4 The nth term of an arithmetic series is t_n and the sum of the first n terms of the series is S_n

Given that $S_2 = \dfrac{2}{3}t_5$ and that $S_4 = t_{10} + 3$

(a) find

  (i) the common difference of the series,

  (ii) the first term of the series.

  (5)

Given also that $S_{p+2} - S_p = 110$

(b) find the value of p.

  (3)

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Question 4 continued

(Total for Question 4 is 8 marks)

5 Using the identities

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\tan A = \frac{\sin A}{\cos A}$$

(a) show that the equation

$$3\sin(x + \alpha) = 5\sin(x - \alpha)$$

can be written in the form $\tan x = 4\tan\alpha$

(5)

(b) Hence solve, to the nearest integer, the equation

$$3\sin(2y + 30)° = 5\sin(2y - 30)° \qquad \text{for } 90 \leqslant y < 180$$

(4)

Question 5 continued

P 4 6 9 0 1 A 0 1 1 3 2

Question 5 continued

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Question 5 continued

(Total for Question 5 is 9 marks)

6 Solve

(a) $\log_x 1024 = 5$

(2)

(b) $\log_3 (7y - 3) = 4$

(2)

(c) $\log_a 25 + 2\log_a 625 = 10$

(3)

(d) $\log_b 7 - 2\log_7 b + 1 = 0$

(5)

Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 12 marks)