

Exercise 4.2

1. Find T_n , the n th term of the following arithmetic sequences.
Hence find T_{22} for each sequence.

(i) 8, 13, 18, 23, ...

(ii) 16, 36, 56, 76, ...

(iii) 10, 7, 4, 1, ...

(i) 8, 13, 18, 23, ...

$a = 8, \quad d = 5$

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

$T_n = 8 + (n-1)5 = 8 + 5n - 5$

$T_n = 3 + 5n$

$n=22 \Rightarrow$

$T_{22} = 3 + 5(22) = 113 \quad \checkmark$

(ii) 16, 36, 56, 76, ...

$a = 16, \quad d = 20$

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

$T_n = 16 + (n-1)20 = 16 + 20n - 20$

$T_n = -4 + 20n$

$n=22 \Rightarrow$

$T_{22} = -4 + 20(22) = 436 \quad \checkmark$

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(i) 8, 13, 18, 23, ...

(ii) 16, 36, 56, 76, ...

(iii) 10, 7, 4, 1, ...

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$a = 10, \quad d = -3$

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

$T_n = 10 + (n-1)(-3) = 10 - 3n + 3$

$T_n = 13 - 3n$

$n=22$

$T_{22} = 13 - 3(22) = -53 \quad \checkmark$

3. Find the number of terms in each of the following arithmetic sequences:

- (i) $-5, -1, 3, 7, \dots, 75$ (ii) $2, 5, 8, 11, \dots, 59$ (iii) $-\frac{3}{2}, -1, -\frac{1}{2}, 0, \dots, 14$

(i)

$$a = -5 \quad d = 4 \quad T_n = 75 \quad n = ?$$

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

$$n = ?$$

$$\Rightarrow 75 = -5 + (n-1)4$$

$$75 = -5 + 4n - 4$$

$$75 = -9 + 4n$$

$$84 = 4n$$

$$21 = n \quad \checkmark$$

$$\Rightarrow T_{21} = 75$$

check: $T_{21} = -5 + (20)4 = 75 \quad \checkmark$

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(ii)

$$a = 2, \quad d = 3, \quad T_n = 59, \quad n = ?$$

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

$$n = ?$$

$$59 = 2 + (n-1)3$$

$$57 = (n-1)3$$

$$57 = 3n - 3$$

$$60 = 3n$$

$$20 = n$$

$$\Rightarrow T_{20} = 59 \quad \checkmark$$

check: $T_{20} = 2 + (19)3 = 59 \quad \checkmark$

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- (i) $-5, -1, 3, 7, \dots, 75$ (ii) $2, 5, 8, 11, \dots, 59$ (iii) $-\frac{3}{2}, -1, -\frac{1}{2}, 0, \dots, 14$.

(ii)

$n = ?$

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

$a = -\frac{3}{2}, d = \frac{1}{2}, T_n = 14, n = ?$

$\Rightarrow 14 = -\frac{3}{2} + (n-1)\left(\frac{1}{2}\right)$

x2

+3

+1

$28 = -3 + (n-1)1$

$31 = n-1$

$32 = n$

$\Rightarrow T_{32} = 14 \quad \checkmark$

check: $T_{32} = -\frac{3}{2} + (31)\left(\frac{1}{2}\right) = 14 \quad \checkmark$

4. In an arithmetic sequence, $T_1 = 4$ and $T_7 = 22$. Using simultaneous equations, find

- (i) the values of a and d (ii) the first five terms of the sequence (iii) T_{20} .

$a = ?$

$d = ?$

(i)

$T_1 = a = 4 \quad \checkmark$

$T_7 = 22$

$\Rightarrow 22 = 4 + (7-1)d$

-4

÷6

$18 = 6d$

$3 = d \quad \checkmark$

First 5 Terms?

(ii)

Count up in 3's from 4

$4, 7, 10, 13, 16 \quad \checkmark$

$T_{20} ?$

simplify rule for T_n

$T_n = 4 + (n-1)3$

$T_{20} = 4 + (19)3 = 61 \quad \checkmark$