CLASS 10 · MATHEMATICS · CHAPTER 5

Arithmetic Progressions - Exercise 5.3

Exercise 5.3 with independently verified solutions.

CHAPTER	RESOURCE	SOURCE
Arithmetic Progressions	NCERT Exercises	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.

QUESTION

Question 1

sum of AP

Find sums: (i) 2,7,12,... 10 terms (ii) −37,−33,−29,... 12 terms (iii) 0.6,1.7,2.8,... 100 terms (iv) 1/15,1/12,1/10,... 11 terms.

Solution

Board-exam working:

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

Use S_n=n/2[2a+(n−1)d].

(i) a=2,d=7−2=5,n=10.

S_{10}=10/2[2×2+9×5]=5[4+45]=5×49=245.

(ii) a=−37,d=−33−(−37)=4,n=12.

S_{12}=12/2[2(−37)+11×4]=6[−74+44]=6(−30)=−180.

(iii) $a=0.6, d=1.7-0.6=1.1, n=100$.

$S_{100}=100/2[2\times0.6+99\times1.1]=50[1.2+108.9]=50\times110.1=5505$.

(iv) $a=1/15, d=1/12-1/15=(5-4)/60=1/60, n=11$.

$S_{11}=11/2[2/15+10/60]=11/2[8/60+10/60]=11/2\times3/10=33/20$.

Final answer

(i)245; (ii)−180; (iii)5505; (iv)33/20.

QUESTION

Question 2

sum of AP

Find sums: (i) 7+10½+14+...+84 (ii) 34+32+30+...+10 (iii) −5−8−11−...−230.

Solution

Board-exam working:

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

First find n from $l=a+(n-1)d$, then use $S_n=n(a+l)/2$.

(i) $a=7, d=10½-7=7/2, l=84$.

Thus $84=7+(n-1)7/2$

$77\times2=7(n-1)$, so $n-1=22$ and $n=23$.

$S_{23}=23/2(7+84)=23\times91/2=2093/2$.

(ii) $a=34, d=-2, l=10$.

Thus $10=34-2(n-1)$

$2(n-1)=24$, so $n=13$.

$S_{13}=13/2(34+10)=13/2\times44=286$.

(iii) $a=-5, d=-3, l=-230$.

Thus $-230=-5-3(n-1)$

$-225=-3(n-1)$, so $n-1=75$ and $n=76$.

$S_{76}=76/2(-5-230)=38(-235)=-8930$.

Final answer

(i)2093/2; (ii)286; (iii)−8930.

QUESTION

Question 3

sum of AP · table

In an AP, solve: (i) $a=5, d=3, a_n=50$, find n and S_n; (ii) $a=7, a_{13}=35$, find d and S_{13}; (iii) $a=37, d=3$, find a_{12} and S_{12}; (iv) $a=15, S_{10}=125$, find d and a_{10}; (v) $d=5, S_9=75$, find a and a_9; (vi) $a=2, d=8, S_n=90$, find n and a_n; (vii) $a=8, a_n=62, S_n=210$, find n and d; (viii) $a=-4, d=2, S_n=-14$, find n and a_n; (ix) $a=3, n=8, S_8=192$, find d; (x) $l=28, S_9=144$, find a.

Solution

Board-exam working:

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

Use $a_n=a+(n-1)d$ and $S_n=n(a+a_n)/2$.

(i) $50=5+(n-1)3$ gives $45=3(n-1)$, so $n=16$.

Then $S_{16}=16/2(5+50)=8\times55=440$.

(ii) $35=7+(13-1)d$ gives $28=12d$, so $d=7/3$.

Then $S_{13}=13/2(7+35)=13\times21=273$.

(iii) $a_{12}=37+(12-1)3=37+33=70$.

Then $S_{12}=12/2(37+70)=6\times107=642$.

(iv) Here $a=15, n=10, S_{10}=125$.

Therefore $125=10/2[2\times15+9d]=5(30+9d)$.

Thus $25=30+9d$, so $d=-5/9$.

Now $a_{10}=15+9(-5/9)=10$.

(v) Here $d=5, n=9, S_9=75$.

Therefore $75=9/2[2a+8\times5]$.

Thus $150/9=2a+40$, so $2a=-70/3$ and $a=-35/3$.

Now $a_9=-35/3+8\times5=85/3$.

(vi) $90=n/2[2\times2+(n-1)8]=n(4n-2)$.

Thus $2n^2-n-45=0=(2n+9)(n-5)$, so $n=5$.

Then $a_5=2+4\times8=34$.

(vii) $210=n/2(8+62)=35n$, so $n=6$.

Also $62=8+(6-1)d$, hence $54=5d$ and $d=54/5$.

(viii) $-14=n/2[2(-4)+(n-1)2]=n(n-5)$.

Thus $n^2-5n+14=0$.

Its discriminant is $25-56=-31$, so the printed data has no real or positive-integer n.

(ix) Here $a=3, n=8, S_8=192$.

Therefore $192=8/2[2\times3+7d]=4(6+7d)$.

Thus $48=6+7d$, so $42=7d$ and $d=6$.

(x) With $l=28, S=144, n=9$: $144=9/2(a+28)$, so $288=9(a+28)$, $a+28=32$ and $a=4$.

Final answer

(i) $n=16, S_n=440$; (ii) $d=7/3, S_{13}=273$; (iii) $a_{12}=70, S_{12}=642$; (iv) $d=-5/9, a_{10}=10$; (v) $a=-35/3, a_9=85/3$; (vi) $n=5, a_n=34$; (vii) $n=6, d=54/5$; (viii) no real/integer solution for the printed data; (ix) $d=6$; (x) $a=4$.

QUESTION

Question 4

sum of AP

How many terms of 9,17,25,... give sum 636?

Solution

Board-exam working:

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

Here a=9,d=8,S_n=636.

636=n/2[2×9+(n−1)8]=n/2[18+8n−8]=n/2(8n+10)=n(4n+5).

Thus $4n^2+5n-636=0=(4n+53)(n-12)$.

Therefore n=12 or n=−53/4.

Reject the negative value.

Check: S_{12}=12/2[18+11×8]=6(18+88)=6×106=636.

Final answer

12 terms.

QUESTION

Question 5

sum of AP

First term 5, last 45, sum 400: find n and d.

Solution

Board-exam working:

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

Given a=5,l=45,S_n=400.

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

400=n/2(5+45)=25n, so n=400÷25=16.

Now use l=a+(n−1)d: 45=5+(16−1)d=5+15d.

Thus 40=15d and d=40/15=8/3.

Check: S_{16}=16/2(50)=400.

Final answer

n=16,d=8/3.

QUESTION

Question 6

sum of AP

First and last terms are 17 and 350, d=9. Find n and sum.

Solution

Board-exam working:

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

Given a=17,d=9,l=350.

Use l=a+(n−1)d.

350=17+9(n−1), so 333=9(n−1), n−1=37 and n=38.

S_{38}=38/2(17+350)=19×367=6973.

Check: a_{38}=17+37×9=17+333=350.

Final answer

38 terms; sum 6973.

QUESTION

Question 7

sum of AP

Find S_{22} when d=7 and a_{22}=149.

Solution

Board-exam working:

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

Use a_{22}=a+21d.

Therefore 149=a+21×7=a+147, so a=2.

Now S_{22}=22/2(a+a_{22})=11(2+149)=11×151=1661.

Check with the other formula: 22/2[2×2+21×7]=11(4+147)=1661.

Final answer

1661.

QUESTION

Question 8

sum of AP

Find S_{51} when second and third terms are 14 and 18.

Solution

Board-exam working:

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

a_2=a+d=14 and a_3=a+2d=18.

Subtracting gives d=4.

Then a=14−4=10.

a_{51}=a+50d=10+50×4=210.

S_{51}=51/2(a+a_{51})=51/2(10+210)=51/2×220=51×110=5610.

Final answer

5610.

QUESTION

Question 9

sum of AP

$S_7=49$ and $S_{17}=289$. Find S_n.

Solution

Board-exam working:

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

$S_7=7/2[2a+6d]=7(a+3d)=49$, so $a+3d=7$.

$S_{17}=17/2[2a+16d]=17(a+8d)=289$, so $a+8d=17$.

Subtracting gives $5d=10$, so $d=2$.

Then $a+3\times2=7$ gives $a=1$.

Therefore $S_n=n/2[2\times1+(n-1)2]=n/2(2n)=n^2$.

Check: $S_7=49$ and $S_{17}=289$.

Final answer

$S_n=n^2$.

QUESTION

Question 10

sum of AP

Show sequences $a_n=3+4n$ and $a_n=9-5n$ are APs; find each S_{15}.

Solution

Board-exam working:

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

(i) $a_1=3+4=7, a_2=3+8=11, a_3=3+12=15.$

The differences are $11-7=4$ and $15-11=4$, so it is an AP with $a=7, d=4$.

Then $S_{15}=15/2[2\times7+14\times4]=15/2(14+56)=15/2\times70=525$.

(ii) $a_1=9-5=4, a_2=9-10=-1, a_3=9-15=-6.$

The differences are $-1-4=-5$ and $-6-(-1)=-5$, so it is an AP with $a=4, d=-5$.

Then $S_{15}=15/2[2\times4+14(-5)]=15/2(8-70)=15/2(-62)=-465$.

Final answer

(i) AP, $d=4, S_{15}=525$; (ii) AP, $d=-5, S_{15}=-465$.

QUESTION

Question 11

sum to nth term

If $S_n=4n-n^2$, find S_1, S_2, a_2, a_3, a_{10} and a_n.

Solution

Board-exam working:

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

$S_1=4(1)-1^2=4-1=3$ and $S_2=4(2)-2^2=8-4=4$.

$a_2=S_2-S_1=4-3=1$.

Also $S_3=4(3)-3^2=12-9=3$, so $a_3=S_3-S_2=3-4=-1$.

In general, $a_n=S_n-S_{n-1}=[4n-n^2]-[4(n-1)-(n-1)^2]$.

Simplifying gives $a_n=5-2n$.

Therefore $a_{10}=5-2(10)=5-20=-15$.

Final answer

3;4;1;−1;−15; $a_n=5-2n$.

QUESTION

Question 12

application · sum of AP

Find the sum of first 40 positive integers divisible by 6.

Solution

Board-exam working:

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

The numbers are 6,12,18,..., so a=6,d=6,n=40.

The 40th term is $a_{40}=6+(40-1)6=6+234=240$.

$S_{40}=40/2(6+240)=20\times246=4920$.

Final answer

4920.

QUESTION

Question 13

application · sum of AP

Find the sum of first 15 multiples of 8.

Solution

Board-exam working:

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

The multiples are 8,16,24,..., so a=8,d=8,n=15.

The 15th term is a_{15}=8+(15−1)8=8+112=120.

S_{15}=15/2(8+120)=15/2×128=15×64=960.

Final answer

960.

QUESTION

Question 14

sum of AP

Find the sum of odd numbers between 0 and 50.

Solution

Board-exam working:

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

The odd numbers are 1,3,5,...,49, so a=1,d=2,l=49.

Find n: 49=1+(n−1)2, so 48=2(n−1), n−1=24 and n=25.

S_{25}=25/2(1+49)=25/2×50=25×25=625.

Final answer

625.

QUESTION

Question 15

application · sum of AP

Daily delay penalty is ₹200,₹250,₹300,... Find total for 30 days.

Solution

Board-exam working:

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

The daily penalties form an AP with a=₹200,d=₹50,n=30.

S_{30}=30/2[2×200+(30−1)50]=15[400+1450]=15×1850=₹27,750.

Check: the 30th-day penalty is 200+29×50=₹1650, and 30/2(200+1650)=₹27,750.

Final answer

₹27,750.

QUESTION

Question 16

application · sum of AP

₹700 funds seven prizes, each ₹20 less than the previous. Find the prizes.

Solution

Board-exam working:

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

Let the first prize be ₹a.

There are n=7 prizes and d=−₹20.

700=7/2[2a+(7−1)(−20)]=7/2(2a−120).

Multiplying by 2/7 gives 200=2a−120, so 2a=320 and a=160.

Subtracting ₹20 successively gives ₹160,₹140,₹120,₹100,₹80,₹60,₹40.

Their sum is ₹700.

Final answer

₹160,₹140,₹120,₹100,₹80,₹60,₹40.

QUESTION

Question 17

application · sum of AP

Three sections of each Class I–XII plant the class number of trees. Find total.

Solution

Board-exam working:

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

For one section, the numbers planted by Classes I–XII are 1,2,3,…,12.

This is an AP with a=1,l=12,n=12.

One-section total=12/2(1+12)=6×13=78 trees.

There are three sections, so total=3×78=234 trees.

Final answer

234 trees.

QUESTION

Question 18

application · sum of AP

A spiral has 13 semicircles of radii 0.5,1.0,1.5,… cm. Find total length using π=22/7.

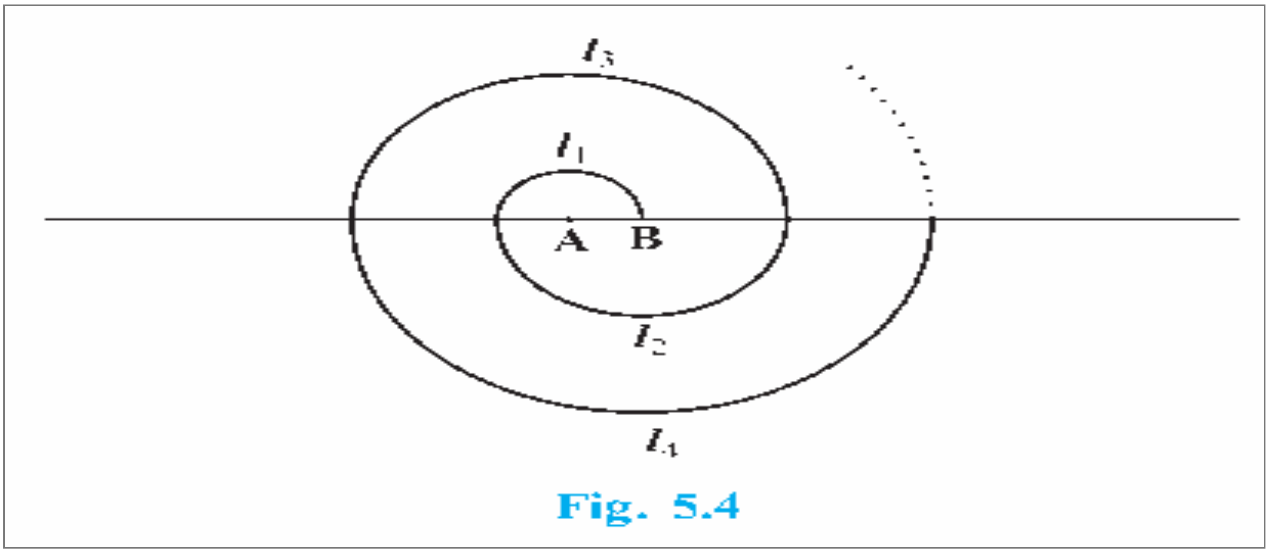

Fig. 5.4

Figure 5.4: spiral of successive semicircles.

Solution

Board-exam working:

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

The radii form an AP with a=0.5 cm,d=0.5 cm,n=13.

The last radius is l=0.5+12×0.5=6.5 cm.

Sum of radii=13/2(0.5+6.5)=13/2×7=45.5 cm.

The length of a semicircle of radius r is πr.

Therefore total length=π×45.5=22/7×45.5=22×6.5=143 cm.

Final answer

143 cm.

QUESTION

Question 19

application · sum of AP

200 logs are stacked 20 in bottom row, then 19,18,... Find rows and top row count.

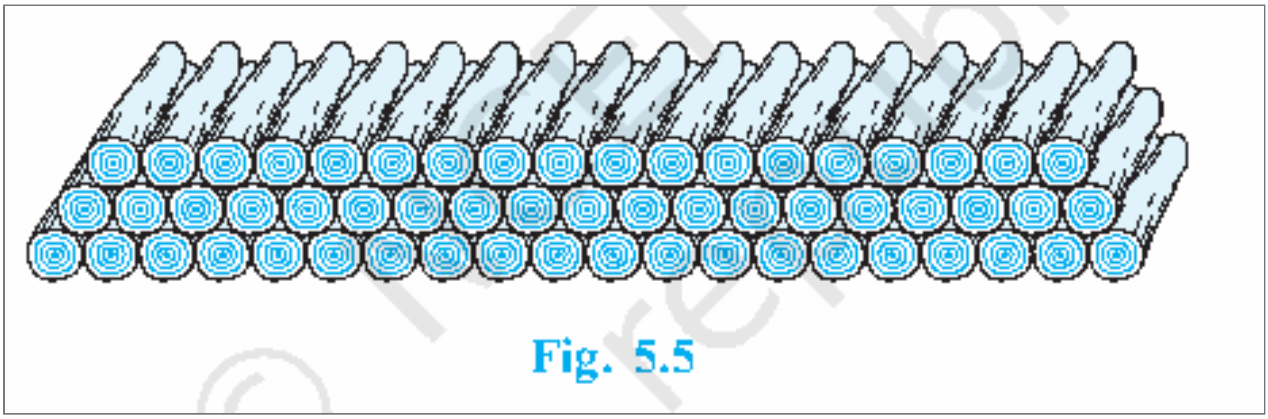

Figure 5.5: stack of 200 logs.

Solution

Board-exam working:

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

The row counts form an AP with a=20,d=−1,S_n=200.

200=n/2[2×20+(n−1)(−1)]=n/2(41−n).

Thus 400=41n−n^2, so n^2−41n+400=0=(n−16)(n−25).

Hence n=16 or n=25.

If n=25, the top row would contain 20+24(−1)=−4 logs, which is impossible.

Therefore n=16.

The top row contains a_{16}=20+15(−1)=5 logs.

Check: 16/2(20+5)=8×25=200.

Final answer

16 rows; 5 logs on top.

QUESTION

Question 20

application · sum of AP

Ten potatoes start 5 m from a bucket and are 3 m apart. Find total out-and-back running distance.

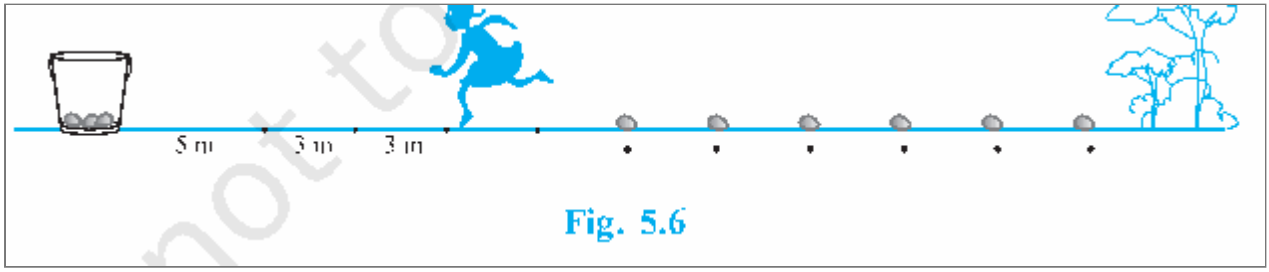

Figure 5.6: potato race layout.

Solution

Board-exam working:

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

The one-way distances from the bucket are 5,8,11,... with a=5,d=3,n=10.

The last distance is a_{10}=5+(10−1)3=5+27=32 m.

Sum of one-way distances=10/2(5+32)=5×37=185 m.

Each potato requires an outward and return journey, so total distance=2×185=370 m.

Final answer

370 m.