

Arithmetic Progressions - NCERT Examples

Examples 1-16 with independently verified solutions.

CHAPTER

Arithmetic Progressions

RESOURCE

NCERT Examples

SOURCE

NCERT Mathematics, Reprint 2026-27

PART 1

Verified NCERT questions and solutions

Verified NCERT questions and solutions

Solutions are checked independently and follow the supplied NCERT chapter edition.

NCERT EXAMPLE

Example 1

first term · common difference

For the AP $3/2, 1/2, -1/2, -3/2, \dots$, write the first term and common difference.

Solution

Board-exam working:

The first term is the first listed number, so $a=3/2$.

$$d=a_2-a_1=1/2-3/2=(1-3)/2=-2/2=-1.$$

$$\text{Check: } a_3-a_2=-1/2-1/2=-1 \text{ and } a_4-a_3=-3/2-(-1/2)=-1.$$

The common difference is constant.

Final answer

$$a = 3/2, d = -1.$$

NCERT EXAMPLE

Example 2

identifying an AP

Which lists form an AP, and for each AP write the next two terms? (i) 4,10,16,22,... (ii) 1,-1,-3,-5,... (iii) -2,2,-2,2,... (iv) 1,1,1,2,2,2,3,3,3,...

Solution

Board-exam working:

Differences are: (i) 6,6,6

(ii) -2,-2,-2

(iii) 4,-4

(iv) 0,0,1.

Thus only (i) and (ii) are APs.

Final answer

(i) AP, $d=6$, next 28,34; (ii) AP, $d=-2$, next -7,-9; (iii),(iv) not APs.

NCERT EXAMPLE

Example 3

n th term

Find the 10th term of 2, 7, 12, ...

Solution

Board-exam working:

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

Here $a=2$ and $d=7-2=5$.

We need $n=10$.

$$a_{10}=a+(10-1)d=2+9\times 5=2+45=47.$$

Check: $a_9=2+8\times 5=42$ and $a_{11}=2+10\times 5=52$, so the difference on both sides is 5.

Final answer

47.

NCERT EXAMPLE

Example 4

term number

Which term of 21,18,15,... is -81? Is any term 0?

Solution

Board-exam working:

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

Here $a=21$ and $d=18-21=-3$.

$$\text{For } -81: -81=21+(n-1)(-3)=21-3n+3=24-3n.$$

$$\text{Thus } 3n=105 \text{ and } n=35.$$

$$\text{Check: } a_{35}=21+34(-3)=21-102=-81.$$

$$\text{For } 0: 0=21+(n-1)(-3)=24-3n.$$

$$\text{Thus } 3n=24 \text{ and } n=8.$$

Check: $a_8 = 21 + 7(-3) = 0$.

Final answer

-81 is the 35th term; 0 is the 8th term.

NCERT EXAMPLE

Example 5

forming an AP

Determine the AP whose 3rd term is 5 and 7th term is 9.

Solution

Board-exam working:

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

$$a_3 = a + 2d = 5 \text{ and } a_7 = a + 6d = 9.$$

Subtract the first equation from the second: $(a + 6d) - (a + 2d) = 9 - 5$, so $4d = 4$ and $d = 1$.

Substitute $d = 1$ in $a + 2d = 5$: $a + 2 = 5$, so $a = 3$.

Therefore the AP begins 3, 4, 5, 6, 7, ...

its third and seventh terms are 5 and 9.

Final answer

3, 4, 5, 6, 7, ...

NCERT EXAMPLE

Example 6

term number

Check whether 301 is a term of 5,11,17,23,...

Solution

Board-exam working:

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

Here $a=5$ and $d=11-5=6$.

Put $a_n=301$.

$$301=5+(n-1)6=5+6n-6=6n-1.$$

Thus $6n=302$ and $n=302/6=151/3$.

Since $151/3$ is not a positive integer, it cannot be a term number.

Final answer

301 is not a term.

NCERT EXAMPLE

Example 7

application · number of terms

How many two-digit numbers are divisible by 3?

Solution

Board-exam working:

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

The first two-digit multiple of 3 is 12 and the last is 99, so the AP is 12, 15, ..., 99 with $a=12, d=3, l=99$.

Use $l=a+(n-1)d$: $99=12+3(n-1)$.

Thus $87=3(n-1)$, $n-1=29$ and $n=30$.

Check: $a_{30}=12+29\times 3=12+87=99$.

Final answer

30 numbers.

NCERT EXAMPLE

Example 8

term from end

Find the 11th term from the end of 10, 7, 4, ..., -62.

Solution

Board-exam working:

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

Here $a=10, d=-3, l=-62$.

First find the number of terms: $-62=10+(n-1)(-3)=13-3n$.

Thus $3n=75$ and $n=25$.

The 11th term from the end is term number $25-11+1=15$ from the start.

$a_{15}=10+(15-1)(-3)=10-42=-32$.

Check from the end: $-62+(11-1)3=-62+30=-32$.

Final answer

-32.

NCERT EXAMPLE

Example 9

application · nth term

₹1000 is invested at 8% simple interest yearly. Do yearly accumulated interests form an AP, and what is the interest after 30 years?

Solution

Board-exam working:

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

Simple interest for one year is $PR/100 = 1000 \times 8/100 = ₹80$.

Therefore the accumulated interests are ₹80, ₹160, ₹240, ... and each consecutive difference is ₹80, so they form an AP with $a=80, d=80$.

For 30 years, $a_{30} = 80 + (30 - 1)80 = 80 + 29 \times 80 = 80 + 2320 = ₹2400$.

Check directly: $PRT/100 = 1000 \times 8 \times 30/100 = ₹2400$.

Final answer

Yes; $d=₹80$ and the 30-year interest is ₹2400.

NCERT EXAMPLE

Example 10

application · number of terms

Rows of a flower bed contain 23, 21, 19, ..., 5 rose plants. Find the number of rows.

Solution

Board-exam working:

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

The row counts form an AP with $a=23, d=21-23=-2$ and last term $l=5$.

Use $l=a+(n-1)d$: $5=23+(n-1)(-2)=23-2n+2=25-2n$.

Thus $2n=20$ and $n=10$.

Check: $a_{10}=23+9(-2)=23-18=5$.

Final answer

10 rows.

NCERT EXAMPLE

Example 11

sum of AP

Find the sum of the first 22 terms of $8, 3, -2, \dots$

Solution

Board-exam working:

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

Here $a=8, d=3-8=-5, n=22$.

$$S_{22}=22/2[2 \times 8 + (22-1)(-5)]=11[16-105]=11(-89)=-979.$$

The last term is $a_{22}=8+21(-5)=-97$, and $22/2(8-97)=11(-89)=-979$, confirming the sum.

Final answer

-979.

NCERT EXAMPLE

Example 12

sum of AP · nth term

The sum of the first 14 terms is 1050 and the first term is 10. Find the 20th term.

Solution

Board-exam working:

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

Given $a=10, n=14, S_{14}=1050$.

Use $S_n = n/2[2a + (n-1)d]$.

$$1050 = 14/2[2 \times 10 + 13d] = 7(20 + 13d) = 140 + 91d.$$

Thus $91d=910$ and $d=10$.

$$\text{Now } a_{20} = a + 19d = 10 + 19 \times 10 = 10 + 190 = 200.$$

Final answer

200.

NCERT EXAMPLE

Example 13

sum of AP · number of terms

How many terms of 24, 21, 18, ... must be taken so their sum is 78?

Solution

Board-exam working:

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

Here $a=24, d=-3, S_n=78$.

$$78 = n/2[2 \times 24 + (n-1)(-3)] = n/2[48 - 3n + 3] = n/2(51 - 3n).$$

Therefore $156 = 51n - 3n^2$, so $3n^2 - 51n + 156 = 0$.

Dividing by 3 gives $n^2 - 17n + 52 = 0 = (n-4)(n-13)$.

Hence $n=4$ or $n=13$.

Check: $S_4 = 4/2[48 - 9] = 2 \times 39 = 78$, and $S_{13} = 13/2[48 - 36] = 13/2 \times 12 = 78$.

Final answer

4 terms or 13 terms.

NCERT EXAMPLE

Example 14

sum of AP

Find (i) the sum of the first 1000 positive integers and (ii) the sum of the first n positive integers.

Solution

Board-exam working:

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

The positive integers form an AP with $a=1, d=1$.

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

(i) Here $n=1000$ and $l=1000$.

$$S_{1000} = 1000/2(1+1000) = 500 \times 1001 = 500500.$$

(ii) For the first n positive integers, $l=n$.

Therefore $S_n = n/2(1+n) = n(n+1)/2$.

Final answer

(i) 500500; (ii) $n(n+1)/2$.

NCERT EXAMPLE

Example 15

sum of AP

Find the sum of the first 24 terms when $a_n = 3 + 2n$.

Solution

Board-exam working:

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

Put $n=1, 2, 3$: $a_1 = 3 + 2 = 5$, $a_2 = 3 + 4 = 7$, $a_3 = 3 + 6 = 9$.

Thus $a=5$ and $d=2$.

$$S_{24} = 24/2[2 \times 5 + (24-1)2] = 12[10 + 46] = 12 \times 56 = 672.$$

Check using the last term: $a_{24} = 3 + 2 \times 24 = 51$, so $S_{24} = 24/2(5 + 51) = 12 \times 56 = 672$.

Final answer

672.

NCERT EXAMPLE

Example 16

application · sum of AP

TV production was 600 sets in year 3 and 700 in year 7, increasing uniformly. Find year 1, year 10, and total for years 1–7.

Solution

Board-exam working:

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

Let first-year production be a and annual increase be d .

Then $a_3 = a + 2d = 600$ and $a_7 = a + 6d = 700$.

Subtracting gives $4d = 100$, so $d = 25$.

Substituting in $a + 2d = 600$ gives $a + 50 = 600$, hence $a = 550$ sets.

The tenth-year production is $a_{10} = a + 9d = 550 + 9 \times 25 = 550 + 225 = 775$ sets.

The total for the first seven years is $S_7 = \frac{7}{2}[2 \times 550 + (7 - 1)25] = \frac{7}{2}[1100 + 150] = \frac{7}{2} \times 1250 = 4375$ sets.

Check: $a_7 = 550 + 6 \times 25 = 700$, as given.

Final answer

550 sets; 775 sets; 4375 sets.