



SHRI BHAGHAVAN MAHAVEER JAIN EVENING COLLEGE

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BANGALORE

METHODS AND TECHNIQUES FOR DATA ANALYSIS

STUDY MATERIAL

II SEMESTER B.COM



CHAPTER - 4
SIMPLE AND COMPOUND INTEREST
RATION AND PROPORTION AND
ANNUITIES

1. Express in lowest terms the ratio of 4: 12.

$$4/12 = 1/3$$

2. A's monthly salary is Rs. 250 and B's annual Income from land is Rs. 4000. What is the ratio of their income.

$$\text{A's yearly income} = 250 \times 12 = 3000$$

$$\text{Ratio} = 3000: 4000 = 3 : 4$$

3. Find the missing term in the proportion 10:40: :x:200

$$40 \times x = 10 \times 200$$

$$x = (10 \times 200) / 40 = 50$$

4. Find fourth proportional to 2:3:4.

Let the fourth proportional be x.

$$2:3:4:x$$

$$2x = 12$$

$$x = 6$$

5. A number is divided into 3 parts in ratio 2:3:4, if the third part is 20. What are the

Others

Let the number be x .

The three numbers are 2x, 3x and 4x.

$$4x = 20$$

$$x = 5$$

$$\text{First part} = 2 \times 5 = 10$$

$$\text{Second part} = 3 \times 5 = 15$$

6. What number must be subtracted from each of 9, 11, 15 and 19. So that the



difference will be proportional.

Let the number Subtracted be x

$(9 - x)$, $(11 - x)$, $(15 - x)$ and $(19 - x)$ are in proportion.

$$(9 - x) : (11 - x) = (15 - x) : (19 - x)$$

$$(9 - x)(19 - x) - (11 - x)(15 - x)$$

$$171 - 9x - 19x + 4x^2 = 165 - 15x - 11x + x^2$$

$$\therefore 2x = 6 \quad x = 3$$

\therefore Number 3 must be subtracted.

7. If $A:B = 2:3$, $B:C = 4:5$, $C:D = 6:7$. Find the ratio

$A:B:C:D$.

$$A : B = 2 : 3$$

$$B : C = 4 : 5$$

$$A : B : C = 8 : 12 : 15$$

$$C : D = 6 : 7$$

$$A : B : C : D = 48 : 72 : 90 : 105$$

$$36 : 24 : 30 : 35$$

8. 10 men can complete a Job in 12 days. How many days will it take for 15 men to complete the same job.

$$10 \text{ men} : 15 \text{ men} :: x : 12 \text{ days}$$

$$15x = 10 \times 12$$

$$x = (10 \times 12) / 15 = 8 \text{ days}$$

9. The ratio of two numbers is 2:3 and their Sum is 85. Find the numbers.

The ratio is 2 : 3

Numbers may be $2a$ and $3a$ where a is a constant.

$$2a + 3a = 85$$

$$5a = 85$$

$$a = 17.$$

Thus the 2 numbers are 2×17 and 3×17 i.e., 34, 51.

10. If Rs. 120 maintains a family of 4 persons for 30 days, How long Rs. 204 maintain a family of 6 persons.



Persons	Money(Rs)	Days
4	120.	30
6	240	x

$$X = (240 \times 4 \times 30) / 120 \times 6$$
$$= 34$$

11. Find the Simple interest on Rs. 570 for $2\frac{1}{2}$ years at 3 % p.a. What is the Simple interest and amount after $2\frac{1}{2}$ years.

$$SI = PTR/100$$

$$P=570 \quad T=2\frac{1}{2} \text{ years} \quad R=3\%$$

$$(570 \times 5 \times 3) / 100 \times 2 = 42.75/-$$

$$A = SI + P \quad 42.75 + 570 = 612.75/-$$

12. Find the SI on Rs 300/- at 8% p.a for 14 weeks

$$SI = PTR/100$$

$$P=300, \quad T=14/52 \quad R=8\%$$

$$= 6.46/-$$

13. Sum of money amounts to Rs 855/- in $3\frac{1}{2}$ years at 4% p.a. Find the sum

$$SI = PTR/100$$

$$A = 855/- \quad R = 4\% \text{ p.a} \quad T = 7/2$$

$$P = A / (1 + (RT/100))$$

$$= 855 / (1 + (4 \times 7/2 \times 100))$$

$$= 750/-$$

14. A person deposited Rs 6200/- on June 20th 1986. It amounts to Rs. 6350/- on September 1986 at the rate of SI. Find the rate of interest

$$P=6200, \quad A=6350 \quad SI=6350-6200=150$$

$$T = \text{Jun} + \text{Jul} + \text{Aug} + \text{September}$$

$$10 + 31 + 31 + 1 = 73 \text{ days}$$

$$1/5 \text{ years}$$

$$R = (SI \times 100) / P \times T$$



$$= (50 \times 100 \times 5) / 6200 \times 125$$
$$= 4\%$$

15. In what time will a Sum Rs. 2000 amount to Rs. 2240 at- the rate of 4% p.a.

$$P=2000 \quad A = 2240 \quad R= 4 \%$$
$$T= (SI \times 100) / P \times R$$
$$T= (240 \times 100) / 2000 \times 4$$
$$= 3 \text{ years}$$

16. Find the Compound interest on Rs. 20000 at 6% p.a. for 4 years. What is the S.I. on the same amount?

$$CI = P(1+R/100)^T - P$$
$$SI = PTR/100$$
$$CI = 20000(1+6/100)^4 - 20000$$
$$5249.54$$
$$SI = (20000 \times 6 \times 4) / 100$$
$$= 4800$$

17. Find the compound interest on Rs 10000 for 2 years at the rate of 4% p.a. payable half yearly.

$$P=10000 \quad R=4/2 \text{ years} \quad T=2 \times 2=4$$
$$A = P(1+R/100)^T$$
$$= 10000(1+2/100)^4$$
$$= 824/-$$

18. What sum amounts to Rs. 8000 after 4 years at 5%. Compound interest.

$$A=8000 \quad R= 5\% \quad T= 4 \text{ years}$$
$$P = A / (1+R/100)^T$$
$$= 8000 / (1+5/100)^4$$
$$= 6581.65/-$$

19. A perpetuity which yields a firm annual rent worth Rs. 125 a year is sold for Rs. 4000. Find the rate of interest.

$$P = a/i$$



$$4000=125/i$$

$$i = 3(1/8)\%$$

20. What is the value of perpetual annuity of Rs. 1000 a year at 3% p.a.

$$a = 1000, r 0.03$$

$$p = a/i$$

$$= 1000/.03$$

$$= 33.3333/-$$

21. Define annuities

Regular periodic payment of a fixed sum is called an annuity. Suppose we deposit Rs. 60 each year for 8 years to an a/c which earns 6% interest compounded annually such periodic payment is called an annuity. Generally the period of payment is a year. The period for which an annuity is payable is called term. One who receives the annuity is called annuitant.

22. Define the Terms

a) Annuity Certain:-

An annuity certain is one whose payments extend over a fixed term of years.

b) Contingent annuity:-

If the term of an annuity depends upon some uncertain event, the annuity is called contingent annuity. Death of an annuitant is a Contingent annuity.

c) Immediate annuity:- If each payment is made at the end of each period, the annuity is called an Immediate annuity.

d) Annuity due-

If payment is made at the beginning of each period then the annuity is called annuity due.

e) Perpetual annuity- An annuity which is payable for ever is called perpetual annuity.

f) Deferred annuity:- A deferred annuity is one whose term does not begin until the expiration of a specified time.

g) Deferred Perpetuity:- If the annuity does not commence at once but after a certain number of years, it is called deferred perpetuity.

h) Present Value of an annuity:- It is the present worth of various payments. Thus it is the sum of money which is at present equivalent in value to the annuity.

i) Amount of annuity- It is the total sum of the unpaid installments together with the stipulated compound interest at the end of the given number of years.

23. A sum of money was divided between A and B in the ratio 4:5. If A received Rs. 20.



How much did B receives.

Let their share be $4x$ and $5x$

Given: A Share = 20 Rs.

$$4x = 20$$

$$x = 5$$

$$\text{B Share} = 5x = 5 \times 5 = 25$$

24. Divide Rs. 118 among A, B and C. So that $A : B :: 3 : 4$ and $B : C :: 5 : 6$.

$$A : B = 3 : 4$$

$$B : C = 5 : 6$$

$$A : B : C = 15 : 20 : 24$$

Total Sum of the terms of the ratio

$$15 + 20 + 24 :: 59$$

A's Share is $\frac{15}{59}$ of the total amount

$$\left(\frac{15}{59}\right) / 118 = 30/-$$

$$\text{B's share is } \left(\frac{20}{59}\right) / 118 = 40/-$$

$$\text{C's share is } \left(\frac{24}{59}\right) / 118 = 48/-$$

25. If $x : y = 4 : 3$. Find the value of $(4x + 3y) : (7x + 64)$.

$$x : y = 4 : 3$$

$$x/y = 4/3$$

$$x = (4y)/3$$

$$(4x + 3y) : (7x + 64) = (4x + 3y) / (7x + 64)$$

Substituting the value of X in the above equation we get

$$Y (16 + 9) / Y (28 + 18)$$

$$25/46$$

$$25:46$$

26. If a man earns Rs. 65/ week, how long must he work to earn Rs. 780?

Let the number of week required to a man to earn Rs. 780 be x .

Ratio of the week = $1 : x$

$$65 : 780 :: 1 : x$$

$$65x = 780$$

$$x = 780/65$$

$$= 12 \text{ weeks}$$

Man work 12 weeks to earn Rs. 780.



27. Carpenters can earn Rs. 360 in 6 days working at 9 hours a day. How much 8 Carpenters can earn in 12 days working 6 hours a day.

5 Carpenters: 8 Carpenters

6 day : 12 day :: 360 : x

9 hours : 6 hour

$$X = (8 \times 12 \times 6 \times 36) / (5 \times 6 \times 9)$$

$$= 768$$

8 Carpenters can earn Rs. 768 in 12 days working at the rate of 6 hrs/days

28. A runner runs at a Speed of 16 Kms/ hrs and reaches a town in 24 hrs, How- much time does he take to cover the same distance if his speed was 30 Kms/hours.

16 Km : 30Kms = x hrs : 24 hours

$$30x = 16 \times 24$$

$$x = \frac{16 \times 24}{30} = 12.8 \text{ hours}$$

The required time is, 1 hour and 48 minutes.

29. 8 men or 16 boys can do a work in 39 days, in how many days will 4 men and 18 boys do it.

8 men's work = 16 boys work

1 man's work = 2 boys work

4 men work + 18 boys work = 8 boys work + 18 boys work = 26 boys work

16 boys: 26 boys : x : 39

$$26x = 16 \times 39$$

$$x = \frac{16 \times 39}{26} = 24 \text{ hours}$$

The required, number of days = 24 days

30. If 15 masons build a wall 40 feet long, 2 1/2 feet thick and 21 feet height in 18 days of 10 1/2 hours each. In how many days of 15 hours each will 45 mason's build a wall 400 feet long 5 feet thick and 20 feet height



Let the number of days = x

15 masorrs = 45 masons

400 ft x 5 ft x 20 ft : 40ft x 2.5 ft x 21 ft) :: x:18

10½ hours :- 15 hours

$$45 \times 40 \times 2.5 \times 21 \times 15x = 15 \times 400 \times 5 \times 20 \times 2.5 \times 18$$

$$= (15 \times 400 \times 5 \times 20 \times 2.5 \times 18) / (45 \times 40 \times 2.5 \times 21 \times 15)$$

$$= 80 \text{ days}$$

31. A contractor undertakes to do a piece of work in 60 days and employs 300 men. But after 40 days he finds that only $\frac{3}{5}$ of the work has been completed. How many extra men be engaged, so that the work may be finish in time.

Number of men employed = 300

Let the number of men required to finish the work be x

Number of days worked = 40 days

Remain days = 60 - 40 = 20 days

Work completed = $\frac{3}{5}$

Work to be completed = $1 - (\frac{3}{5}) = \frac{2}{5}$

300 men: X men} :: $\frac{3}{5} : \frac{2}{5}$ or 3:2

40 days: 20 days

$$X = 20 \times 3 = 300 \times 40 \times 2$$

$$= \underline{300. \times 40 \times 2} = 400 \text{ men}$$

32. Sunil is elder than Rajesh by 5 _years. After 5' years, the ratio of their ages would be 5 :

4. Find their present age.

Let Rajesh's age be y years.

$$x = 5 \quad \text{---(1)}$$

After 5 years Sunil's age = x + 5

Rajesh's age = y + 5

$$\frac{x + 5}{y + 5} = \frac{5}{4}$$

$$4(x + 5) = 5(y + 5)$$



$$4x + 20 = 5y + 25$$

$$4x - 5y = Y \quad \text{---(2)}$$

Solving (1) and (2)

$$. x = 20 \quad Y = 15$$

Sunil's present age is 20 years.

Rajesh's present age is 15 years.

33. A purse contains some coins consisting of Rs, 50 paise and 25 paise. If the coins be in the ratio of 2 : 3 : 10 and Their total value be Rs. 72. Find the number of coins of each kind.

$$\text{Ratio of coins} = 2 : 3 : 10$$

$$\begin{aligned} \text{Ratio of the value} &= 2 \times 1 : 3 \times 5 : 10 \times 25 \\ &= 4 : 3 : 5 \end{aligned}$$

$$\text{Sum of Rs} = 4 + 3 + 5 = 12$$

$$\text{Value of Rupee Coins} = (4/12) \times 72 = 124/-$$

No of one rupee coins 24

$$\text{Value of 50 paise coins} = (3/12) \times 72 = 18$$

No of 50 paise coins = 36

$$\text{Value of 25 paise coins} (5/12)72 = 30$$

No of 25 paise coins = 120

34. Divide Rs. 2250 among A, B and C. So that B may get half as much again as C and A half as much as B and C together .

Let C's Share be 1

$$\text{B gets } 1 + 1/2 = 3/2$$

$$\text{A gets } 1/2(1 + 3/2) = 5/4$$

Ratio between A B and C 5:6:4

$$\text{Sum of the ratio} = 5 + 6 + 4 = 15$$

$$\text{A share} = (5/15) \times 2250 = 750/-$$

$$\text{B share} = (6/15) \times 2250 = 900/-$$

$$\text{C share} = (4/15) \times 2250 = 600/-$$



35. A person borrowed Rs. 6400. After 2 years and 3 months, he paid Rs. 6136 in cash with a horse and cleared the amount. If the rate of interest was 3¹/₂% p.a. Find the value of the horse.

$$P=6400 \quad R=3.5 \quad T= 2.25 \text{ years}$$

$$SI= PTR/100$$

$$(6400 \times 3.5 \times 2.25) / 100 = 504$$

Let the value of the horse be x

$$\text{The amount paid} = 6400 + 504 = 6904 \text{ Rs.}$$

$$\text{This amount is} = 6136 + x$$

$$6904 = 6136 + x$$

$$x = 6904 - 6136$$

$$= 768$$

∴ Value of the horse = 768/-

36. A Sum of money amounted to Rs. 1071 in 6 months and Rs. 1106 in 16 months. Assuming S.I. Find the principal amount.

$$\text{Amount in 16 months} = 1106$$

$$\text{Amount in 6 months} = 1071$$

$$\text{Interest for 10 months} = 35$$

$$\frac{35}{10} = 3.50$$

$$\text{Interest for 6 months} = 3.50 \times 6$$

$$= 21$$

$$\text{Principal} = A - P$$

$$= 1071 - 21 = 1050/-$$

37. A person interest Rs. 200 for 5 years and Rs. 500 for 2 years. The rate of Simple interest being the same in both the cases. If he receives altogether Rs. 125 as interest find the rate of interest.

$$\text{Let the interest on Rs. 200 for 5 years} = x$$

$$\text{Interest on Rs. 500 for 2 years} = 125 - x$$

$$R = (SI \times 100) / PT$$

$$(x \times 100) / 200 \times 5 = (125 - x) / 10$$



$$R = (125 - X) \times 100 / (500 \times 2)$$

$$x/10 = (125 - x)/10$$

$$x = 62.5$$

$$R = x/10 = 62.5/10 = 6.25\%$$

38. A man had Rs. 4800 part of which he lent at 6% and the rest at 3%. The whole yearly interest amounts to Rs. 210. How much did he lent at 6% and at 3%.

Suppose he lent the whole sum at 3.%

$$SI = \frac{4800 \times 3 \times 1}{1000} = 144$$

But the actual interest = 210

$$\text{Difference in interest} = 210 - 144 = 66$$

$$\text{Difference in rate \%} = 6 - 3 = 3$$

If the difference is Rs. 3 the sum lent at 6% = 100

$$\begin{aligned} \text{If the difference is Rs. 66 the sum lent 6 \%} &= (66 \times 100) / 3 \\ &= 2200 \end{aligned}$$

Amount lent at 6% is 2200 at 3% is Rs. 2600

39. Divide Rs. 5697 into 2 parts so that the interest on the first part for 2 years at 5% is equal to the interest on the second part for 5 years at 4%.

Suppose the first part be 100

$$\text{Interest on 100} = (100 \times 5 \times 2) / 100 = 10$$

Interest on II part = Rs 10 R = 4% T = 5 years

$$P = (SI \times 100) / R \times T$$

$$(10 \times 100) / 5 \times 4 = 50/-$$

The ratio of the 2 parts = 100 : 50 = 2 ; 1

$$\text{First part} = 2/3 \times 5697 = 3798/-$$

$$\text{Second part} = 1/3 \times 5697 = 1899/-$$



40. In what time will Rs. 1200 amounts to Rs. 1323 at 5% Compound interest?

$$A/P = (1+r/100)^T$$

$$1323/1200 = (1+5/100)^T$$

$$(21/20)^T = (21/20)^2$$

T=2 years.

41. A man borrowed Rs. 12500 from a bank and after 2 years paid bank Rs 13250 in full settlement of his debt. What is the percentage rate of compound interest charged by the bank?

A= 13250 P= 12500 T= 2 years R = ?

$$A/P = (1+r/100)^T$$

$$13250/12500 = (1+R/100)^2$$

$$1.0816 = (1+R/100)^2$$

$$1 + R/100 = \text{sqrt}(1.0816)$$

$$R = .04 \times 100$$

4%

42. Find the amount of an annuity of Rs. 4000/- annum for 10 years reckoning CI 10% p.a

$$A = a/i((1+r)^n-1)$$

$$= 4000/.01((1+.01)^{10}-1)$$

$$40000(1.5967)$$

63.748/-

43. How many annual payments of Rs. 48 each are needed to accumulate Rs. 2000 if the interest is 4%.
Compounded annually.

$$A = a/i((1+r)^n-1)$$

$$2000 = 48/0.04((1+0.04)^n-1)$$



$n = 24.2$ years.

44. A man wishes to pay back his debt of Rs; 5044 due after 6 years by 6 equal yearly installments, Find the amount of each installment, money being worth 10% p.a.
Compound interest.

$$A = a/i((1+r)^n-1)$$

$$5044 = a/0.1((1+0.1)^6-1)$$

$$a = 653.37/-$$



CHAPTER - 5
PROGRESSIONS

1. Define a Sequence.

A set of numbers arranged according to some definite rule is called a Sequence. The members of the Sequence are called terms and they are numbered as the 1st, 2nd, 3rd and so on.

Eg: 1,2,3

2. Define Infinite Series.

When the terms of a Sequence are connected by any sign '+' or '-' then the expression so obtained is called infinite series.

Eg: 1 + 5 + 9 + 13

3. Define finite Series

A Series containing a limited number of terms is said to be a finite Series.

Eg: 2+4+6+8+10+12.

4. Define Arithmetic Progressions (A.P.)

A Sequence is said to be in arithmetic progression, if the difference between any term and the preceding term is always the same. The first term and the common difference of an A.P. is denoted by 'a' and 'd' respectively.

The general representatives of an A.P. is a, a+d, a+2d, ..., Where a is the first term and d is the common difference

[Eg: 1, 2, 3, 4 is an A.P.

13,10,7,4 ...is an A.P.

5. What the formula to find the nth term 'of A.P.

$$T = a + (n - 1)d$$

Where

T = nth term

a = First term



$d = \text{Common difference}$

6. Find the 10th term of the Sequence 3, 5, 7, 9

$$T_n = a + (n-1)d$$

$$d = 5 - 3 = 2$$

$$a = 3$$

$$n = 10$$

$$\begin{aligned} T_{10} &= 3 + (10-1)2 \\ &= 3 + 9 \times 2 \\ &= 3 + 18 \\ &= 21 \end{aligned}$$

7. Find the 15th term of the Series.

$$35 + 39 + 43 + 47 + \dots$$

$$T_n = a + (n-1)d$$

$$T_n = 15$$

$$a = 35$$

$$d = 39 - 35 = 4$$

$$\begin{aligned} T_{15} &= 35 + (15 - 1)4 \\ &= 35 + 14 \times 4 \\ &= 91 \end{aligned}$$

8. Find the 32nd term of the Sequence -13; -8, -3, 2, 7.

$$d = -8 - (-13), \quad -8 + 13 = 5$$

$$n = 32$$

$$a = -13$$

$$\begin{aligned} T_N &= -13 + (32 - 1)5 \\ &= -13 + 155 \\ &= -142 \end{aligned}$$



45. Find the 20th and 41st terms of the Series.

$$4 + 7 + 10 + \dots$$

$$T_n = a + (n - 1)d$$

$$T_{20} = 4 + (20 - 1)3$$

$$= 4 + 57 = 61$$

$$T_{41} = 4 + (41 - 1)3$$

$$= 4 + 40 \times 3$$

$$= 124$$

10. Which term of the AP 7, 10, 13 ... is 160.

$$T = 160, a = 7, d = 3, n = ?$$

$$T_n = a + (n - 1)d$$

$$160 = 7 + (n - 1)3$$

$$160 = 7 + 3n - 3$$

$$160 = 4 + 3n,$$

$$156 = 3n$$

$$n = 156/3 = 52$$

11. Which term of a the Series. -5, 0, 5 is 70.

$$T_n = 70, a = -5, d = +5, n = ?$$

$$70 = -5 + (n - 1)5$$

$$70 = -5 + 5n - 5$$

$$70 = 5n - 10$$

$$80 = 5n$$

$$n = 80/5 = 16$$

12. Find the Sum of first 10 odd integers.

$$1, 3, 5, 7, 9, 11, 13, 15, 17, 19$$

$$S_n = n/2(a + l)$$



$$10/2(1+19)$$

$$100$$

13. Write the formula to find the sum of first n terms of an arithmetic progression.

$$S_n = n/2(2a + (n - 1)d)$$

Where

S_n = Sum of first n terms of an A.P.

a = First term of the A.P.

d = Common difference of the A. P ..

n = The number of terms which is finite.

14. The first term of an A.P. is 34; the last term is 1 and the sum is 210. Find the number of term

$$a=34, l=1, S_n=210$$

$$S_n = n/2(a+l)$$

$$210 = n/2(34+1)$$

$$n = 420/35 = 12$$

15. Find the missing terms of the following

$$a = 4, d = 3, n = 5$$

$$l = a + (n - 1)d$$

$$= 4 + (5 - 1)3$$

$$= 16$$

$$S_n = n/2(a+l)$$

$$= 5/2(4+16)$$

$$= 50$$

16. Given n = 12, $T_n = 71$, d = 3, Find a and S.

$$T_n = a + (n - 1)d$$

$$71 = a + (12 - 1)3$$

$$71 = a + 33$$

$$a = 38$$



$$\begin{aligned}S_n &= n/2(a+1) \\ &= 12/2(38+71) \\ &= 654\end{aligned}$$

17. Define geometric progression. (G.P). A sequence of numbers is said to be in G.P. if the ratio of each term to the preceding term is constant throughout.

Eg: 5, 10, 20, 40.

The general representation of G.P is a, ar, ar^2

18. Write the formula for the nth term of G.P.

$$T_n = ar^{(n-1)}$$

a = first term r = common ratio

19. Find the common ratio of GP 7, -7/3, 7/9

Common ratio = Any term / previous term

$$(-7/3)/7 = -1/3$$

20. Find the 5th term of the Sequence

3, 6, 12

$$CR = 6/3 = 2$$

$$T_n = ar^{(n-1)}$$

$$= 3 \times 2^{(5-1)}$$

$$= 48$$

21. Which term of the Sequence?

1/2, -1/4, 1/8, -1/16... is -1/256

$$CR = -1/2$$

$$T_n = -1/256$$

$$T_n = ar^{(n-1)}$$

$$-1/256 = \frac{1}{2}(-1/2)^{(n-1)}$$

$$(-1/256)^8 = (-1/2)^n$$



$$n = 8$$

22. The first term of a G.P. is 5 and the C.R. is -2. What is the 6th term ?

$$a = 5, \text{ C.R.} = -2, T_6 = ?$$

$$T_6 = 5(-2)^{(6-1)}$$

$$5(-2)^5$$

$$= -160$$

23. The second term of a G.P is 21 and the 7th term is 1/9

Find common ratio.

$$T_2 = ar$$

$$T_7 = ar^6$$

$$27 = ar \quad \dots 1$$

$$1/9 = ar^6 \quad \dots 2$$

Dividing 1 by 2 we get

$$ar^6/ar = (1/9)/27$$

$$r^5 = (1/3)^5$$

$$r = 1/324.$$

24. Sum the Series $1 + 3 + 9 + \dots$ to 10 term

$$a = 1, r=3, n = 10$$

$$S_n = a(r^{(n-1)}) / (r-1)$$

$$S_n = 1(3^{(10-1)}) / (3-1)$$

$$= (59049-1)/2$$

$$= 29524$$

25. Find an infinite G.P. whose 1 term is 1/4 and the sum is 1/3.

Sum to infinite series = $a/(1-r)$

$$1/3 = (1/4) / (1-r)$$

$$1/3 = 1/4(1-r)$$

$$r = 1/4$$

Infinite series is

$$1/4, 1/16, 1/64 \dots$$



26. The second term of a G.P. is 27 and the T'' term is 119. Find the first term and the common ratio

$$T^2 = ar = 27 \quad \text{-----(1)}$$

$$T^6 = ar^6 = 27 \quad \text{---:-----(1)}$$

Dividing (2) by (1)

$$ar^6 / ar = (1/9) / 27$$

$$r = 1/3$$

$$ar = 27$$

$$a/3 = 27$$

$$a = 81$$

27. Find the G.M. between 8 and 32.

Let M be the G.M. between 8 and 32 .

8, M, 32 are in G.P.

$$M^2 = 8 \times 32 = 256 .$$

$$M = \sqrt{256}$$

$$M = 16$$

$$GM = 16$$

28. If the n th term of AP is 44 .and 16^{th} term is 19, Find the 20^{th} term of an A.P. .

Let the Series be $a, a+d, a+2d$

$$11 \text{ th term} = a + 10d = 44$$

$$16^{\text{th}} \text{ term} = a + 15d = 19$$

$$\text{Sub 1 and 2} \quad 5d = -25$$

$$d = -5$$

$$a + 10(-5) = 44$$

$$a - 50 = 44$$

$$a = 44 + 50$$

$$= 94$$

$$T_n = a + (n-1)d$$

$$T_n = 94 + (10-1) \cdot (-5)$$

$$= 94 - 19 \times 5$$

$$= 94 - 95$$



$$=1$$

29. Find the common difference of an AP whose first term is 5 and 11th term is 125. Find also the series.

$$A=5, T_{11}=125$$

$$T_{11}= a+10d$$

$$125=5+10d$$

$$d =12$$

Series 5, 17,29,...

30 The 12th term of an A.P. is nine times the Second. Show that the 17th term is five times the fourth.

Let the Series be a , a+d, a+2d+

$$12\text{th term} = a + 11 d$$

$$2^{\text{nd}} \text{ term} = a + d$$

$$a + 11d = 9 (a + d)$$

$$a - 9a = d - 2d$$

$$-8a = -2d$$

$$d = 4a$$

$$17^{\text{th}} \text{ term} = a + 16d$$

$$= a + 16 \times 4a$$

$$= a + 64 a$$

$$= 65 a$$

$$4\text{th term} = a + 3d$$

$$= a + 3 \times 4a$$

$$= 13a$$

$$5 \times 4\text{th term} = 13a \times 5$$

$$= 65 a$$

31. The 12th term of an A.P. exceeds the 3rd term by 36. If the 16th term is- 64. Determine the Series

Let the Series be a, a + d, a + 2d,



$$12\text{th term} = a + 11d$$

$$3^{\text{rd}} \text{ term} = a + 2d$$

Given,



$$a + 11d = a + 2d + 36$$

$$9d = 36$$

$$d = 4$$

$$16^{\text{th}} \text{ term} = 64$$

$$64 = a + (16 - 1)4$$

$$64 = a + 60$$

$$a = 4$$

Series-is

4, 8, 12, 16,

32. Find the sum of all integers between 200 and 500 which are divisible by 7 ..

The first number between 200 to 500 divisible by 7 is 203
and the last number is 497.

$$a = 203, \quad d = 7$$

$$T_n = a + (n-1)d$$

$$497 = 203 + (n - 1)7$$

$$497 = 203 + 7n - 7$$

$$301 = 7n$$

$$n = 43$$

$$S_n = \frac{n}{2}(a+l)$$

$$43/2(203+497)$$

$$=15050$$

33. How many terms of the Series. $5 + 7 + 9 + \dots$

must be taken so that the Sum may be 192?

$$a = 5, d = 2, S = 192, n = ?$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$192 = \frac{n}{2}(2 \times 5 + (n-1)2)$$

$$192 = 5n + n^2 - n$$

$$192 = 4n + n^2$$

$$n^2 + 4n - 192 = 0$$

$$n(n + 16) - 12(n + 16) = 0$$

$$(n+16)(n-12) = 0$$

$$n+16=0 \quad n-12=0$$

$$n = -16, n = +12$$



$$\therefore n = 12$$

34. How many terms of the series 17, 15, 13 amount to 72.

$$a = 17, d = -2, S = 72, n = ?$$

$$S_n = n/2(2a + (n-1)d)$$

$$72 = n/2 (2 \times 17 + (n-1) \cdot -2)$$

$$72 = 17n - n^2 + n$$

$$n^2 - 18n + 72 = 0$$

$$n^2 - 12n - 6n + 72 = 0$$

$$n(n-12) - 6(n-12) = 0$$

$$(n-6)(n-12) = 0$$

$$n=6, n=12$$

35. Find the Sum of all numbers which were the remainder 5 when divided by 7 between 50 and 200.

The numbers are 54, 61, 68 .. 194 .

$$a = 54, d = 7, l = 194$$

$$l = a + (n-1)d$$

$$194 = 54 + 7n - 49$$

$$7n = 147$$

$$n = 21$$

$$S_n = n/2(a+l)$$

$$= 21/2(54+194)$$

$$= 2604$$

36. Sum of 3 integers in AP is 15 and their product is 80 find them

Let the numbers be

$$a+d, a, a-d = 15$$

$$a+d + a + a-d = 15$$

$$a = 5$$

$$(a-d)(a)(a+d) = 80$$

$$a(a^2 - d^2) = 80$$



$$5(25 - d^2) = 80$$

$$45 = 5d^2$$

$$d^2 = 9$$

$$d = \pm 3$$

When $d = 3$

Terms are 2, 5, 8.

When $d = -3$

terms are 8, 5, 2.

39. The 3 numbers are in the ratio 3:7:9. If 5 is subtracted from the second the resulting numbers form an A.P. Find the original numbers.

Let the numbers be $3x, 7x, 9x$

5 is subtracted from the second

$3x, 7x - 5, 9x$ are in A.P.

We have

$$7x - 5 = (9x + 3x)/2$$

$$X = 5$$

The numbers are 15, 35, 45

40. The sum of 4 numbers in A.P. is zero. and the sum of their squares is 500. Find them.

Let the numbers be $a - 3d, a - d, a + d, a + 3d$.

$$S = a - 3d + a - d + a + d + a + 3d = 0$$

$$4a = 0$$

$$a = 0$$

Sum of their squares

$$(a + 3d)^2 + (a - d)^2 + (a + d)^2 + (a - 3d)^2 = 500$$

$$15, 5, -5, -15$$

41. Insert 4 arithmetic means between 2 and -8.

Let A_1, A_2, A_3 and A_4 be the required A.M.S.

Then 2, $A_1, A_2, A_3, A_4, -8$ are in A.P.

$$a = 2, T_6 = -8$$

Let $d =$ Common difference

$$T_6 = 2 + 5d$$



$$-8 = 2 + 5d$$

$$d = -2$$

$$A_1 = 2 + (-2) = 0$$

$$A_2 = 2 + 2d = 2 - 4 = -2$$

$$A_3 = 2 + 3d = 2 - 6 = -4$$

$$A_4 = 2 + 4d = 2 - 8 = -6$$

∴ Four A_n are 0, -2, -4, -6.

42. A man saved Rs. 16,500 in ten years; In each year after the first, he saved Rs. 100 more than he did in the preceding year. How much did he save in the first year..

Let a = Savings in the first year

$$n = 10 \text{ years}$$

$$d = 100$$

$$S = 16500$$

$$S_n = n/2(2a + (n-1)d)$$

$$16500 = 10/2(a + (10-1)100)$$

$$a = 1200$$

43. Twenty persons are to be awarded prizes so that every person gets twice the amount the previous person gets. If the first person gets Rs. 2. What is the total amount spent on the prizes.

$$n = 20 \quad a = 2, \quad d = 2$$

$$S_n = n/2(2a + (n-1)d)$$

$$= 20/2(2 \times 2 + (20-1)2)$$

Total amount spent for the prizes is Rs. 420.

44. A man saves Rs. 20 in the 1st month and Rs. 30 in the n th month and Rs. 40 in the 3rd month and so on. Find the total amount saved in 5 years.

$$a = 20 \quad d = 10 \quad n = 12 \times 5 = 60 \text{ months}$$

$$S_n = n/2(2a + (n-1)d)$$

$$= 60/2(2 \times 20 + (60-1)10)$$

$$= 18900$$

45. In a G.P. which begins with 1 the sum of three terms is 13. Find C.R.

Let $a = 1$ st term



$r =$ Common Ratio

$a = 1, S_3 = 13$

$$(r^3 - 1) = (r - 1)(r^2 + r + 1)$$

$$S_3 = a(r-1)/(r-1)$$

$$(r^3-1)/(r-1) = (r-1)(r^2+r+1)/(r-1)$$

$$r^2+r+1=13$$

$$r^2+r-12=0$$

Factorizing we get

$$r = 3, r = -4$$

When $r = 3$ the terms are

1, 3, 9

When $r = -4$ the terms are

1, -4, 16

46. The third term of a G.P. is 12 and the 6th term is 96. Find the Sum of 9 terms?

Let $a = 1^{st}$ term

$r =$ Common Ratio,

$$3^{rd} \text{ term} = T_3 = ar^{3-1} = 12$$

$$6^{th} \text{ term} = T_6 = ar^{6-1} = 96$$

Divide (2) by (1)

$$\frac{ar^6}{ar^2} = \frac{96}{12}$$

$$r^4 = 8$$

$$r^3 = 8$$

$$r = 2$$

$$ar^5 = 12$$

$$\text{Put } r = 2$$

$$a \times 4 = 12$$

$$a = 3$$

Sum to 9th term

$$S_n = a(r^{n-1})/(r-1)$$

$$= 3(2^{9-1})/3-1$$

1533

47. The Arithmetic means of 2 numbers whose sum is 100 is to their G.M. in the ratio 5:4.

Find the numbers;

Let A be the arithmetic mean between 2 numbers a and h.

Let G be the G.M. between the same numbers 'a' and 'b'.



$$a + b = 100$$

$$\text{G.M. of } a \text{ and } b = G = \sqrt{ab}$$

$$A/G = 5/4$$

$$(a+b/2)/\sqrt{ab} = 5/4$$

$$50/\sqrt{ab} = 5/4$$

$$ab = 16000$$

$$a - b = 60$$

$$a + b = 100$$

Solving for a and b we get $a = 80$ and $b = 20$

48. The Sum of 2 numbers- is 15 and their GM is 6. Find the numbers

$$a + b = 15, ab = 36, \sqrt{ab} = 6, 4ab = 144$$

$$a - b = 9$$

$$a + b = 15$$

solving for a and b we get $a = 12$ and $b = 3$

49. A person borrows Rs. 4800 to be repaid in 5 monthly installments. If each installment is double the preceding one, find the amount of 1st and the last installment?

Since each installment is double the preceding one, the installments in each month are the terms of a G.P. So here

$$S = 4800 \quad n = 5 \quad r = 2 \quad a = ? \quad T_5 = ?$$

$$S_n = a(r^n - 1)/r - 1$$

$$4800 = a(2^5 - 1)/2 - 1$$

$$a = 154.84$$

$$T_5 = ar^4$$

$$154.84 \times 16$$

$$= 2477$$

50. If the value of a machine depreciated by 25% annually. What will be its estimated value at the end of 8 years if its present value is Rs. 4096 .

$$\text{Present Value} = \text{Rs. } 4096$$



If Present value is Rs. 100 then Value after one year =Rs.75

If the present value is Rs 1 then value after one year is $75/100$

If present value is Rs. 4096 the value after one year is

$$(75 \times 4096) / 100$$

$$= 3072$$

$$a = 3072 \quad r = 75/100 = \frac{3}{4}$$

Value at the end of 8 years

$$T_8 = ar^{(n-1)}$$

$$3072 = (3/4)^7$$

$$= 410.06$$