

Arithmetic Progressions - Exercise 5.2

Exercise 5.2 with independently verified solutions.

CHAPTER

Arithmetic Progressions

RESOURCE

NCERT Exercises

SOURCE

NCERT Mathematics, Reprint 2026-27

PART 1

Verified NCERT questions and solutions

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

QUESTION

Question 1

nth term · table

Complete table: (i) $a=7, d=3, n=8$; (ii) $a=-18, n=10, a_n=0$; (iii) $d=-3, n=18, a_n=-5$; (iv) $a=-18.9, d=2.5, a_n=3.6$; (v) $a=3.5, d=0, n=105$.

Solution

Board-exam working:

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

Use $a_n = a + (n - 1)d$ in every row.

$$(i) a_8 = 7 + (8 - 1) \times 3 = 7 + 21 = 28.$$

$$(ii) 0 = -18 + (10 - 1)d, \text{ so } 18 = 9d \text{ and } d = 18 \div 9 = 2.$$

Check: $-18 + 9 \times 2 = 0$.

(iii) $-5 = a + (18 - 1)(-3) = a - 51$, so $a = -5 + 51 = 46$.

Check: $46 - 51 = -5$.

(iv) $3.6 = -18.9 + (n - 1) \times 2.5$, so $22.5 = 2.5(n - 1)$, $n - 1 = 9$ and $n = 10$.

Check: $-18.9 + 9 \times 2.5 = 3.6$.

(v) $a_{105} = 3.5 + (105 - 1) \times 0 = 3.5$.

Final answer

(i) $a_n = 28$; (ii) $d = 2$; (iii) $a = 46$; (iv) $n = 10$; (v) $a_n = 3.5$.

QUESTION

Question 2

nth term

Choose and justify: (i) 30th term of 10, 7, 4, ...; (ii) 11th term of $-3, -1/2, 2, \dots$

Solution

Board-exam working:

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

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

(i) $a = 10, d = 7 - 10 = -3, n = 30$.

Therefore $a_{30} = 10 + 29(-3) = 10 - 87 = -77$, which is option C.

(ii) $a = -3, d = -1/2 - (-3) = 5/2, n = 11$.

Therefore $a_{11} = -3 + 10 \times 5/2 = -3 + 25 = 22$, which is option B.

Final answer

(i) C, -77; (ii) B, 22.

QUESTION

Question 3

missing terms

Fill missing terms: (i) 2, □, 26 (ii) □, 13, □, 3 (iii) 5, □, □, 9 (iv) -4, □, □, □, □, 6 (v) □, 38, □, □, □, -22.

Solution

Board-exam working:

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

Use $a_n = a + (n - 1)d$ and divide the change between known terms equally.

(i) $26 = 2 + 2d$, so $2d = 24$ and $d = 12$.

The middle term is $2 + 12 = 14$.

(ii) $3 = 13 + 2d$, so $2d = -10$ and $d = -5$.

Hence the first term is $13 - (-5) = 18$ and the third is $13 - 5 = 8$.

(iii) $9=5+3d$, so $3d=4$ and $d=4/3$.

The missing terms are $5+4/3=19/3$ and $19/3+4/3=23/3$.

(iv) $6=-4+5d$, so $5d=10$ and $d=2$.

Adding 2 successively gives $-2, 0, 2, 4$.

(v) $-22=38+4d$, so $4d=-60$ and $d=-15$.

The first term is $38-(-15)=53$

continuing gives $23, 8, -7, -22$.

In every completed sequence, each consecutive difference is constant.

Final answer

(i) 14; (ii) 18, 8; (iii) $19/3, 23/3$; (iv) $-2, 0, 2, 4$; (v) $53, 23, 8, -7$.

QUESTION

Question 4

term number

Which term of $3, 8, 13, 18, \dots$ is 78?

Solution

Board-exam working:

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

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

Put $a_n=78$.

$$78=3+(n-1)5=3+5n-5=5n-2.$$

Thus $5n=80$ and $n=16$.

Check: $a_{16}=3+15\times 5=3+75=78$.

Final answer

16th term.

QUESTION

Question 5

number of terms

Find number of terms: (i) 7,13,19,...,205 (ii) 18,15½,13,...,-47.

Solution

Board-exam working:

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

Use $l=a+(n-1)d$.

(i) $a=7, d=6, l=205$.

Then $205=7+6(n-1)$, so $198=6(n-1)$, $n-1=33$ and $n=34$.

Check: $7+33\times 6=205$.

(ii) $a=18, d=15\frac{1}{2}-18=-5/2, l=-47$.

Then $-47=18+(n-1)(-5/2)$, so $-65=-5/2(n-1)$.

Multiplying by $-2/5$ gives $n-1=26$, hence $n=27$.

Check: $18+26(-5/2)=18-65=-47$.

Final answer

(i) 34; (ii) 27.

QUESTION

Question 6

term number

Is -150 a term of $11, 8, 5, 2, \dots$?

Solution

Board-exam working:

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

Here $a=11$ and $d=8-11=-3$.

Put $a_n=-150$ in $a_n=a+(n-1)d$.

$$-150=11+(n-1)(-3)=11-3n+3=14-3n.$$

Therefore $3n=164$ and $n=164/3$.

Since a term number must be a positive integer, -150 is not a term of this AP.

Final answer

No.

QUESTION

Question 7

nth term

Find the 31st term when the 11th is 38 and 16th is 73.

Solution

Board-exam working:

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

$$a_{11} = a + 10d = 38 \text{ and } a_{16} = a + 15d = 73.$$

Subtracting gives $5d = 35$, so $d = 7$.

Substitute in $a + 10d = 38$: $a + 70 = 38$, hence $a = -32$.

$$a_{31} = a + 30d = -32 + 30 \times 7 = -32 + 210 = 178.$$

Check: $a_{11} = -32 + 70 = 38$ and $a_{16} = -32 + 105 = 73$.

Final answer

178.

QUESTION

Question 8

n th term

An AP has 50 terms, third term 12 and last term 106. Find the 29th term.

Solution

Board-exam working:

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

$$a_3 = a + 2d = 12 \text{ and } a_{50} = a + 49d = 106.$$

Subtracting gives $47d = 94$, so $d = 2$.

Substitute in $a + 2d = 12$: $a + 4 = 12$, hence $a = 8$.

$$a_{29} = a + 28d = 8 + 28 \times 2 = 8 + 56 = 64.$$

Check: $a_{50} = 8 + 49 \times 2 = 106$.

Final answer

64.

QUESTION

Question 9

term number

Third and ninth terms are 4 and -8. Which term is zero?

Solution

Board-exam working:

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

$$a_3 = a + 2d = 4 \text{ and } a_9 = a + 8d = -8.$$

Subtracting gives $6d = -12$, so $d = -2$.

Substitute in $a + 2d = 4$: $a - 4 = 4$, hence $a = 8$.

$$\text{Put } a_n = 0: 0 = 8 + (n - 1)(-2) = 10 - 2n.$$

Thus $2n = 10$ and $n = 5$.

$$\text{Check: } a_5 = 8 + 4(-2) = 0.$$

Final answer

5th term.

QUESTION

Question 10

common difference

The 17th term exceeds the 10th by 7. Find d.

Solution

Board-exam working:

Write $a_{17}=a+16d$ and $a_{10}=a+9d$.

The given condition is $a_{17}-a_{10}=7$.

$$\text{Therefore } (a+16d)-(a+9d)=7.$$

Cancelling a gives $7d=7$, so $d=7\div 7=1$.

Final answer

$$d=1.$$

QUESTION

Question 11

term number

Which term of 3,15,27,39,... is 132 more than its 54th term?

Solution

Board-exam working:

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

Here $a=3$ and $d=15-3=12$.

First find $a_{54}=3+(54-1)12=3+53\times 12=3+636=639$.

The required term is $639+132=771$.

Put $a_n=771$: $771=3+(n-1)12$.

Thus $768=12(n-1)$, $n-1=64$ and $n=65$.

Check: $a_{65}=3+64\times 12=771$.

Final answer

65th term.

QUESTION

Question 12

n th term

Two APs have the same d . Their 100th terms differ by 100. Find the difference of their 1000th terms.

Solution

Board-exam working:

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

Let the first terms be a and b and let the common difference of both APs be d .

Their 100th-term difference is $[a + 99d] - [b + 99d] = a - b = 100$.

Their 1000th-term difference is $[a + 999d] - [b + 999d] = a - b$.

Since $a - b = 100$, this difference is also 100.

Final answer

100.

QUESTION

Question 13

application · number of terms

How many three-digit numbers are divisible by 7?

Solution

Board-exam working:

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

The first three-digit multiple of 7 is 105 and the last is 994, so the AP is 105, 112, ..., 994 with $a=105, d=7, l=994$.

Use $l=a+(n-1)d$: $994=105+7(n-1)$.

Thus $889=7(n-1)$, $n-1=127$ and $n=128$.

Check: $a_{128}=105+127 \times 7=105+889=994$.

Final answer

128.

QUESTION

Question 14

application · number of terms

How many multiples of 4 lie between 10 and 250?

Solution

Board-exam working:

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

The first multiple of 4 greater than 10 is 12 and the last below 250 is 248.

Thus $a=12, d=4, l=248$.

Use $l=a+(n-1)d$: $248=12+4(n-1)$.

Hence $236=4(n-1)$, $n-1=59$ and $n=60$.

Check: $a_{60}=12+59 \times 4=12+236=248$.

Final answer

60.

QUESTION

Question 15

nth term

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

Solution

Board-exam working:

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

For the first AP, $a=63, d=2$, so $a_n=63+2(n-1)=61+2n$.

For the second AP, $a=3, d=7$, so $a_n=3+7(n-1)=7n-4$.

Equate them: $61+2n=7n-4$.

Thus $65=5n$ and $n=13$.

Check: $63+12 \times 2=87$ and $3+12 \times 7=87$.

Final answer

$n=13$.

QUESTION

Question 16

forming an AP

Determine the AP whose third term is 16 and whose 7th exceeds its 5th by 12.

Solution

Board-exam working:

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

The third term gives $a + 2d = 16$.

Also $a_7 - a_5 = 12$.

Therefore $(a + 6d) - (a + 4d) = 12$, so $2d = 12$ and $d = 6$.

Substitute in $a + 2d = 16$: $a + 12 = 16$, hence $a = 4$.

The AP is 4, 10, 16, 22, ... Check: $a_7 = 40$ and $a_5 = 28$, whose difference is 12.

Final answer

4, 10, 16, 22, ...

QUESTION

Question 17

term from end

Find the 20th term from the end of 3, 8, 13, ..., 253.

Solution

Board-exam working:

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

Here $a = 3, d = 5, l = 253$.

First find the total terms: $253 = 3 + 5(n - 1)$, so $250 = 5(n - 1)$, $n - 1 = 50$ and $n = 51$.

The 20th term from the end is term number $51 - 20 + 1 = 32$ from the start.

$a_{32} = 3 + (32 - 1)5 = 3 + 31 \times 5 = 3 + 155 = 158$.

Check from the end: $253 - 19 \times 5 = 158$.

Final answer

158.

QUESTION

Question 18

forming an AP

$a_4 + a_8 = 24$ and $a_6 + a_{10} = 44$. Find the first three terms.

Solution

Board-exam working:

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

$$a_4 + a_8 = (a + 3d) + (a + 7d) = 2a + 10d = 24.$$

$$a_6 + a_{10} = (a + 5d) + (a + 9d) = 2a + 14d = 44.$$

Subtracting the first equation from the second gives $4d = 20$, so $d = 5$.

Substitute in $2a + 10d = 24$: $2a + 50 = 24$, so $2a = -26$ and $a = -13$.

The first three terms are $a, a + d, a + 2d = -13, -8, -3$.

Check: $a_4 = 2, a_8 = 22$ and their sum is 24.

Final answer

$-13, -8, -3$.

QUESTION

Question 19

application · term number

Subba Rao began in 1995 at ₹5000 with ₹200 annual increments. When did salary reach ₹7000?

Solution

Board-exam working:

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

The annual salaries form an AP with $a = ₹5000$, $d = ₹200$.

Put $a_n = ₹7000$.

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

Thus $2000 = 200(n - 1)$, $n - 1 = 10$ and $n = 11$.

Taking 1995 as year 1, year 11 is $1995 + (11 - 1) = 2005$.

Check: $5000 + 10 \times 200 = ₹7000$.

Final answer

2005.

QUESTION

Question 20

application · term number

Ramkali saves ₹5 in week 1 and increases weekly saving by ₹1.75. In which week is it ₹20.75?

Solution

Board-exam working:

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

The weekly savings form an AP with $a = ₹5, d = ₹1.75$.

Put $a_n = ₹20.75$.

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

Thus $15.75 = 1.75(n - 1)$, $n - 1 = 15.75 \div 1.75 = 9$ and $n = 10$.

Check: $a_{10} = 5 + 9 \times 1.75 = 5 + 15.75 = ₹20.75$.

Final answer

10th week.