Arithmetic Progression I

Objective

To verify that the given sequence is an arithmetic progression by paper cutting and pasting method.

Arithmetic Progression

A sequence is known as an arithmetic progression (sequence) if the difference between the term and its predecessor always remains constant.

Prerequisite Knowledge

Understanding the concept of an arithmetic progression.

Materials Required

Coloured papers, a pair of scissors, fevicol, geometry box, sketch pens, drawing sheets.

Procedure

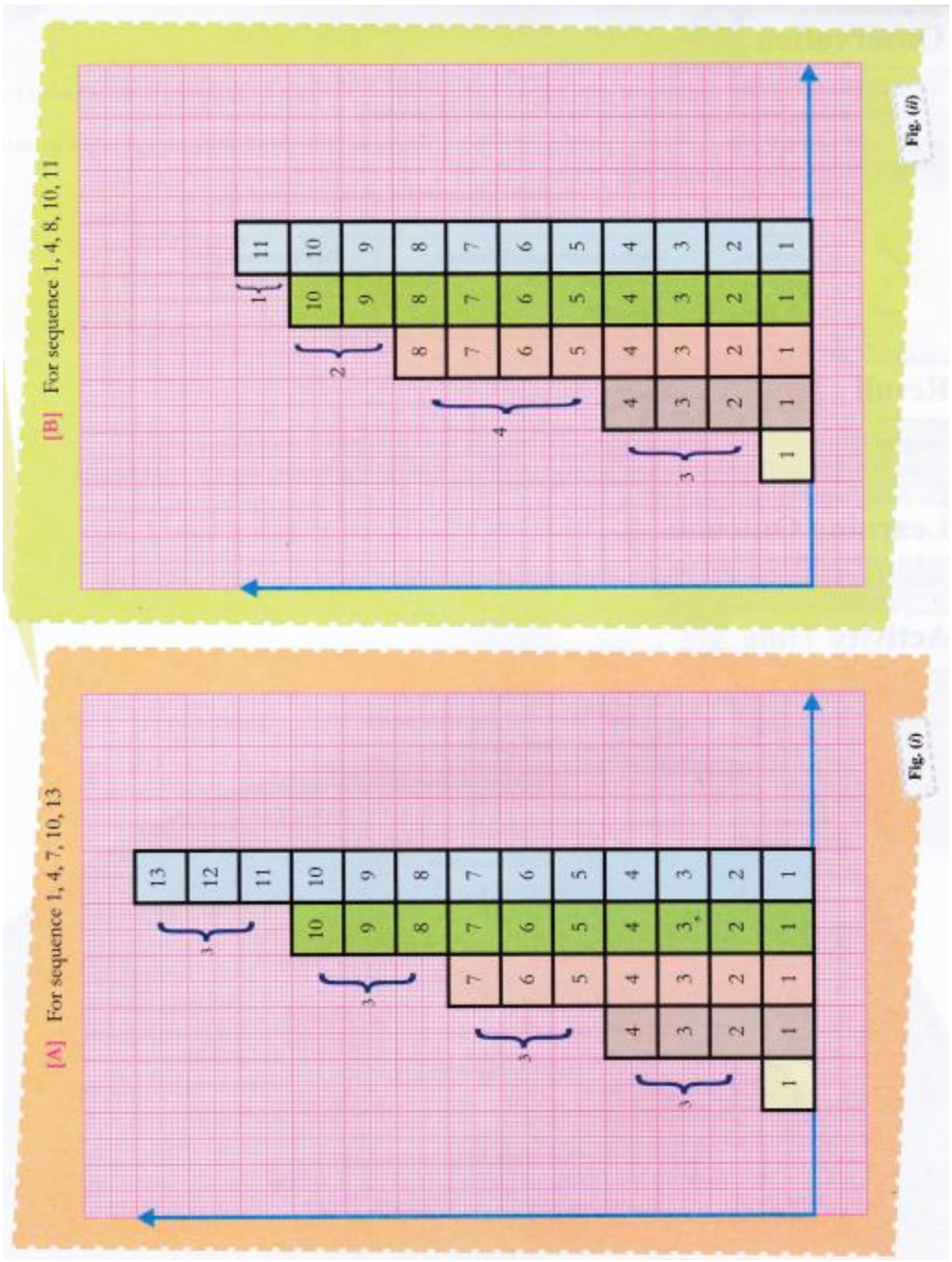
1. Take a given sequence of numbers say A1, A2, A,…
2. Cut a rectangular strip from coloured paper of width 1 cm and length A, cm.
3. Repeat the procedure by cutting rectangular strips of same width 1 cm and lengths A,, A3…cm.
4. Take a graph paper and paste these rectangular strips adjacent to each other in order on graph paper.

[A] Consider a sequence 1, 4, 7, 10, 13.

1. Take different colour strips of lengths 1 cm, 4 cm, 7 cm, 10 cm, 13 cm and all of the same width 1 cm
(say).
2. Arrange and paste these strips in order on a graph paper as shown in fig. (i).

[B] Consider a sequence 1, 4, 8, 10, 11.

1. Take different colour strips of lengths 1 cm, 4 cm, 8 cm, 10 cm, 11 cm and all of the same width 1 cm (say).
2. Arrange and paste these strips in order on a graph paper as shown in fig. (ii).



Observation

We observe from fig(i) that the adjoining strips have a common difference in heights i.e. 3 cm and a ladder is formed in which the adjoining steps are constant. Hence it is an arithmetic progression.

In fig (ii) the adjoining strips don't have a common difference in heights and thus the

adjoining steps of ladder are not constant. Hence it is not an arithmetic progression.

	fig. (i)	*fig. (ii)*
Observation	There is a common difference in heights i.e. 3 cm	Don't have common difference in heights
Result	It is an AP.	Not an AP.

Result

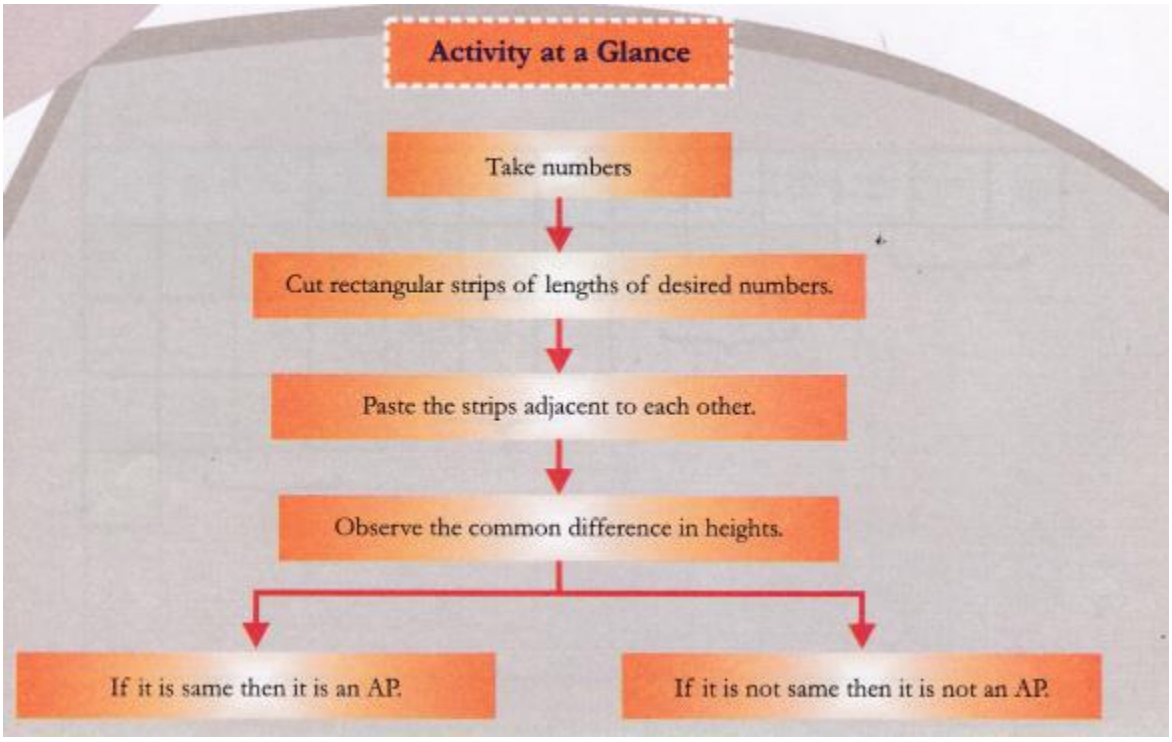
Sequence [A] is an AP because common difference between the term and its predecessor remains constant.
Sequence [B] is not an AP because common difference between the term and its predecessor does not remain constant.

Learning Outcome

Students will learn the meaning of an arithmetic progression by relating it to an activity that involves visualisation.

Activity Time

Verify experimentally whether the following sequences are AP or not.
(i) 2, 4, 6, 8, 10
(ii) 3, 5, 6, 7, 11
(iii) 1, 5, 9, 13, 17
(iv)4, 7, 9, 10, 12



Viva Voce

Question 1:
What is common difference for an AP ?
Answer:
The difference between a term and its predecessor is called the common difference in an AP.

Question 2:
Is the sequence of odd natural numbers an AP ?
Answer:
Yes

Question 3:
What does l_n-l_{n-1} , represent for an AP, where $l_n$and l_{n-1} represents consecutive terms of an AP ?
Answer:
Common difference.

Question 4:
Are the numbers 2, 4, 7, 10, 11 in AP?
Answer:
No

Question 5:
What is the common difference of a sequence of multiples of 4 ?
Answer:
4

Question 6:
What is the formula for n^{th} term of an AP ?
Answer:
T_n =a+(n—1)d,
where a —> first term.
d —>common difference.
n —> place of the term.

Question 7:
Find next two terms of —11, —8, —5, —2.
Answer:
1, 4

Question 8:
Find k, so that 15, k, -1 are in an AP.

Answer:
k =7

Multiple Choice Questions

Question 1:
The n th term of an AP is
(a) a+(n—1)d
(b) a—(n—1)d
(c) a— (n + 1)d
(d) none of these

Question 2:
20th term of the series 4, 7, 10, ……. is
(a) 51
(b) 59
(c) 61
(d) 62

Question 3:
Which sequence forms an AP ?
(a) 3, $3+\sqrt{2}$, $3+2\sqrt{2}$
(b) 3, $3+\sqrt{2}$, 3 + 2
(c) 3, $3+\sqrt{2}$, $3-2\sqrt{2}$
(d) none of these

Question 4:
If a=7 and d=3, then a8=
(a) 27
(b) 26
(c) 25
(d) 28

Question 5:
The 30 term of the AP 10, 7, 4, ….. is
(a) 97
(b) 77
(c) -77
(d) -87

Question 6:
Find the missing terms of an AP 5, ……, …., $9\frac{1}{2}$
(a) $6\frac{1}{2}$, 8

(b) 6, 8
(c) 6, $8\frac{1}{2}$
(d) none of these

Question 7:
Which term of the AP 3, 8, 13, 18, …… is 78 ?
(a) 16 th term
(b) 17 th term
(c) 18 th term
(d) 19 th term

Question 8:
If d=3, n = 18 and an = —5, then a =
(a) 44
(b) 45
(c) 46
(d) none of these

Question 9:
If n th term of an AP is 7-4n, the common difference d is
(a) 3
(b) -3
(c) -4
(d) 4

Question 10:
How many three-digit numbers are divisible by 7 ?
(a) 121
(b) 125
(c) 127
(d) 128

Question 11:
Find first four terms of the AP whose first term is -1 adncommon difference is $\frac{1}{2}$.
(a) -1, $\frac{-1}{2}$, 0, $\frac{1}{2}$
(b) 1, $\frac{-1}{2}$, 0, $\frac{1}{2}$
(c) -1, $\frac{-1}{2}$, 1, $\frac{1}{2}$
(d) none of these

Answers

1. (a)
2. (c)
3. (a)
4. (d)
5. (c)
6. (a)
7. (a)
8. (c)
9. (c)
10. (d)
11. (a)