

# Arithmetic Sequences

Level 1 – 2

1. Determine which of the following sequences are arithmetic:

a) 6, 7, 8, 9, 10

b) 3, 5, 8, 12, 17

c) 3, 3, 3, 3, 3

d) 5, 1, -2, -5, -8

e) 2, 4, 8, 16, 32

f) 0, -5, -10, -15, -20

2. Determine the next three terms of the arithmetic sequences:

a) 4, 7, 10, ... ..

b) 10, 17, 24, ... ..

c) 5, 3, 1, ... ..

d) 1, 1.2, 1.4, ... ..

e) -10, -6, -2, ... ..

f) 30, 22, 14, ... ..

3. Determine the first three terms of the arithmetic sequences:

a)  $t_n = 1 + 5n$  .....

b)  $t_n = t_{n-1} + 3$       $t_1 = 9$  .....

c)  $t_n = 3 + 2(n - 1)$  .....

d)  $t_n = -2 - 3n$  .....

e)  $t_n = t_{n-1} - 2$       $t_1 = -4$  .....

f)  $t_n = 7n$  .....

g)  $t_n = -3 - 4(n - 1)$  .....

h)  $t_n = 3 - 2n$  .....

i)  $t_n = t_{n-1} + \frac{1}{2}$       $t_1 = 1$  .....

4. Determine the missing term in the arithmetic sequences:

a) 3, ..... , 15

b) 10, ..... , 30

c) 4, ..... , 0

d) 5, ..... , 9

e) 3, ..... , -2

f) -6, ..... , -4

g) -1, ..... , 5

h) 50, ..... , 38

i) -5, ..... , -20

*Level 3 – 4*

5. For the following arithmetic sequences

i) determine an expression for the  $n^{\text{th}}$  term  $t_n$  in the form  $t_n = a + (n - 1)d$

ii) Expand and simplify your expression to write it in the form  $t_n = b + cn$

iii) determine a recursive expression for the  $n^{\text{th}}$  term  $t_n$  (don't forget to write down the value of  $t_1$ )

iv) find the value of the 53<sup>rd</sup> term

a) 5, 7, 9, 11, ...

i) .....

ii) .....

iii).....

iv).....

b) 3, 6, 9, 12, ...

i) .....

ii) .....

iii).....

iv).....

c) -2, 1, 4, 7, ...

i) .....

ii) .....

iii).....

iv).....

d) 8, 4, 0, -4, ...

i) .....

ii) .....

iii) .....

iv) .....

e) -5, -10, -15, -20, ...

i) .....

ii) .....

iii) .....

iv) .....

f) 10, 17, 24, 31, ...

i) .....

ii) .....

iii) .....

iv) .....

6. Paul is training for a marathon. On the first day he run 1 km. On each subsequent day he runs 200 m more than the previous day.

a) Determine an expression for the distance he runs on the  $n^{\text{th}}$  day.

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b) Determine how far he runs on the 17<sup>th</sup> day.

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c) On which day does he run 5km?

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Level 5 – 6

7. Find the value(s) of  $k$  in the following arithmetic sequences:

a)  $5, k + 1, 3k + 3$  .....

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b)  $9, 2k + 3, k^2 - 8$  .....

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c)  $10, 3k + 3, k^2 + 4$  .....

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d)  $k - 1, k^2, 5k + 1$  .....

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e)  $k + 1, 3k + 2, 2k^2 - 39$  .....

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8. Show that the mean value of three consecutive terms of an arithmetic sequence is equal to the middle term.

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*Level 7 – 8*

9. a) Show that the sum  $S_n$  of the first  $n$  terms of an arithmetic sequence is  $S_n = \frac{n}{2}[2t_1 + (n-1)d]$ .

*Hint, what do you notice about  $t_1 + t_n$ ,  $t_2 + t_{n-1}$ ,  $t_3 + t_{n-2}$  etc?*

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- b) Hence show that  $S_n = \frac{n}{2}(t_1 + t_n)$ .

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c) Determine the sum of all odd numbers less than 100

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d) Determine the sum of all even numbers greater than 100 and less than 200

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e) Determine the sum of all positive integers less than 200 which are not divisible by 3.

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f) Determine the value of  $2 + 3 + 7 + 8 + 12 + 13 + \dots + 102 + 103$ .

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