**CRITIRCAL AND CREATIVE THINKING ITEMS**

**CLASS X : CHAPTER 5: ARITHMETIC PROGRESSION**

**INDEX**

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| **S.No.** | **Theme of the item** |
|  | Beautiful pattern |
|  | Construction of a building |
|  | Arrangement of Stones |
|  | Money needed for higher study |
|  | Tour of Manali |
|  | Distances between planets |

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| Domain : Mathematical Literacy | Topic : Arithmetic Progression | | Class: X  Expected Time :10 minutes  Total credit: 2 x 5 = 10 |
| Description of items : Text / Image | Learning outcomes: Understanding Arithmetic Progression and application viz; nth term , sum to n terms | | |
| Expected competetencies: interpret and evaluate | | Types of questions: Short response items   |  | | --- | | Credit Pattern :  Full credit : 02  Half credit: 01  Nil credit:0 | | Proficiency level of question: 3 | | |

**Beautiful pattern**: Venkatesh has observed a beautiful pattern on the wall of a cricket stadium.

1. He wants to know the number of boxes in 7th row can you help him to find the same?
2. In the last row there are 23 boxes can you find the total number of rows on the wall?
3. Can you give the total number of boxes in the Pattern?
4. If the cost of painting one box is rupees 2/- Can you find the total cost of painting the pattern?
5. Can you give the formula for cost of painting of ‘n’ such walls?

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| Description of answer key and credits:  The pattern is an AP containing boxes 3, 5, 7 …… boxes in corresponding rows 1st , 2nd ,3rd ….   1. Answer : Number of boxes in 7th row = 3 + 6 x 2 = 15 Full credit any other answer nil credit. 2. Answer : 3 + (n – 1 )2 = 23 ; n = 11, 11th row Full credit any other answer nil credit. 3. Total number of boxes = 11/2(2x 3 + 10 x 2) = 143 Full credit any other answer nil credit. 4. Total cost of painting = 143 x 2 = Rupees 286. Full credit any other answer nil credit. 5. Formula for cost of painting ‘n’ such walls is 286 n. full credit any other answer nil credit. |

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Name of Vidyalya : K V Danapur (Second shift)

K V S Region: Patna Region

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| --- | --- | --- | --- |
| Domain : Mathematical Literacy | Topic : Arithmetic Progression | | Class: X  Expected Time :20 minutes  Total credit: 2 x 5 = 10 |
| Description of items : Text / Image | Learning outcomes: Understanding Arithmetic Progression and application viz; nth term , sum to n terms | | |
| Expected competencies: interpret and evaluate | | Types of questions: Short response items   |  | | --- | | Credit Pattern :  Full credit : 02  Half credit: 01  Nil credit: 0 | | Proficiency level of question: 5 | | |

**Construction of a building:** Raman is a contractor; he is constructing a building of many floors. The building has interesting design on each floor it has open space thus number of rooms decreases as we go up. If number of bricks for construction of a room is 1500. The number of bricks required for ground floor is 30,000 on 1st floor it is 27,000 on 2nd floor It is 24,000 …… and so on

1. Find the total number of rooms on ground floor.
2. Find the number of rooms on 5th floor.
3. Find the maximum number of floors that can be build.
4. Find the total bricks required for construction of maximum floors.
5. Find the cost of bricks for first three floors at the rate of Rs.10 per brick.

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| Description of answer key and credits:   1. Number of rooms on ground floor = 30000/1500 = 20. Full credit any other answer nil credit. 2. Number of room on 5th floor = 20 + 5(- 2) = 10. Full credit any other answer nil credit. 3. For maximum floors an > 0 ; 20 + (-2)(n – 1) > 0 ; n – 1 < 10 ; n < 11; hence maximum number of floors = 10. Full credit any other answer nil credit. 4. Number of bricks = 1500(10/2(20+2)) = 1,65,000 Full credit any other answer nil credit. 5. Cost of bricks = Rs.10 X 3/2(60000-6000) = Rs 8,10,000. Full credit any other answer nil credit. |

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| --- | --- | --- |
| DOMAIN SL/ML/RL | TOPIC/CHAPTER  ARITHEMATIC PROGRESSION  Arrangement of Stones | CLASS-X  EXPECTED TIME- 10 MINUTES  TOTAL CREDIT- 02 X 4Q= 8 |
| DESCRIPTION OF ITEM- TEXT | LEARNING OUTCOME Understanding Arithmetic Progression and application viz; nth term , sum to n terms | CONTEXT: - SCIENTIFIC |
| EXPECTED COMPETENCIES/ COGNITIVE INTERPRET AND EVALUATE | TYPE OF QUESTIONS: - SHORT RESPONSE ITEM.  CREDIT PATTERN: - FULL CREDITS: - 02  : - HALF CREDITS: - 01  : - NO CREDITS: - 00 | |

Q1. Let there are (2n+1) Stones placed at intervals of 10 m. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. That person carried the job with one of the end stone by carrying then in succession. In carrying all the stones he covered a distance of 3 KM. let P is the middle stone and A,B are end Stones on the left and right of P respectively. Suppose the man starts from A .He picks up the end stone on the left of mid-stone and goes to the mid-stone, drops it and goes to (n-1) stone on left, picks it up, goes to the mid-stone and drop it. This process is repeated till he collects all stones on the left of the mid-stone at the mid-stone.Find

(a) the distance covered in collecting stones on the left of the middle stones.

(b) the distance covered in collecting the stones on the right side of the middle stone.

(c) find the value of n.

(d) find the number of stones.

DESCRIPTION OF ANSWER KEY AND CREDITS

1. Full Credit: 10 X n + 2 [ 10 X (n-1) + 10 X(n-2)+ ………….+ 10 X 2 + 10 X 1]

No Credit : Any other answer or missing answer

1. Full Credit: 2 [10Xn + 10 X (n-1) + 10 X(n-2)+ ………….+ 10 X 2 + 10 X 1]

No Credit: Any other answer or missing answer

1. Full Credit : Total distance covered = 10 X n + 2 [ 10 X (n-1) + 10 X(n-2)+ ………….+ 10 X 2 + 10 X 1] + 2 [10Xn + 10 X (n-1) + 10 X(n-2)+ ………….+ 10 X 2 + 10 X 1] = 20n2 + 10n = 3000m (given)

N = 12

Partial credit :10 X n + 2 [ 10 X (n-1) + 10 X(n-2)+ ………….+ 10 X 2 + 10 X 1] + 2 [10Xn + 10 X (n-1) + 10 X(n-2)+ ………….+ 10 X 2 + 10 X 1]

No Credit : Any other answer or missing answer

1. Full Credit : Number of stones = 25

No Credit : Any other answer or missing answer

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REGION: - PATNA

**Domain:- ML Topic- Arithmetic Progression Class:- X**

**Expected Time:- 15 minutes**

**Total Credit:- 08**

**Theme:- Money needed for higher study**

Mr.Dinkar has just admitted his son Dipu in class I . Dipu is a very bright student and doing well. His father belongs to lower middle income group so he has planned to save the certain amount of money every year on the name of higher studies of his son. Suppose Dipu never fails in any class and did not repeat in same class. As per his plan Dinkar will need an amount of Rs 5 lakhs for the higher studies of his son after completion of school (10+2). So he started saving an amount of Rs 20,000 in the first year of his study and increased his yearly savings by Rs 5,000 each year. When Dipu will pass his class XII, it will be his choice to decide about his study.

1. What will be his saving amount for the year in which Dipu will be in class XII ?
2. Will Dinkar be able to have his gross saving sufficient for Dipu’s higher study in the year in which Dipu will pass out Class XII.
3. How much amount will be left with Dinkar if he paid 5 lakhs to Dipu for his higher study as per his plan?
4. Dipu decided to go to abroad for further study so he needs Rs 9 lakhs . Dipu’s father do not have that much amount of money. He thought about per year increase in his saving. How much amount per year increase he should have been saving to create his total saving equal to Rs 9 lakhs in the year Dipu is in his class XII?

**Learning Outcomes** :- 1.Children will be able to formulate and employ the concept of Arithmetic progression their real life situation.

**Credit Pattern** :-

Full Credit :- 02 marks

Partial Credit:- 01 marks

NIL Credit: - 00 marks

**Proficiency Level of question**:- 4

**Description of Answer Key and Credits:**

1. His savings per year are 20000, 25000, 30000, 35000… up to 12 terms Partial credit

12th year saving amount= 20000+11x5000 = Rs 75000. Full credit

1. Gross Saving of DINKAR = 20000+25000+30000+………….,………………………….+75000.

Partial credit

S12= Rs 5,70,000 Fulll credit

III) Rs 70000 Full credit

IV)Per year inresement = 10, 000 Full credit .

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**Domain:- ML Topic- Arithmetic Progression Class:- X**

**Expected Time:- 15 minutes**

**Total Credit:- 08**

**Theme:- Tour of Manali**

Rinku and Pawan live in Delhi.They decided to go on a tour of hill station of Manali with family. Manali is 500 km far from Delhi . Rinku and Pawan started their journey at the same time from same place. Rinku was drivining his car at uniform speed of 40 km per hour . Pawan is very new in driving so he decided to drive his car at the rate of 20 km per hour in first hour and increased the speed by 5 km in each succeeding hour. In the return journey they planned to stop at a Hotel after divining 5 hours continuously and will take some refreshment . Again Rinku was drivining his car at uniform speed of 40 km per hour and Pawan started drivining his car at the rate of 20 km per hour in first hour and thought to increase his speed per hour as per Plan.

1. Will Pawan’s car be able to overtake Rinku’s car before reaching to Shimla? Suppose they do not stop anywhere in their journey.
2. How much time it will take Pawan to meet or overtake Rinku’s car? Suppose they do not stop anywhere in their journey.
3. At what distance from Delhi Pawan and Rinku will meet or overtake each other?
4. In the return journey they planned to stop at a Hotel after 5 hours of journey and take some refreshment . So Rinku told Pawan that I will drive my car at uniform speed of 40 km per hour but you have to increase your speed . Pawan started drivining his car at the rate of 20 km per hour in first hour. What should be the rate of increase in his speed so that they reach hotel at the same time after 5 hours?

**Learning Outcomes** :- 1.Children will be able to formulate and employ the concept of Arithmetic progression their real life situation.

**Credit Pattern :-**

Full Credit :- 02 marks

Partial Credit:- 01 marks

NIL Credit:- 00 marks

**Proficiency Level of question**:- 5

**Description of Answer Key and Credits**

Suppose Pawan will overtake in t hours ,then speed of Pawan in succeeding hour will be 20,25,30, ………… up to t terms partial credit

Now 40Xt = t/2[ 20X2 +(t-1)5]

t =9

1. yes in 9th hour they will meet /overtake each other. Full credit
2. 9 hour full credit
3. 9X40= 360 km Full credit
4. 4oX5= 5/2[2X20+(5-1)d] partial credit

d = 10 km/hour per hour increase in speed= 10 km per hour full credit

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**Domain:- ML Topic- Arithmetic Progression Class:- X**

**Expected Time:- 15 minutes**

**Total Credit:- 08**

# DISTANCES BETWEEN PLANETS

The distances between planets will vary depending on where each [planet](https://theplanets.org/planets/)  is in its orbit around the [Sun](https://theplanets.org/the-sun/). Sometimes the distances will be closer and other times they will be farther away.

The reason for this is that the planets have elliptical orbits and none of them are perfect circles. As an example, the distance between the planet [Mercury](https://theplanets.org/mercury/) and [Earth](https://theplanets.org/earth/) can range from 77 million km at the closest point, to as far as 222 million km at the farthest. There is a huge amount of difference in the distances between the planets depending on their position on their orbit path.

The table below shows the average distance between earth and different planets

**1 AU ( astronomical unit) is the distance from the Sun to Earth, which is 149,600,000 km.**

**PLANET DISTANCE TABLE-**

|  |  |  |
| --- | --- | --- |
| FROM | TO | DISTANCES (IN km) |
| Earth | Mars | 78,340,000 |
| Earth | Jupiter | 628,730,000 |
| Earth | Saturn | 1,275,000,000 |
| Earth | Uranus | 2,723,950,000 |
| Earth | Neptune | 4,351,400,000 |
| Earth | Venus | 41,400,000 |
| Earth | Mercury | 91,691,000 |
|  |  |  |

Read the Table given above and answer the following question.

1. Distance between Earth and Mercury is 91,691,000 km .convert this distance in AU and write this in standard form.
2. 1 AU is equal to 149,600,000 km . Convert it in standard form .
3. A planet is 1.275X109 km far from the Earth. Name the planet.
4. Which planet is nearest from the Earth? Write the distance of nearest planet in metre and convert it in standard form.

**Learning Outcomes** :- 1.Children will be able to formulate and employ the concept of Exponent and Power their real life situation.

**Credit Pattern :-**

Full Credit :- 02 marks

Partial Credit:- 01 marks

NIL Credit:- 00 marks

**Proficiency Level of question**:- 3

**Description of Answer Key and Credits:**

1. 0.61 AU partial credit

6.1X10-1 AU Full Credit

ii) 1.496X108 Km Full credit

1. 1.275X109 = 1,275,000,000 km partial credit

Saturn Full credit

1. Venus partial credit

41,400,000 km = 41,400,000X1000 = 41,400,000,000 m

4.14X1010 m Full credit

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