



CLASS 10 MATHS

PART Ex 5.2 · Examples

ARITHMETIC PROGRESSIONS

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NCERT SOLVED EXAMPLES

E3 Find the 10th term of the AP : 2, 7, 12, ...Here $a = 2$, $d = 7 - 2 = 5$, $n = 10$

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

$$a_{10} = 2 + (10 - 1)(5)$$

$$a_{10} = 2 + 45 = 47$$

E4 Which term of the AP : 21, 18, 15, ... is -81 ? Is any term 0?Here $a = 21$, $d = -3$

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

$$-81 = 21 + (n - 1)(-3)$$

$$-81 = 24 - 3n \Rightarrow 3n = 105 \quad n = 35$$

$$\text{For } a_n = 0 : 21 + (n - 1)(-3) = 0 \Rightarrow n = 8 \quad \text{8th term is 0}$$

E5 Determine the AP whose 3rd term is 5 and 7th term is 9.

$$a + 2d = 5 \quad \dots\dots(i)$$

$$a + 6d = 9 \quad \dots\dots(ii)$$

Subtracting (i) from (ii) : $4d = 4 \Rightarrow d = 1$

$$\text{From (i) : } a = 5 - 2 = 3 \quad \text{AP : 3, 4, 5, 6, 7, ...}$$

EXAMPLES (Continued)

E6 Check whether 301 is a term of : 5, 11, 17, 23, ...

Difference is constant (6), so it is an AP.

$$a = 5, d = 6$$

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

$$n = \frac{302}{6} = \frac{151}{3}$$

 n is not a positive integer, so : **301 is not a term****E7** How many two-digit numbers are divisible by 3?

The numbers are 12, 15, 18, ..., 99

$$a = 12, d = 3, a_n = 99$$

$$99 = 12 + (n - 1)(3)$$

$$87 = 3(n - 1) \Rightarrow n - 1 = 29 \quad n = 30$$

E8 Find the 11th term from the last term of : 10, 7, 4, ..., -62 .Write the AP in reverse : first term -62 , $d = 3$.

$$a_{11} = -62 + (11 - 1)(3)$$

$$a_{11} = -62 + 30 = -32$$

E9 ₹1000 at 8% simple interest per year. Do the yearly interests form an AP? Find the interest after 30 years.

Interest each year : 80, 160, 240, ...

Difference is 80 (constant) $\rightarrow$ it is an AP.

$$a_{30} = 80 + 29(80) \quad \text{₹ 2400}$$

E10 23 rose plants in row 1, 21 in row 2, 19 in row 3, ... and 5 in the last row. How many rows?

$$a = 23, d = -2, a_n = 5$$

$$5 = 23 + (n - 1)(-2)$$

$$-18 = -2(n - 1) \Rightarrow n - 1 = 9 \quad \text{10 rows}$$

**Remember :** Study these worked examples first — they show how to set up $a_n = a + (n - 1)d$ and solve step by step.

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PART 1 (Ex 5.2)

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EXERCISE 5.2 — SOLUTIONS

1 Fill in the blanks using $a_n = a + (n - 1)d$.**(i)** $a = 7, d = 3, n = 8$

$$a_8 = 7 + (8 - 1)(3) = 7 + 21 \quad \boxed{a_8 = 28}$$

(ii) $a = -18, n = 10, a_n = 0$

$$0 = -18 + (10 - 1)d \Rightarrow 9d = 18 \quad \boxed{d = 2}$$

(iii) $d = -3, n = 18, a_n = -5$

$$-5 = a + (18 - 1)(-3) \Rightarrow a - 51 = -5 \quad \boxed{a = 46}$$

(iv) $a = -18.9, d = 2.5, a_n = 3.6$

$$3.6 = -18.9 + (n - 1)(2.5) \Rightarrow 22.5 = 2.5(n - 1) \quad \boxed{n = 10}$$

(v) $a = 3.5, d = 0, n = 105$

$$a_{105} = 3.5 + (105 - 1)(0) \quad \boxed{a_{105} = 3.5}$$

EXERCISE 5.2 — SOLUTIONS (Continued)

2 Choose the correct choice and justify.**(i)** 30th term of 10, 7, 4, ... :

$$a = 10, d = 7 - 10 = -3$$

$$a_{30} = 10 + (30 - 1)(-3)$$

$$a_{30} = 10 - 87 = -77 \quad \boxed{(C) -77}$$

(ii) 11th term of $-3, -\frac{1}{2}, 2, \dots$:

$$a = -3, d = -\frac{1}{2} - (-3) = \frac{5}{2}$$

$$a_{11} = -3 + (11 - 1)\left(\frac{5}{2}\right)$$

$$a_{11} = -3 + 25 = 22 \quad \boxed{(B) 22}$$

**Remember :** The n^{th} term is $a_n = a + (n - 1)d$. Substitute the known values and solve for the unknown.

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PART 2 (Ex 5.2)

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EXERCISE 5.2 — SOLUTIONS (Continued)

3 Find the missing terms in the boxes.

(i) 2, $\square$, 26 $\rightarrow a = 2, a_3 = 26$

$$26 = 2 + 2d \Rightarrow 2d = 24 \Rightarrow d = 12$$

Missing term = $2 + 12$ **14**

(ii) $\square$, 13, $\square$, 3 $\rightarrow a_2 = 13, a_4 = 3$

$$a_4 = a_2 + 2d \Rightarrow 3 = 13 + 2d \Rightarrow d = -5$$

$$a_1 = 13 - (-5) = 18, a_3 = 13 + (-5) = 8$$
 18, 8

(iii) 5, $\square$, $\square$, $9\frac{1}{2}$ $\rightarrow a_1 = 5, a_4 = 9.5$

$$9.5 = 5 + 3d \Rightarrow 3d = 4.5 \Rightarrow d = 1.5$$
 $6\frac{1}{2}, 8$

(iv) -4, $\square$, $\square$, $\square$, $\square$, 6 $\rightarrow a_1 = -4, a_6 = 6$

$$6 = -4 + 5d \Rightarrow 5d = 10 \Rightarrow d = 2$$
 -2, 0, 2, 4

(v) $\square$, 38, $\square$, $\square$, $\square$, -22 $\rightarrow a_2 = 38, a_6 = -22$

$$-22 = 38 + 4d \Rightarrow 4d = -60 \Rightarrow d = -15$$
 53, 23, 8, -7

EXERCISE 5.2 — SOLUTIONS (Continued)

4 Which term of the AP : 3, 8, 13, 18, ... is 78?

$$a = 3, d = 5, a_n = 78$$

$$78 = 3 + (n - 1)(5)$$

$$75 = 5(n - 1) \Rightarrow n - 1 = 15$$
 $n = 16$

5 Find the number of terms in each AP.

(i) 7, 13, 19, ..., 205 $\rightarrow a = 7, d = 6$

$$205 = 7 + (n - 1)(6)$$

$$198 = 6(n - 1) \Rightarrow n - 1 = 33$$
 $n = 34$

(ii) $18, 15\frac{1}{2}, 13, \dots, -47 \rightarrow a = 18, d = -2.5$

$$-47 = 18 + (n - 1)(-2.5)$$

$$-65 = -2.5(n - 1) \Rightarrow n - 1 = 26$$
 $n = 27$

6 Check whether -150 is a term of the AP : 11, 8, 5, 2, ...

$$a = 11, d = -3$$

$$-150 = 11 + (n - 1)(-3)$$

$$-161 = -3(n - 1) \Rightarrow n - 1 = \frac{161}{3}$$

n is not a whole number, so : **-150 is not a term**

**Remember :** A number is a term of an AP only if the value of n obtained is a positive whole number.

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PART 3 (Ex 5.2)

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EXERCISE 5.2 — SOLUTIONS (Continued)

- 7** Find the 31st term of an AP whose 11th term is 38 and 16th term is 73.

$$a + 10d = 38 \quad \dots\dots(i)$$

$$a + 15d = 73 \quad \dots\dots(ii)$$

Subtracting (i) from (ii) : $5d = 35 \Rightarrow d = 7$

From (i) : $a = 38 - 70 = -32$

$$a_{31} = -32 + (31 - 1)(7) = -32 + 210 = 178$$

- 8** An AP has 50 terms; its 3rd term is 12 and last term is 106. Find the 29th term.

$$a + 2d = 12 \quad \dots\dots(i)$$

$$a_{50} = a + 49d = 106 \quad \dots\dots(ii)$$

Subtracting (i) from (ii) : $47d = 94 \Rightarrow d = 2$

From (i) : $a = 12 - 4 = 8$

$$a_{29} = 8 + (29 - 1)(2) = 8 + 56 = 64$$

- 9** If the 3rd and 9th terms of an AP are 4 and -8, which term is zero?

$$a + 2d = 4 \quad \dots\dots(i)$$

$$a + 8d = -8 \quad \dots\dots(ii)$$

Subtracting (i) from (ii) : $6d = -12 \Rightarrow d = -2$

From (i) : $a = 4 + 4 = 8$

$$a_n = 0 \Rightarrow 8 + (n - 1)(-2) = 0 \quad \text{5th term}$$

EXERCISE 5.2 — SOLUTIONS (Continued)

- 10** The 17th term of an AP exceeds its 10th term by 7. Find the common difference.

$$a_{17} - a_{10} = 7$$

$$(a + 16d) - (a + 9d) = 7$$

$$7d = 7 \quad \text{d = 1}$$

- 11** Which term of the AP : 3, 15, 27, 39, ... will be 132 more than its 54th term?

$$a = 3, d = 12$$

$$a_{54} = 3 + 53(12) = 639$$

$$\text{Required term} = 639 + 132 = 771$$

$$771 = 3 + (n - 1)(12)$$

$$768 = 12(n - 1) \Rightarrow n - 1 = 64 \quad \text{65th term}$$

- 12** Two APs have the same common difference. The difference of their 100th terms is 100. Find the difference of their 1000th terms.

$$a_{100} - a'_{100} = (a - a') = 100$$

For the same d , the difference of terms at any position equals $a - a'$.

So the difference of the 1000th terms is also **100**

Remember : When two terms are given, form two equations and subtract to eliminate a and find d .

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PART 4 (Ex 5.2)

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EXERCISE 5.2 — SOLUTIONS (Continued)

13 How many three-digit numbers are divisible by 7?

The numbers are 105, 112, ..., 994

$$a = 105, d = 7, a_n = 994$$

$$994 = 105 + (n - 1)(7)$$

$$889 = 7(n - 1) \Rightarrow n - 1 = 127 \quad \boxed{128}$$

14 How many multiples of 4 lie between 10 and 250?

The numbers are 12, 16, ..., 248

$$a = 12, d = 4, a_n = 248$$

$$248 = 12 + (n - 1)(4)$$

$$236 = 4(n - 1) \Rightarrow n - 1 = 59 \quad \boxed{60}$$

15 For what n are the n th terms of 63, 65, 67, ... and 3, 10, 17, ... equal?

$$\text{First AP : } a_n = 63 + (n - 1)(2) = 61 + 2n$$

$$\text{Second AP : } a_n = 3 + (n - 1)(7) = 7n - 4$$

$$61 + 2n = 7n - 4$$

$$65 = 5n \quad \boxed{n = 13}$$

16 Determine the AP whose 3rd term is 16 and whose 7th term exceeds the 5th term by 12.

$$a + 2d = 16 \quad \dots\dots(i)$$

$$a_7 - a_5 = 2d = 12 \Rightarrow d = 6$$

$$\text{From (i) : } a = 16 - 12 = 4 \quad \boxed{4, 10, 16, 22, \dots}$$

EXERCISE 5.2 — SOLUTIONS (Continued)

17 Find the 20th term from the last term of the AP : 3, 8, 13, ..., 253.

$$n\text{th term from the last} = \ell - (n - 1)d.$$

$$\ell = 253, d = 5$$

$$20\text{th from last} = 253 - (20 - 1)(5)$$

$$= 253 - 95 \quad \boxed{= 158}$$

18 The sum of the 4th and 8th terms of an AP is 24 and of the 6th and 10th terms is 44. Find the first three terms.

$$(a + 3d) + (a + 7d) = 24 \Rightarrow a + 5d = 12 \quad \dots\dots(i)$$

$$(a + 5d) + (a + 9d) = 44 \Rightarrow a + 7d = 22 \quad \dots\dots(ii)$$

$$\text{Subtracting (i) from (ii) : } 2d = 10 \Rightarrow d = 5$$

$$\text{From (i) : } a = 12 - 25 = -13 \quad \boxed{-13, -8, -3}$$

19 Subba Rao's salary was ₹5000 in 1995, rising ₹200 each year. In which year did it reach ₹7000?

$$a = 5000, d = 200, a_n = 7000$$

$$7000 = 5000 + (n - 1)(200)$$

$$2000 = 200(n - 1) \Rightarrow n - 1 = 10 \Rightarrow n = 11$$

$$11\text{th year from 1995 : } \boxed{\text{Year 2005}}$$

20 Ramkali saved ₹5 in week 1, increasing ₹1.75 weekly. In which week were her savings ₹20.75?

$$a = 5, d = 1.75, a_n = 20.75$$

$$20.75 = 5 + (n - 1)(1.75)$$

$$15.75 = 1.75(n - 1) \Rightarrow n - 1 = 9 \quad \boxed{n = 10}$$

**Remember :** For word problems : write the list of numbers, identify a , d and the required term, then apply $a_n = a + (n - 1)d$.

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