

Start here for

Question Number:

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$$a = 1000 \quad d = 750$$

$$\begin{aligned} \text{a) (i)} \quad U_n &= a + (n-1)d \\ &= 1000 + (n-1)750 \\ &= 1000 + 750n - 750 \\ &= 250 + 750n \\ &= \cancel{250} + \cancel{750}n \end{aligned}$$

$$\begin{aligned} a_n &= 250 + (750 \times 9) \\ &= 250 + 6750 \\ &= 7000 \end{aligned}$$

$\therefore$  Susannah runs 7km in the 9th week

~~ii~~ (ii)

$$10000 = 250 + 750n$$

$$9750 = 750n$$

$$13 = n$$

$\therefore$  the 13th week is when 10km is ran.

$$\begin{aligned} \text{(iii)} \quad S_n &= \frac{n}{2} [2a + (n-1)d] \\ &= \frac{26}{2} [2000 + (25 \times 750)] \\ &= \cancel{26} \cdot 13 [2000 + 18750] \\ &= 269750 \end{aligned}$$

$\therefore$  Susannah runs 269.75 km.

$$b) \quad y = e^{2x} - y = e^{-x}$$

$$\int_0^2 e^{2x} - e^{-x}$$

$$= \left[ \frac{1}{2} e^{2x} + e^{-x} \right]_0^2$$

$$= \left( \frac{1}{2} e^{2 \times 2} - \frac{1}{2} e^{2 \times 0} \right) + \left( e^{-2} - e^{-0} \right)$$

$$= \left( \frac{1}{2} e^4 - \frac{1}{2} \right) + \left( e^{-2} - 1 \right)$$

$$= \frac{1}{2} e^4 - \frac{1}{2} + e^{-2} - 1$$

$$= \frac{1}{2} e^4 + e^{-2} - \frac{3}{2}$$

$$= \frac{1}{2} e^4 + \frac{1}{e^2} - \frac{3}{2} \quad \text{units}^2$$

c) 12 chocolates

4 chocolate mint centres

4 caramel centres

4 strawberry centres

$$(i) \quad P(\text{two chocolate}) = \frac{4}{12} \times \frac{3}{11}$$

$$= \frac{1}{11}$$

$$(ii) \quad P(\text{2 same centre}) = P(\text{2 chocolate}) + P(\text{2 caramel}) + P(\text{2 strawberry})$$

$$= \left( \frac{4}{12} \times \frac{3}{11} \right) + \left( \frac{4}{12} \times \frac{3}{11} \right) + \left( \frac{4}{12} \times \frac{3}{11} \right)$$

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4) c. (ii) continued

$$= \left( \frac{4}{12} \times \frac{3}{11} \right) \times 3$$

$$= \frac{3}{11}$$

$$\begin{aligned} \text{(iii)} \quad P(\text{different centres}) &= P(\text{mint caramel}) + P(\text{mint strawberry}) + \\ &\quad P(\text{caramel mint}) + P(\text{caramel strawberry}) + \\ &\quad P(\text{strawberry mint}) + P(\text{strawberry caramel}) \end{aligned}$$

$$= \left( \frac{4}{12} \times \frac{4}{12} \right) \times 6$$

$$= \frac{2}{3}$$

d)  $f(x) = 1 + e^x$

$$f(x) \times f(-x) = f(x) + f(-x)$$

$$f(-x) = 1 + e^{-x}$$

$$1 + e^x \times 1 + e^{-x} = 1 + e^x + 1 + e^{-x}$$

$$1 + e^x + 1 + e^{-x} = 2 + e^x + e^{-x}$$

