Start here for Question Number: 4

a) 1km + 1.750 + 2.5 + ...

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

$a = 1$

$d = 0.750$

$n = 9$

$T_9 = 1 + (9 - 1) \times 0.750$

$T_9 = 7$

in the 9th week Susannah runs 7km

$10 = 1 + (n-1) \times 0.750$

$10 = 1 + 0.750n - 0.750$

$10 = \frac{1}{4} + 0.750n$

$-\frac{1}{4} \quad -\frac{1}{4}$

$\frac{9.75}{0.75} = \frac{0.75n}{0.75}$

$n = 13$

∴ Susannah first runs 10km in the 13th week.

$S_n = \frac{n}{2}(2a + (n-1)d)$

$S_{26} = \frac{26}{2}(2 \times 1 + (26-1)0.75)$

$T_{26} =$

$S_{26} = 269.75$ km

∴ The total distance Susannah runs in 26 weeks is 269.75km

b) $A = \int_1^2 e^{2x} - e^{-x}$

$\left[\frac{1}{2}e^{2x} + e^{-x}\right]_1^2$

$\left[\frac{1}{2}e^{2(2)} + e^{-2}\right] - \left[\frac{1}{2}e^{2} + e^{-1}\right]$

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

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

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

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

$\frac{e^2(e^2-1)}{2} + \frac{e^1 - e^2}{e^1 \times e^2}$

$\frac{e^2(e^2-1)}{2} + \frac{e^1(1-e^1)}{e^3}$ units^2

47.209

Additional writing space on back page.

c/ 4 mint centres

4 caramel centres

4 strawberry centres.

i/ $P(\text{mint and mint}) = \frac{4}{12} \times \frac{3}{11}$

$= \frac{1}{11}$

ii/ $P(\text{mint and mint})$ or $P(\text{strawberry and strawberry})$ or $P(\text{caramel and caramel})$

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

$= \frac{3}{11}$

$P(\text{different centres}) = 1 - P(\text{same centres})$

$= 1 - \frac{3}{11}$

$= \frac{8}{11}$

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

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

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

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

You may ask for an extra Writing Booklet if you need more space to answer question 4.