. He gets 100 marks and yet fails by 50 marks. find the maximum marks.

13. A person sold his mobile for ₹2500 and got a percentage profit equal to cost price. Find the cost price of the mobile.

14. Find the cost price of an article which is sold for ₹550 at a loss of 10%.

15. Find the cost price of an article which is sold for ₹350 at a profit of 6%.

16. A seller bought a colour T.V set for ₹10,000. He marked the selling price as ₹25,000. If he sells the TV after giving a discount of 30% from the marked price. find the profit percentage.

17. The cost price of 12 articles is equal to the selling price of 9 articles. Find the profit percent.

18. A dealer by selling 15 pens get the cost price of 20 pens. What is the profit percentage?

19. By selling 16 rings a shopkeeper loses the selling price of 4 rings. Find the loss percent.

20. The difference between cost price and selling price is 175. If the profit is 12%. Find the selling price.

21. In a dance competition 70% of the participants were girls. 35% of the boys and 65% of the girls got qualified for the next round. If 49 girls were eliminated find the number of boys who were selected.

22. Monthly income Anish, Manish and Suresh was increased from 27,000, 29,000 and 18,000 to 28,500, 30,500 and 20,000 respectively whose gain percent is maximum.

23. Rajesh's salary was increased by 10% and then again by 3%. If the present salary is ₹12,800. What was Rajesh's previous salary.

24. By how many percent should the use of tea be increased if the price of tea is decreased by 10%. So that the expenditure remains unchanged.

25. By how much percent should the use of sugar be increased if the price of the sugar is decreased by 15% so that the expenditure remains unchanged.

26. The cost of an article is increased by 15% and then decreased by 5%. Find the percentage increase in the original cost.

27. A number x is mistakenly divided by 20 instead of being multiplied by 20. What is the percentage error in the result.

28. A number 'x' is mistakenly multiplied by 10 instead of being divided by 10. What is the percentage error in the result.

29. A dealer buys 200 quintals of wheat at ₹1200 a quintal. He spends ₹10,000 on transportation and storage. Then he sells the wheat at ₹13/kg. Find his profit or loss. Also calculate it as a percentage.

30. 'A' sells a laptop to 'B' at a profit of 18% and 'B' sells to 'C' at a profit of 25%. If 'C' pays ₹2800 for the laptop what did 'A' pay for it.

31. A microoven is sold for ₹9400in which sales tax amounts for 20% of this and profit 2/3 of the remainder. Find the cost price of the microven. Calculate the sale than % profit.

32. By selling 12 notebooks a person gains the selling price of 8 notebooks. calculate the gain percent.

33. Ram Singh purchased two camels for ₹18,000 and ₹15,000 respectively. He sold them at a loss of 15% and a gain of 19% respectively. Find the selling price of each of the camels. Also find the overall loss or gain percet in the transaction.

34. A trader sells a calculator at a profit of 12%. If he had bought it at 6% less and sold it for ₹12 more, he would have gained 16½ percent. What did it cost him?

35. An article is sold at ₹36, there is a profit of ₹8. If it is sold at a loss of 8% find out its selling price.

36. A person sold a furniture at a profit of 10% instead of a loss of 10% and got ₹108 more. Find the cost price of the furniture.

37. Nihal refused to sell his book for ₹726 because there was a loss of 12%. If he sold the book at a profit of 5% find the selling price.

38. A person refuses to sell his car for ₹2,20,000 because there was a loss of 8%. If he sold the car at a profit of 6%. Find the selling price.

39. 1 kg of salt and 4 kg of sugar cost ₹160. But if the cost of sugar rose by 20% and that of salt by 10% the same quantity of salt and sugar would cost ₹190. Find the prices per kg of salt and sugar.

5 MARKS QUESTIONS
(Application)

1. There are two candidates in an election 20% of the members in the voters list did not cast their votes and 50 votes were declared invalid. The successful candidate secured 300 votes more than his rival. If 45% of the total members voted in favour of successful candidate then find the votes secured by each candidate.

2. A person gives 60% to his wife, 30% of the remaining he spends on recreation, 10% of the remaining he give to his daughter as pocket money and still saves ₹8000. What is the person's income? Also find the amount he gives his wife and daughter.

3. A person spent 25% of his salary and thereafter ₹22,000 and further 12% of the remainder. If ₹18,900 is still remaining what was his total salary.

4. In a college there are 2200 students. Last day except 5% of the boys all the students were present in the college. Today except 4% of the girls all the students are present in the college, but in both the days number of students present in the college were same. Find the number of boys and girls in the college.

5. Due to increase in the price of tea by 6% a man reduces his consumption by 5%. Find the percentage increase or decrease in expenditure. What difference would it make if the price decreases by 6% and the consumption increases by 6%?

6. The total number of students is Arts and Science College is 4200. If the number of arts students is increased by 40% and the number of science students is decreased by 25%. The total strength remains unchanged. Find the number of arts and science students.

7. A radio channel telecast the programme from 11:00 a.m to 11:00 p.m. It telecast 80 advertisements each of 6 seconds and 18 advertisements of 35 seconds. What is the percentage of time devoted in a day for the advertisement?

8. A man sells an article for ₹1750 and earns a profit of 15%. Find the (a) cost price (b) profit % at s.p.

9. If an article is sold for ₹3700 there is a profit of 20%. If the cost price ncreased by ₹800. Find the profit percentage.

10. A man purchased a certain number of apples at ₹35 and the same number at ₹30. He mixes them together sells them at ₹45. How much percent does he loose or gain in the transaction.

11. A dealer sold 3 furniture sets at ₹12,500 each. He sold one at a profit of 12% and the other two at a loss of 6%. Find his gain or loss percentage.

12. 6% more is gained by selling a table for ₹180 than by selling for ₹225. Find the cost price of the table.

13. A T.V is sold at a profit of 20% cost price and selling price both are increased by 250. If the new profit is at the rate of 15%, find the original cost of the t.v.

14. A wholesale dealer sold a machine to a shopkeeper at 20% profit. The shopkeeper sold it to a customer so as to get 25% profit for himself. The difference between the selling price of the shopkeeper and that of the wholesale dealer was found to be ₹129. Find the initial price of the machine.

15. Ram sold to Rahim cinema tickets at a profit of 12%. Rahim sold it back to Ram at a loss of 12%. In the whole process Ram gain ₹75 in all. Find the price at which Ram originally bought the tickets.

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Linear Functions

1m	2m	3m	4m	5m	Total
–	–	–	1(K)	–	4

(Knowledge based)

3 MARK QUESTIONS

1. The fixed cost of a firm and variable cost per unit of the product are ₹5000/- years and ₹5 respectively. If the selling price is ₹15/- unit. Find the
   (i) BEP in unit   (ii) Prove that total revenue is equal to the total cost at BEP.

2. A company sells x box of chalkpowder each day at ₹20 per box. The cost of manufacturing and selling these boxes is ₹15 per box. Plus a fixed dailies overhead cost of ₹900. Find the profit if 1000 boxes are manufactured and sold per day?

3. If the cost function C(x) of producing 'x' unit of a product is given by C(x) = $500x^2 + 2500x + 5000$ and if each unit of the product is sold at ₹6000 then find BEP.

4. The phillips light co. a manufacturing of light bulbs will break even at a sales volume of ₹2,00,000. The fixed cost is ₹40,000 and the selling price per bulb is ₹5. What is the average variable cost per bulb?

5. A manufacturer sells his product at ₹8.35 per unit. He is able to sell his entire production. His fixed cost is ₹2,116 and his varible cost per unit is ₹7.20. Find

6. A manufacturer of a product sells his entire output x. His total revenue R(x) = $7x$ and C(x) = $6x + 800$ find the,
   (i) BEP.
   (ii) Write the Break Even Chart.
   (iii) The BEP output of the total cost increased by 5%.

7. A manufacture of transistor finds that his cost function is linear. The total cost for 200 units is ₹6000 and for 300 units the total cost is ₹8000. What are the fixed cost and variable cost permit.

8. If R(x) = $1.05x$, C(x) = $0.85x$, total fixed cost = 600 (x = the volume of output) find the rupees sales and quantity sold at break even point. If a profit of ₹5000 is required how much rupees sales and volume of output are required?

9. If 'x' represents number of units produced, selling price per unit is ₹14, variable cost per unit is ₹7.33 and the fixed cost is ₹1200. Find the break-even point and quantity of sales. What is the slope of the total cost line?

10. A manufacture produce and sells bag at ₹8/- unit. His fixed cost is ₹5,550 and the variable cost per bag is ₹2.45. Find
    (i) Revenue function   (ii) Cost function   (iii) Profit function   (iv) BEP in unit

4 MARKS QUESTIONS

(Knowledge based)

1. A publishing house finds that the production of each book and the cost of the book are directly attributed. If the cost of each book is ₹30 and the fixed costs are ₹15000, selling price of each book is ₹45 then determine

   (i) Revenue function   (ii) Cost function   (iii) Break even point function

2. A confectioner makes and sells biscuit. He sells one pack of biscuit at ₹80. His cost of manufacturing is ₹40 per packet as variable cost and ₹3000 as fixed cost. Find the

   (i) Revenue function   (ii) Cost function   (iii) Profit function

   (iv) If he limits his production to 100 packets can he make profit?

   (v) What will be the number of boxes he must sell to make a profit so that he does not incur loss?

3. A manufacturer of steel vessels finds that his cost function is linear. He calculates that the total cost for 250 units is ₹8,000 and for 350 unit the total cost is ₹10,000. What are his fixed cost and variable cost per unit?

4. The daily cost of production C for x units of a manufactured product is given by

   $C(x) = 3.5x + 15000$

   (i) If each unit is sold for ₹5. Determine the minimum number of units that should be produced and sold to ensure no loss.

   (ii) If the selling price is increased by half a rupee per unit. What should be BEP.

   (iii) If 5000 units are sold daily what price per unit should be charged to guarantee no loss.

5. If the sale price per unit is ₹3, the variable cost per unit is ₹2 and the total fixed cost is ₹4,500 find the

   (i) Break even quantity.

   (ii) Total revenue function and total cost function at BEP.

   (iii) If a profit of ₹10,000 is desired the volume of output to be produced and sold.

   (iv) Sketch the break even chart.

6. A watch manufacturer produce 100 watches for a total cost of ₹20,000 and when the production is increased to 200 watches the total cost increased to ₹30,000. Assuming the cost and output to be in each related. Find the variable cost per unit, fixed cost and the slope of the line $y = a + bx$ (y = total cost). If the selling and sold what is the profit per watch. At a selling price of ₹200. What will be BEP output?

7. A shoe manufacturer is planning production of new varieties of shoes. For the first year the fixed cost of setting up the new production line are ₹1.25 lakh variable cost for producing each pair of shoes are ₹35. The sales department project that 1500 pair can be sold in the first year at the rate of ₹160 per pair.

(i) Find the cost function

(ii) Revenue function

(iii) Find the profit function for the product for the sale of 'x' pair of shoes.

(iv) If 1500 pairs are actually sold then what profit or loss does the company incur?

(v) Determine the BEP.

8. A company sells 'x' tins of talcum powder per day at ₹10 per tin. The cost of manufacturing is ₹6 per tin and the distributor charge ₹1 per tin. Besides the daily overhead cost comes to ₹600.

(i) Determine the profit function.

(ii) What is the profit if 500 tins are manufactured and sold per day.

(iii) How do you interpret the situation is the company manufacturer and sells 100 tins per day.

(iv) What is the B.E.P?

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UNIT III - TRIGNOMETRY

Angles and Trignometric Ratios ⟨13⟩

1m	2m	3m	4m	5m	Total
1(K)	–	1(U)	–	1(U)	09

1 MARK QUESTIONS

1. Define angle.
2. Convert 25° into radians.
3. Convert 720° into radians.

4. Convert $67\frac{1}{2}^{\circ}$ into radians.

5. Convert $\frac{2\pi^{C}}{3}$ into degrees [Sexagesimal measure].

6. Convert $\frac{3\pi^{C}}{5}$ into degrees.

7. Convert $\frac{3^{C}}{4}$ into degrees $\left[\text{Hint: Use } \pi = \frac{22}{7}\right]$

8. Prove that cosA.tanA = sinA.
9. Prove that sinA.secA = tanA.
10. Prove that $(1 - \sin^2A).\sec^2A = 1$.
11. Prove that $(\sec^2A - 1).\cot^2A = 1$.
12. Prove that $(1 - \cos^2A).\cosec^2A = 1$.
13. Prove that $\sin^2\theta.\sec^2\theta = \sec^2\theta - 1$.
14. prove that $\sec^2A + \cosec^2A = \sec^2A.\cosec^2A$.
15. Prove that $1 + \tan^2\theta = \sec^2\theta$.
16. Prove that $\sin^2\theta + \cos^2\theta = 1$.
17. Define radian.

3 MARKS QUESTIONS

1. Prove that $\cos^4A - \sin^4A = 1 - 2\sin^2A = 2\cos^2A - 1$.
2. The angles of a triangle are in the ratio 2:3:4. Express them in radians and as well as in degrees.

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3. The angles of a triangle are inthe ratio 4:5:6. Find them in degrees and radians.

4. The angles of a triangle are in A.P. and the greatest is double the least. Express them in degrees and radians.

5. The angles of a triangle are in A.P. The least being 36°. Find the angles in degrees and radians.

6. The angles of a triangle are in A.P and the greatest is 5 times the least. Find them in degrees and radians.

7. The angles of a quadrilateral are in the ratio 2:3:5:8. Find them in radians and degrees.

8. In right angle triangle, the difference between the two acute angles is $\dfrac{\pi}{9}$ radians. Find them in degrees.

9. If $x = a\cos^3\theta$; $y = a\sin^3\theta$. Show that $x^{2/3} + y^{2/3} = a^{2/3}$.

10. If $\cos A = \dfrac{12}{13}$ and A is acute, find other five trignometric functions.

11. If $\sec A = \dfrac{2}{\sqrt{3}}$ and A is acute, find other five trignometric functions.

12. Prove that $(1 + \tan A + \sec A).(1 + \cot A - \csc A) = 2$.

13. If $\cos\theta = \dfrac{a}{b}$. Show that $\dfrac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta} = \dfrac{a^2 - b^2}{a^2 + b^2}$.

14. Prove that $(1 + \sin\theta + \cos\theta)^2 = 2(1 + \sin\theta)(1 + \cos\theta)$.

15. Prove that $\dfrac{\cot A + \tan B}{\cot B + \tan A} = \dfrac{\cot A}{\cot B}$.

16. Prove that $\sqrt{\dfrac{1 + \cos A}{1 - \cos A}} = \csc A + \cot A$.

17. Prove that $\dfrac{\cos\theta}{1 - \tan\theta} + \dfrac{\sin\theta}{1 - \cot\theta} = \cos\theta + \sin\theta$.

18. Prove that $\dfrac{1}{1 + \sin^2 A} + \dfrac{1}{1 + \csc^2 A} = 1$.

19. Prove that $\dfrac{1}{1 + \cos A} + \dfrac{1}{1 - \cos A} = 2\csc^2 A$.

20. If $\cot A = \dfrac{5}{12}$ and A is acute, then show that $2\csc A - 4\sec A = \dfrac{247}{30}$.

21. If $\tan\theta = \dfrac{5}{12}$ and θ is acute. Show that $3\sin\theta - 4\cos\theta = -\dfrac{33}{13}$.

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22. If $x = a \sin\alpha.\cos\beta$, $y = b \sin\alpha.\sin\beta$ & $Z = \cos\alpha$. Show that $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z^2}{c^2} = 1$.

23. If $\sin A + \cos A = \sqrt{2} \sin A$. Show that $\sin A - \cos A = \sqrt{2} \cos A$.

5 MARKS QUESTIONS

1. The angles of a quadrilateral are in A.P. such that the greatest is double the least. Find them in degrees as well as in radians.

2. Prove that: $\dfrac{\tan A}{1 - \cot A} + \dfrac{\cot A}{1 - \tan A} = 1 + \sec A.\text{cosec } A$.

3. If $\tan A + \sin A = m$ and $\tan A - \sin A = n$. Show that $m^2 - n^2 = 4\sqrt{mn}$.

4. If $\tan A + \sin A = m$ and $\tan A - \sin A = n$, then prove that $(m^2 - n^2)^2 = 16$.

5. Prove that: $\dfrac{\tan A}{\sec A - 1} + \dfrac{\tan A}{\sec A + 1} = 2\text{cosec } A$.

6. If $\tan\theta + \sec\theta = \dfrac{5}{2}$. Then find the value of $\sin\theta$.

7. Prove that $\dfrac{\cos^3 A + \sin^3 A}{\cos A + \sin A} + \dfrac{\cos^3 A - \sin^3 A}{\cos A - \sin A} = 2$.

8. If $\tan\theta = \dfrac{p}{q}$. Then prove that $\dfrac{p\sin A - q\cos A}{p\sin A + q\cos A} = \dfrac{p^2 - q^2}{p^2 + q^2}$.

9. (*a*) If $\sin x + \sin^2 x = 1$. Then prove that $\cos^2 x + \cos^4 x = 1$.

    (*b*) If $\cot\theta = \dfrac{5}{2}$ and q is acute show that $\dfrac{5\cos\theta + 2\sin\theta}{5\cos\theta - 2\sin\theta} = \dfrac{29}{21}$.

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Standard Angles And Allied Angles   ⟨14⟩

1m	2m	3m	4m	5m	Total
1(U)	1(U)	1(S)	–	–	06

1 MARK QUESTIONS

1. If $A = 60°$. Prove that $\tan 2A = \dfrac{2\tan A}{1+\tan^2 A}$.

2. Prove that $\sin 30°.\cos 60° + \cos 30°.\sin 60° = 1$.

3. Show that: $4\sec^2 45° + 4\sin^2 30° - 2\cot^2 60° = \dfrac{25}{3}$.

4. If $A = 45°$. Prove that $\sin 2A = 2\sin A.\cos A$.

5. If $A = 60°$. Prove that $\cos 2A = \dfrac{1-\tan^2 A}{1+\tan^2 A}$.

6. Find the value of $\cos 120°$.

7. Find the value of $\cos 1125°$.

8. Find the value of $\sin 840°$.

9. Find the value of $\tan(-855°)$.

10. Find the value of $\sin\left(\dfrac{15\pi}{4}\right)$.

11. Find the value of $\tan\left(\dfrac{16\pi}{3}\right)$.

12. Find the value of $\sec\left(\dfrac{7\pi}{3}\right)$.

13. Find the value of $\operatorname{cosec}\left(\dfrac{-7\pi}{4}\right)$.

14. Find the value of $\cot\left(\dfrac{-13\pi}{4}\right)$.

2 MARKS QUESTIONS

1. Prove that $\sin 30° . \cos 60° + \cos 30° . \cos 60° = \dfrac{1+\sqrt{3}}{4}$.

2. Find the value of $\sin^2 \dfrac{\pi}{6} + \cos^2 \dfrac{\pi}{3} - \tan^2 \dfrac{\pi}{4}$.

3. Find the value of $\cot^2 60° + \sin^2 45° + \sin^2 30° + \cos^2 90°$.

4. Find the value of $\sin^2 \dfrac{\pi}{6} + \cos^2 \dfrac{\pi}{3} - \tan^2 \dfrac{\pi}{6} + \sin \dfrac{\pi}{2}$.

5. Find the value of $3\tan^2 \dfrac{\pi}{6} + \dfrac{4}{3}\cos^2 \dfrac{\pi}{6} - \dfrac{\sec^2 \left(\pi/4\right)}{2}$.

6. Find the value of $\cos^2 45° - \cos^4(30°) + \sin^4(30°)$.

7. Prove that $\cos(189°) + \cos 9° = 0$.

8. Prove that $\tan(225°) . \cot(405°) + \tan(765°) . \cot(675°) = 0$.

9. Prove that $\sin(480°) . \cos(690°) + \cos(780°) . \sin(1050°) = \dfrac{1}{2}$.

10. Prove that $\dfrac{\sin\left(90°+\theta\right) . \cos\left(180°-\theta\right) . \cot\left(270°+\theta\right)}{\sin\left(90°-\theta\right) . \sin\left(270°-\theta\right) . \cot\left(90°+\theta\right)} = 1$.

11. Simplify: $\dfrac{\cos 120° + \sin 135°}{\sin 135° - \cos 120°}$

3 MARKS QUESTIONS

1. $\dfrac{\sin^2 60° \cos^3 60° \sec^2 30°}{2\operatorname{cosec}^2 30° - \dfrac{1}{2}\sin^2 60° \tan^2 30°}$

2. S.T $\left(\dfrac{1-\cot \dfrac{\pi}{3}}{1+\cot \dfrac{\pi}{3}}\right)^2 = \dfrac{1-\cos \pi/6}{1+\cos \pi/6}$

3. If $x \sin 30° \cos^2 45° = \dfrac{\cot^2 30° \sec 60° \tan 45°}{\operatorname{cosec}^2 45° \operatorname{cosec} 30°}$ find x.

4. If $x \sin 45° \cos^2 60° = \dfrac{\tan^2 60° \operatorname{cosec} 30°}{\sec 45° \cot 30°}$ find x.

5. If $\left(x^2 - 2 + \operatorname{cosec}^2 \dfrac{\pi}{4}\right) x - 2 \sec^2 \dfrac{\pi}{3} = \cos 90°$ show that $x = 4, -2$.

6. If $x \sin 45° \tan 60° = \dfrac{\sin 30° \cot 30°}{3 \cos 60° \operatorname{cosec} 45°}$ show that $x = \dfrac{1}{3}$.

7. Find $x : x \sin 30° \cos^2 45° = \dfrac{\cot^2 30° \sec 60° - \tan 45°}{\operatorname{cosec} 45° \operatorname{cosec} 30° \cos 60°}$

8. If $x^2 (\operatorname{cosec}^2 45° - \cos^2 90°) - 5 (\cos 0° + \tan 0°)x + \sec^2 45° = 0$ show that $x = 2, \dfrac{1}{2}$.

9. Simplify $\dfrac{\sin 150° - 5 \cos 300° + 7 \tan 2250°}{\tan 135° + 3 \sin 210°}$

10. If $\sin \theta = \dfrac{-3}{5}$ and θ lies in IV Quadrant then porve that $\dfrac{3 \tan \theta - 4 \cos \theta}{4 \tan \theta + 3 \cos \theta} = \dfrac{109}{12}$.

11. Simplify: $\dfrac{\tan (180 + A) \sec (180 + A) \operatorname{cosec} (90 + A)}{\sec (360 - A) \cot (90 + A)}$

12. Simplify: $\dfrac{\operatorname{cosec} (180 + \theta) \sin (360 - \theta) \tan (360 + \theta)}{\sin (90 + \theta) \cos (180 - \theta) \tan(-\theta)}$

13. If $\sin \theta = \dfrac{11}{61}$ and $90 < \theta < 180°$. Find the values of $\cos \theta$, $\tan \theta$, $\sec \theta$.

14. If $\sin \theta = \dfrac{-8}{17}$ and $\pi < \theta < \dfrac{3\pi}{2}$. Find the values of $\dfrac{\tan \theta - \cos \theta}{\sec \theta + \operatorname{cosec} \theta}$.

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UNIT IV - ANALYTICAL GEOMETRY

Co-ordinate System in a Plane ⟨15⟩

1m	2m	3m	4m	5m	Total
–	1(K)	–	–	1(A)	7

(Knowledge)

2 MARKS QUESTIONS

1. Find the value of k if the distance between $(2k, 5)$ and $(-k, 4)$ is $\sqrt{90}$.

2. If the distance between the points $(3, -2)$ and $(-1, a)$ is 5 units. Find the value of $'a'$.

3. Find the distance of the following points from x-axis.
   (*a*) $(-4, 2)$ (*b*) $(-\frac{1}{2}, 2)$ (*c*) $(5, 3)$

4. Find the distance of the following points from the y-axis
   (*a*) $(8, 4)$ (*b*) $(-2, 3)$ (*c*) $(0, 3)$

5. Find the distance of the following points from the origin.
   (*a*) $(4, -1)$ (*b*) $(5, 3)$ (*c*) $(-3, -2)$

6. Find the points of trisection of the line joining the points $(3, 4)$ and $(5, -2)$.

7. Find the points of trisection of the line joining the points $(2, -1)$ and $(5, 4)$.

8. One end of a diameter of a circle is $(1, 3)$ and its centre is $(4, -2)$. Find the co-ordinates of the other end of the diameter.

9. The centroid of the triangle ABC is the point $(4, 3)$. The co-ordinates of 'A' is $(5, -4)$ and B is $(-1, 6)$. Find the co-ordinates of C.

10. Find the area of the triangle whose vertices are
    (i) A(6, -4) B(-2, 5) C(6, 2)   (ii) A(4, -2) B(1, 3) C(4, -3)
    (iii) A(5, 2) B(6, -1) C(5, -1)

11. Find the perimeter of the triangle formed by the points $(3, -1)$ $(5, 2)$ and $(-1, 2)$.

5 MARKS QUESTIONS

(Application)

1. Show that the following points are the vertices of a square and hence find the areas.
   (a) $(3, 2)$ $(0, 5)$ $(-3, 2)$ $(0, -1)$ (b) $(1, 1)$ $(4, 1)$ $(4, 4)$ $(1, 4)$
   (c) $(4, -5)$ $(8, 1)$ $(14, -3)$ $(10, -9)$

2. Prove that the following sets of points form a rhombus. Also find their areas.
   (a) $(-3, 6)$ $(-2, 11)$ $(3, 12)$ $(2, 7)$ (b) $(7, 3)$ $(3, 0)$ $(0, 4)$ $(4, 7)$

3. Prove that the following sets of points form paralelogram.
   (a) $(3, 2)$ $(4, -1)$ $(7, 3)$ and $(6, 6)$ (b) $(0, 1)$ $(-3, 7)$ $(6, -9)$ $(9, -1)$

4. Prove that the following sets of points are the vertices of a rectangle
   (a) (8,3) (8, 6) (10, 6) (10, 3)   (b) (3, –2) (3, 1) (5, 1) (5, –2)

5. Find the circumcentre of the triangle whose vertices are (1, 2) (2, 1) & (2, 3). Also find the circum radius.

6. Find the coordinates of the circumcentre of the triangle so formed by the points (1, 1) (2, –1) and (3, 2).

7. Find the length of the medians of the triangle with vertices (–3, 6) (5, 4) (1, –2).

8. Find the ratio in which the line segment joining the points (4, 5) & (1, 2) is divided by the x-axis? Also find the coordinates of the point of division.

9. Find the ratio in which the line segment joining (2, –3) and (5, 6) is divided by y-axis. Also find the co-ordinates of the point of division.

10. The midpoints of the sides of the triangle are (2, 6) (4, 6) and (3, 5) the find the vertices of the triangle.

11. Find the co-ordinates of the vertices of the triangle given the midpoints of the sides are (4, –1) (7, 9) (4, 11).

12. Find the ratio in which the co-ordinate axis divide the line joining the points (2, 5) & (1, 9). Find the co-ordinates of the points of division.

13. Find the area of the quadrilateral whose vertices are
    (a) (1, 2) (6, 2) (5, 3) (3, 4)   (b) (–1, 3) (4, –1) (3, 2) (4, 2)
    (c) (2, –1) (1, 1) (3, 2) (1, 2)   (d) (1, 1) (3, 4) (5, –2) (4, –7)

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Locus and its Equations 16

1m	2m	3m	4m	5m	Total
–	–	1	–	1(U)	5

3 MARKS QUESTIONS

1. Find the equation of the locus of the point equidistant from (–1, 1) and (4, 2).

2. Find the equation of the locus of the point which moves such that its distance from the co-ordinate axes which is in the ratio 5:3.

3. Find the equation of the locus of the point which moves such that its distances from the points A(3, 1) and B(1, 3) are in the ratio 2:3.

4. A point P moves such that $PA^2 = 3PB^2$. If A = (5, 0) and B = (–5, 0). Find the equation of the locus P.

5. Find the equation of the locus of a point which moves such that it forms a right angle triangled with the points (2, 3) and (3, 4).

6. Find the equation of the locus of the point which moves such that it is equidistant from (2, 4) and y-axis.

7. Find the equation of the locus of the point P(x, y) such that its distance from (1, –2) is greater than 3.

8. Find the equation of the perpendicular bisector of the line joining A(3, –2) and B(4, 1).

Straight Lines

1m	2m	3m	4m	5m	Total
1(K)	1(U)	1(U)	–	1(S)	11

1 MARK QUESTIONS

1. Find the slope of the line with inclination $\dfrac{\pi}{4}$.

2. Write the equation of the line which is parallel to x-axis and at a distance of 5 units below the x-axis.

3. Find the slope of $\sqrt{3}x + y + 2 = 0$.

4. Reduce $2x + 3y = 7$ to slope intercept form.

5. Reduce $\sqrt{3}x + y + 8 = 0$ to intercept form.

6. Find slope of $3x + 5y - 11 = 0$.

7. If the slope of line AB is $\dfrac{3}{4}$ and AB $\perp$ CD then find slope of CD.

8. Find centroid of the triangle formed by the points (2, 4) (5, 3) and (8, 3)

9. Find the slope of the line joining points (1, 2) and (–1, –2).

10. Find the slope of line with inclination 60°.

11. Find the slope of line with inclination $\dfrac{\pi}{2}$.

2 MARKS QUESTIONS

1. Show that the points (5, –1) and (–3, 4) lie on either side of the line $6x - 5y + 1 = 0$.

2. Show that the points (0, 0) and (1, –1) lie on the same side of the line $4x - 7y + 1 = 0$.

3. Determine the position of the points (0, 0) and (1, –1) with respect to the line $2x + 4y - 1 = 0$.

4. Find the distance between the parallel lines $4x - 3y - 2 = 0$ and $4x - 3y - 6 = 0$.

5. Find K so that the distance from (2, 3) to the line $8x + 15y + K = 0$ may be equal to 4 units.

6. Derive the equation of the line in one point form i.e., $y - y_1 = m(x - x_1)$. Geometrically, where m is the slope and $P(x_1, y_1)$ is the given point.

7. Find the value of a if the slope of the line joining the points (3, a) and (4, 3) is $\dfrac{7}{2}$.

8. Find the equation of the line joining the points $(-1, -3)$ $(6, 11)$.

9. Show that the points $A(4, -2)$ $B(2, -4)$ and $C(7, 1)$ are collinear using slope method.

10. Find the points of intersection of lines $x + 5y + 4 = 0$ and $3x - 4y - 7 = 0$.

11. Write the equation of the line which has x intercept $= 3$ y intercept $= 5$.

12. If $(3, a)$ lies on the line joining $(1, -4)$ and $(-2, 5)$ find a.

13. Find the equation of the line parallel to x axis and at distance of $+7$ from it.

14. Find the equation of the line passing through $(4, 3)$ and with slope 2.

15. Find the equation of the line passing through $(3, 5)$ and making an angle $45°$ with the positive x-axis.

16. Find the length of the perpendicular from $(-3, 2)$ to the line $12x - 5y + 7 = 0$.

3 MARKS QUESTIONS

1. Derive slope intercept form of line $y = mx + C$. Also write the equation of passing through origin with slope m.

2. Find the distance between the parallel lines $5x + 12y - 19 = 0$ and $5x + 12y + 7 = 0$.

3. Find the equation of the line which passes through the point $(-4, 5)$ and whose intercepts are equal in magnitude but opposite in sign.

4. Show that the line joining $(2, -3)$ and $(-5, 1)$ is parallel to the line joining $(7, -1)$ and $(0, 3)$.

5. Find the equation of the line passing through $(2, -3)$ which cuts off intercepts on x and y axes which are in the ratio $3:4$.

6. Find the euation of the line parallel to $2x + 3y + 1 = 0$ and passing through $(-1, 1)$.

7. Find the equation of the line perpendicular to $3x - 2y + 1 = 0$ and passing through $(1, -2)$.

8. Find K if the line $(K + 1)x + (2K + 3) y + 3 = 0$ and $2x - 5y + 1 = 0$ are perpendicular to each other.

9. Find the equation of the line through the point of intersection of and $2x - 5y = 1$ and $3x - 2y = 8$ and parallel to the line $2x + y = 3$.

10. Find the value of a if the lines $x - 2y = 1$, $2x + y = 7$ and $ax - 5y = 4$ are concurrent.

11. Derive equation of a line in two-point form.

4 MARKS QUESTIONS

1. Prove that the lines $x + y + 4 = 0$, $2x = 3y + 7$ and $3x + y = -6$ are concurrent. Also find the point of concurrency.

2. If the line $2x + 3y = -1$ cuts the x and y axis at A and B respectively. Find the area of the tirangle OAB.

3. Find the equation of line passing through the intersection of the line $2x + 3y = 5$, $7x - y = 6$ is perpendicular to the line $3x + 4y + 1 = 0$.

5 MARKS QUESTIONS

1. Find the equation of the medians of the triangle whose vertices are A(2, 3), B(–1, –4), C(5, –2).

2. Find the equation of the line passing through the point of intersection of $2x + 4y = 3$ and $x + 5y = 1$ and making equal positive intercepts on the cordinate axes.

3. Find equation of a line passing through the point (2, 2) such that the sum of its intercepts on the axes is equal to 9.

4. In what ratio is the line joining the points (2, 3) and (4, –5) is divided by the line joining (6, 8) and (–3, 2).

5. Find the equation of the line which passes through the intersection of the lines $x – 2y + 4 = 0$ and $4x – 3y + 1 = 0$ and is inclined at an angle 135° with the x-axis.

6. Find the foot of the perpendicular drawn from the point (–2, –1) on the line $3x + 2y – 5 = 0$.

7. Find the image of the point (2, 4) on the line $x + y – 10 = 0$.

8. Find the equations of the medians of the triangle formed by the points (–1, 3) (–3, 5) and (7, –9).

9. Find the reflection of the point P(2, 1) in the line $x + y = 5$.

10. Find the equation of the line passing through the points of intersection of points $2x + 3y – 7 = 0$ and $5x + 6y + 8 = 0$ and the point (4, 3).

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I PUC BASIC MATHEMATICS

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