

SEE CAPSULE-2082

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(Compulsory Mathematics)

DAY-4

SEE Q. No. 8

1. A shopping centre provides cash incentive to its employees based on their performance. The table given below represents the cash increment received by an employee, Rajan.

Baisakh	Jesth	Asadh	Shrawan	Bhadra	Aswin	Kartik
Rs. 800	Rs. 1000	Rs. 1200	Rs. 1400	Rs. 1600	Rs. 1800	Rs. 2000

- (a) Write the formula to find the arithmetic mean between 'a' and 'b'. [1K]
 (b) What is the mean cash incentive between the months Baisakh and Asadh? [1U]
 (c) Find the total amount of incentives received during the year. [2A]
 (d) Compare the cash incentives received by him up to the first 6 months and the last 6 months of the year. [2HA]

Ans: (a) $AM = \frac{a+b}{2}$ (b) Rs. 1000 (c) Rs 22,800 (d) 13: 25

2. Roshan collected following sum of money in first five days of month Baisakh.

Baisakh-1	Baisakh-2	Baisakh-3	Baisakh-4	Baisakh-5
Rs. 500	Rs. 700	Rs. 900	Rs. 1100	Rs. 1300

- (a) Whether the above sequence is arithmetic or Geometric on the basis of the deposited money in each day? Write with reason [1K]
 (b) How much money will be deposited by tenth day? Find using formula. [2U]
 (c) Based on the above sequence, is extra 2 days enough after 10 days to collect the total amount Rs 20,000? Write it with reason. [2HA]

Ans: (a) Arithmetic (b) Rs. 14,000 (c) No

3. An arithmetic series has the first term 15, the last term 65 and sum of its all terms is 440.

- (a) Write the formula to find the sum of 'n' terms of an arithmetic series having first term 'a' and last term 'l'. [1K]
 (b) Find the number of terms of the series and the common difference. [2U]
 (c) Compare the third mean and the last mean. [2HA]

Ans: (a) $S_n = \frac{n}{2}(a + l)$ (b) $n = 11, d = 5$ (c) 1: 2

4. A worker in a garment factory produces 2000 Nepali cap (Dhaka Topi) at the first year and increases the production by 200 caps every year.

- (a) Write the formula for finding the sum of 'n' terms of an arithmetic series having first term (a) and common difference (d). [1K]
 (b) How many Nepali caps does he produce by the fifth year? Find it. [1U]
 (c) In how many years will he produce a total of 25,200 Nepali caps? Find it. [2HA]

Ans: (a) $S_n = \frac{n}{2}[2a + (n - 1) d]$ (b) 12,000 (c) 9 years

5. **There are 4 arithmetic means between 20 and 45.**

- (a) First term 'a', last term 'b' and number of arithmetic means 'n' are given. Write the formula for the calculation of common difference in the given condition. [1K]
 (b) What is the third mean of the given series? Find it. [2U]
 (c) In arithmetic mean and geometric mean between 20 and 45, which one is greater and by how much? Compare it. [1HA]

Ans: (a) $d = \frac{b-a}{n+1}$ (b) 40 (c) A.M. is 2.5 more than G.M.

6. **In an arithmetic series, the 5th term is 11 and 16th term is 33.**

- (a) The first term 'a', and common difference 'd' of an A.P. are given. Write the formula to find of n^{th} term. [1K]
 (b) Find the first term and the common difference. [2U]
 (c) How many terms should be added to make the sum 440? Find it. [2HA]

Ans: (a) $t_n = a + (n-1)d$ (b) $a = 3, d = 2$ (c) 20 terms

7. **Kabita collected following sum of money in first five months of 2080 BS.**

Baisakh	Jesth	Asar	Shrawan	Bhadra
Rs. 100	Rs. 200	Rs. 400	Rs. 800	Rs. 1600

- (a) Write the formula to find the sum of first n terms of a geometric series. [1K]
 (b) How much money will be deposited by the eighth month? Find using formula. [1U]
 (c) Based on the above sequence, how many extra months enough after 8 months to collect the total amount Rs 1,02,300? [2HA]

Ans: (a) $S_n = \frac{a(r^n - 1)}{r - 1}$ (b) Rs. 25,500 (c) 2 months more

8. **In a Business expo, daily sales of number of mobiles in two stalls are given below:**

Stall / Days	1 st day	2 nd day	3 rd day	4 th day
Stall-A	20	25	30	35
Stall-B	3	6	12	24

- (a) Which stall made the sales in geometric sequence? [1K]
 (b) How many total mobiles did stall-A sell in a week? Find it. [2U]
 (c) Which stall sold more number of mobile sets in a week and by how much? Find it. [2HA]

Ans: (a) Stall-B (b) 245 (c) Stall-B, more by 136

9. **A geometric series has the first term 7, the last term 448 and sum of its all terms is 889.**

- (a) Write the formula to find the sum of 'n' terms of a geometric series having first term 'a' and last term 'l'. [1K]
 (b) Find the common ratio. [2U]
 (c) How many terms should be removed from the last term so that the sum of the terms would be 217? Find it. [2HA]

Ans: (a) $S_n = \frac{l-a}{r-1}$ (b) $r = 2$ (c) 2 terms

10. **Hariram borrowed Rs. 91,728 from Ramhari on a condition that he would pay back it in 6 installments without interest and the amount of each installment is three times the former one.**

- (a) Write the formula to find the sum of 'n' terms of a geometric series having first term 'a' and common ratio 'r'. [1K]
 (b) Find the amount of the first installment. [2U]
 (c) If the amount of each installment was only twice the former one, what would be the difference between the amounts of the first installment? [2HA]

Ans: (a) $S_n = \frac{a(r^n - 1)}{r - 1}$ (b) Rs 252 (c) Rs 1204

11. There are 4 geometric means between 3 and 96.

- (a) The first term 'a', last term 'b' and number of arithmetic means 'n' are given. Write the formula for the calculation of common ratio in the given condition. [1K]
 (b) What is the second mean of the given series? Find it. [2U]
 (c) Find the sum of the terms of the series. [2A]

Ans: (a) $r = \left(\frac{b}{a}\right)^{\frac{1}{n+1}}$ (b) 12 (c) 189

12. In a geometric series, the third term is 18 and the sixth term is 486.

- (a) Define geometric series. [1K]
 (b) Find the first term and the common ratio. [2U]
 (c) Find the sum of first 7 terms. [2A]

Ans: (b) $a = 2, r = 3$ (c) 2186

13. Five birds are migrated to a community forest on the first day. The birds migrated to forest on each succeeding day was double the number of the preceding day.

- (a) Define geometric means. [1K]
 (b) How many birds did migrate to the forest in 10 days? Find it. [2A]
 (c) In how many days, a total of 1275 birds migrated to the forest? Find it. [2HA]

Ans: (b) 5115 (c) 8 days

SEE Q. No. 9**1. Given quadratic equation is $x^2 - 7x + 12$.**

- (a) Define quadratic equation. [1K]
 (b) Solve the equation by completing square method. [2U]
 (c) Replace the constant term of the given equation by 6 and solve the new equation by using formula. [2A]

Ans: (b) 3, 4 (c) 1, 6

2. In Pre-SEE, Narayan secured 4 marks more in Mathematics than in English. If he secured 2 more marks in Mathematics and 3 fewer marks in English, then the product of his marks would be 4270.

- (a) Write the roots of x in the quadratic equation $ax^2 + bx + c = 0$. [1K]
 (b) Find the marks that he secured in both subjects. [3A]
 (c) Compare the marks obtained by him in English and Mathematic by finding ratio. [1A]

Ans: (a) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ (b) Math: 68, English: 64 (c) 16: 17

3. The length of volleyball court in a school is double its breadth and its area is 162 m².

- (a) If the breadth of the volleyball court is x m, what is the length of the court? [1K]
 (b) Find the length and breadth of the court. [3A]
 (c) What equal length of ground should be increased towards length and breadth of the court so that its area would be 220 m²? [1HA]

Ans: (a) 2x (b) 18 m, 9 m (c) 2 m

4. The perimeter and area of a rectangular ground are 100 m and 600 m² respectively.

- (a) How many roots does a quadratic equation $ax^2 + bx + c = 0$ have? [1K]
 (b) Find the length and breadth of the plot? [2U]
 (c) How long the plot should be decreased from its length to form it is a square plot? Calculate it. [1HA]

Ans: (a) 2 roots (b) 30 m, 15 m (c) 15 m

5. In a rectangular field, the longer side is 20 m more than the shorter side but the diagonal of the field is 20 m more than its longer side.

- (a) Write the standard form of quadratic equation. [1K]
 (b) Find the length and breadth of the field. [3A]

(c) How many plots of land of dimension (12 m × 16 m) can be made on that field? [1A]

Ans: (a) $ax^2 + bx + c = 0$ (b) 80 m, 60 m (c) 25

6. **The area of a rectangular room is 54 sq. m. If the length had been 2 m less and the breadth 1 m more, it would have been a square.**

(a) Write the standard form of quadratic equation in x. [1K]

(b) Find the length and breadth of the room. [2A]

(c) Find the cost of carpeting the room with pieces of carpet each of size (3 m × 1.5 m) at the rate of Rs 550 per piece? [2HA]

Ans: (a) $ax^2 + bx + c = 0$ (b) 9 m, 6 m (c) Rs 6,600

7. **The present ages of Harka and Balen are 46 years and 35 years respectively.**

(a) Write their ages before x years. [1K]

(b) How many years ago the product of their ages was 900? [2U]

(c) In how many years later, the sum of their ages will be 99? [1A]

Ans: (a) (46 - x) yrs, (35 - x) yrs (b) 10 years ago (c) 9 years later

8. **The age difference between the mother and her daughter is 25 years. Now, the product of their ages is 600.**

(a) Assuming the present age of mother is x years, write the present age of daughter in terms of x. [1K]

(b) Find their actual present age. [2U]

(c) After how many years hence, the mother will be twice as old as her daughter? [1HA]

Ans: (a) $x - 25$ (b) 40 years, 15 years (c) 10 years

9. **The product of the digits of a two digit number is 18. If 27 is added to the number, the places of digits are reversed.**

(a) Write the two digit number by supposing x as the digit at tens place and y as the digit at ones place. [1K]

(b) Find the number. [3A]

(c) Compare the original number and the number obtained by reversing the digits. [1HA]

Ans: (a) $10x + y$ (b) 36 (c) 4: 7

10. **The two digit number is equal to the four times the sum of their digits and three times the product of their digits.**

(a) What does 'x' denote in the two digit number $10x + y$? [1K]

(b) Find the number. [3A]

(c) Compare the original number and the number obtained by reversing the digits. [1HA]

Ans: (a) digit of tens place (b) 36 (c) 4: 7

11. **The product of two consecutive positive even numbers is 48.**

(a) If the smaller number is x, what is the greater number? [1K]

(b) Find the number. [3A]

(c) Which number must be added to the smaller one and subtracted from the greater number so that the product of two numbers will be 33? [1HA]

Ans: (a) $x + 2$ (b) 6, 8 (c) 3

12. **In a right angled triangular garden, the hypotenuse is 26 metre and the difference between the remaining sides is 14 metre.**

(a) Find the length of remaining sides of the garden. [3A]

(b) Find the area of the garden. [1U]

(c) Find the cost of fencing 5 rounds around the garden with the barbed wire at the rate of Rs 75 per metre. [1A]

Ans: (a) 10 m, 24 m (b) 120 m^2 (c) Rs 22,500

13. **A school planned to distribute 120 colourful balloon equally to the children who come to join in Play Group (PG). But, on the balloons distribution day, 4 more new children came to join in PG in the school and each child got 1 less number of baloon.**

- (a) Define quadratic equation. [1K]
 (b) How many children had joined in PG initially? [3A]
 (c) Find the number of balloons received by each child. [1A]

Ans: (b) 20 (c) 5 balloons

SEE Q. No. 10

1. (a) Simplify: $\frac{1}{x-y} - \frac{1}{x+y}$ [2U]

(b) Solve: $3^x + \frac{1}{3^x} = 3\frac{1}{3}$ [3A]

Ans: (a) 2 (b) ± 1

2. (a) Simplify: $\frac{x+y}{x-y} + \frac{x-y}{x+y}$ [2U]

(b) Solve: $2^x + \frac{1}{2^x} = 8\frac{1}{8}$ [3A]

Ans: (a) $\frac{2(x^2 + y^2)}{x^2 - y^2}$ (b) ± 3

3. (a) Simplify: $\frac{x^3 + 1}{x^2 - x + 1} - \frac{x^3 - 1}{x^2 + x + 1}$ [2U]

(b) Solve: $2^{x-2} + 2^{3-x} = 3$ [3A]

Ans: (a) 2 (b) 2, 3

4. (a) Simplify: $\frac{a^3 + 1}{a^2 - a + 1} + \frac{a^3 - 1}{a^2 + a + 1}$ [2U]

(b) Solve: $3^{x-3} + 3^{4-x} = 4$ [3A]

Ans: (a) 2a (b) 3, 4

5. (a) Simplify: $\frac{1}{2a-3b} - \frac{6b}{4a^2 - 9b^2}$ [2U]

(b) Solve: $5 \times 4^{x+1} - 16^x = 64$ [3A]

Ans: (a) $\frac{1}{2a + 3b}$ (b) 1, 2

6. (a) Simplify: $\frac{pr^2 + q}{2r - 1} + \frac{pr^2 - q}{2r + 1} + \frac{4pr^3}{1 - 4r^2}$ [2U]

(b) Solve: $16^x - 5 \times 4^{x+1} + 64 = 0$. Prove that the value of x satisfies $5^x + \frac{125}{5^x} = 30$ [3A]

Ans: (a) $\frac{2q}{4r^2 - 1}$

7. (a) Simplify: $\frac{a}{(a-b)(a-c)} + \frac{b}{(b-c)(b-a)} + \frac{c}{(c-a)(c-b)}$ [2U]

(b) Solve: $2^x + \frac{16}{2^x} = 10$ [3A]

Ans: (a) 0 (b) 1, 3

8. (a) Simplify: $\frac{x^2 + y^2}{x^2 - y^2} - \frac{x - y}{x + y}$ [2U]

(b) If $x^2 - 2 = 3^{\frac{2}{3}} + 3^{-\frac{2}{3}}$, then prove that $3x(x^2 - 3) = 10$ [3A]

Ans: (a) $\frac{2xy}{x^2 - y^2}$

9. (a) Solve: $3^{x-1} + 3^{x-2} + 3^{x-3} = 13$ [2U]

(b) Simplify: $\frac{1}{a^2 - 5a + 6} + \frac{2}{4a - 3 - a^2}$ [3A]

Ans: (a) 3 (b) $\frac{1}{(1-a)(a-2)}$

10. (a) If $x = 5^a$, $y = 5^b$ and $x^b y^a = 25$, proved that: $ab = 2$. [2U]

(b) Simplify: $\frac{x^2 - (y-z)^2}{(x+z)^2 - y^2} + \frac{y^2 - (x-z)^2}{(x+y)^2 - z^2} + \frac{z^2 - (x-y)^2}{(y+z)^2 - x^2}$ [3A]

Ans: (b) 1

11. (a) Solve: $6,655 = 5000 \left(1 + \frac{10}{100}\right)^x$ [2U]

(b) Simplify: $\frac{1}{a^2 - 5a + 6} + \frac{1}{a^2 - 3a + 2} + \frac{2}{a^2 - 8a + 15}$ [3A]

Ans: (a) 3 (b) $\frac{4}{(a-1)(a-5)}$

12. Given exponential equation is $4 \times 3^{x+1} - 9^x = 27$.

(a) Solve the given equation. [3A]

(b) Prove that the value of x obtained by solving the given equation also satisfy the equation $2^x + 8 \times 2^{-x} = 6$. [2U]

Ans: (a) 1, 2

13. (a) If $a = b^x$, $b = c^y$ and $c = a^z$, prove that: $xyz = 1$ [2U]

(b) Simplify: $\frac{1}{4(1-\sqrt{x})} - \frac{1}{4(1+\sqrt{x})} + \frac{2\sqrt{x}}{2(1-x)}$ [3A]

Ans: (b) $\frac{\sqrt{x}}{1-x}$

14. (a) Solve: $4^{x-2} = 0.25$ [2U]

(b) Simplify: $\frac{a+b}{a^2+ab+b^2} + \frac{a-b}{a^2-ab+b^2} + \frac{2b^3}{a^4+a^2b^2+b^4}$ [3A]

Ans: (a) 1 (b) $\frac{2(a+b)}{a^2+ab+b^2}$

15. Given expression is $\frac{a}{x+2} + \frac{3}{2x+1} = \frac{13x+11}{2x^2+5x+2}$.

(a) Find the value of a . [2U]

(b) Solve: $a^x + \frac{1}{a^x} = 25\frac{1}{25}$ [3A]

Ans: (a) 5 (b) ± 2

16. (a) Solve: $2^{x-5} = 0.125$ [2U]

(b) Simplify: $\frac{a+b}{a^2+ab+b^2} + \frac{a-b}{a^2-ab+b^2} - \frac{2a^3}{a^4-a^2b^2+b^4}$ [3A]

Ans: (a) 2 (b) $\frac{-4a^5b^2}{a^8+a^4b^4+b^8}$

17. (a) Solve: $2^x + 2^{x+1} + 2^{x+2} = 7$ [2U]

(b) Simplify: $\frac{p+1}{p^2+p+1} + \frac{p-1}{p^2-p+1} - \frac{2}{p^4+p^2+1}$ [3A]

Ans: (a) 0 (b) $\frac{2(p-1)}{p^2-p+1}$