

Arithmetic Series

Q0

$$d = 7 - 3 = 11 - 7$$

$$d = 4$$

$$a = 3$$

$$S_{100} = \frac{100}{2} (6 + 99 \times 4)$$

$$S_{100} = 20100$$

Q1

$$a + 6d = 37 \quad (A)$$

$$a + 3d = 17 \quad (B)$$

$$3d = 20$$

$$d = 20/3$$

$$\text{from (B)} \quad a = 17 - 3d$$

$$a = 17 - 3 \times \frac{20}{3}$$

$$a = -3$$

$$S_{20} = \frac{20}{2} \left(-6 + 19 \times \frac{20}{3} \right)$$

$$S_{20} = 1206.\bar{6}$$

Q2

$$a + a + d = 0$$

$$2a + d = 0 \quad (A)$$

$$a + 9d = 85 \quad (B)$$

from (A)

$$d = -2a$$

sub into (B)

$$a - 18a = 85$$

$$-17a = 85$$

$$a = -5$$

$$-10 + d = 0$$

$$d = 10$$

Q3

$$1 + 2 + 3 + 4 + \dots + 1000$$

$$a = 1 \quad d = 1$$

$$S_{1000} = \frac{1000}{2} (2 + 999)$$

$$S_{1000} = 500500$$

$$7, 14, 21, 28, \dots, 994$$

$$a = 7 \quad d = 7$$

$$S_{142} = \frac{142}{2} (14 + 141 \times 7)$$

$$S_{142} = 71071$$

$$\text{Answer} = 500500 - 71071$$

$$= 429429$$

Q4

$$x = \frac{10}{2} (2a + 9d)$$

$$x = 10a + 45d \quad (A)$$

$$y = \frac{20}{2} (2a + 19d)$$

$$y = 20a + 190d \quad (B)$$

$$\underline{2x = 20a + 90d \quad (A) \times 2}$$

$$y - 2x = 100d$$

$$d = \frac{y - 2x}{100} \quad \text{sub into (A)}$$

$$x = 10a + \frac{45}{100} (y - 2x)$$

$$x = 10a + \frac{9}{20} (y - 2x)$$

$$a = \frac{x}{10} + \frac{9}{200} (2x - y)$$

Q5

$$a = 7$$

$$d = 11 - 7 = 4$$

$$S_n = \frac{n}{2} (14 + (n-1)4) < 174$$

Solve

$$\frac{n}{2} (14 + (n-1)4) = 174$$

$$n(4n + 10) = 348$$

$$4n^2 + 10n - 348 = 0$$

$$2n^2 + 5n - 174 = 0$$

use quadratic formula

$$a=2 \quad b=5 \quad c=-174$$

$$n = 8.16 \quad \text{and} \quad n = -10.661$$

$$n > 0 \quad \therefore \quad n = 8.16$$

answer 9 bits including the last one

Q6

$$\frac{\text{second}}{\text{first}} = 3$$

$$\frac{a+d}{a} = 3 \quad (A)$$

$$\frac{a+9d}{a+4d} = \frac{19}{9} \quad (B)$$

from (A) $d = 2a$
sub into (B)

$$\frac{a+18a}{a+8a} = \frac{19}{9}$$

$$\frac{19a}{9a} = \frac{19}{9}$$

$$a \in \mathbb{R}$$

Q7

$$x, x+1, x^2$$

$$\begin{matrix} (x+1) - x & = & x^2 - (x+1) \\ 2^{\text{nd}} - 1^{\text{st}} & & 3^{\text{rd}} - 2^{\text{nd}} \end{matrix}$$

$$1 = x^2 - x - 1$$

$$0 = x^2 - x - 2$$

$$0 = (x-2)(x+1)$$

$$x = 2 \quad x = -1$$

$$\text{let } x = 2$$

2, 3, 4 arithmetic series

$$x = -1$$

-1, 0, 1 arithmetic series

Q8

use graphing software
| calculator

$$x, x+3, x^3$$

$$x+3 - x = x^3 - (x+3)$$

$$3 = x^3 - x - 3$$

$$0 = x^3 - x - 6$$

