Start here for Question Number: 4

4a) (i) 26 weeks.

a 1 wk = 1 km

$a+d$ 2 wk = 1.75 km

$a+2d$ 3 wk = 2.5 km

$a+9d$ 10 wk = 7.75 km.

$a = 1$, $d = 0.75$

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

$T_9 = a + 8d$

$= 1 + (8 \times 0.75)$

$= 7$

∴ Week 9, Susannah runs 7 km.

(ii) $10 = 1 + (n-1)\,0.75$

$9 = 0.75n - 0.75$

$0.75n = 8.25$

$n = 11$

∴ in week 11, she first runs 10km.

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

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

$= 13(2 + (25)\,0.75)$

$= 269.75$ km

∴ the total distance that Susannah runs in 26 weeks is 269.75 km.

b) $A = \int_0^2 e^{2x} - e^{-x}\,dx$

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

$= (2e^4 + e^{-2}) - (2e^0 + e^{-0})$

$= (2e^4 + e^{-2}) - (2 + 1)$

$= 2e^4 + e^{-2} - 3$

c)(i) 12 choco. in box

4 mint, 4 caramel, 4 strawberry.

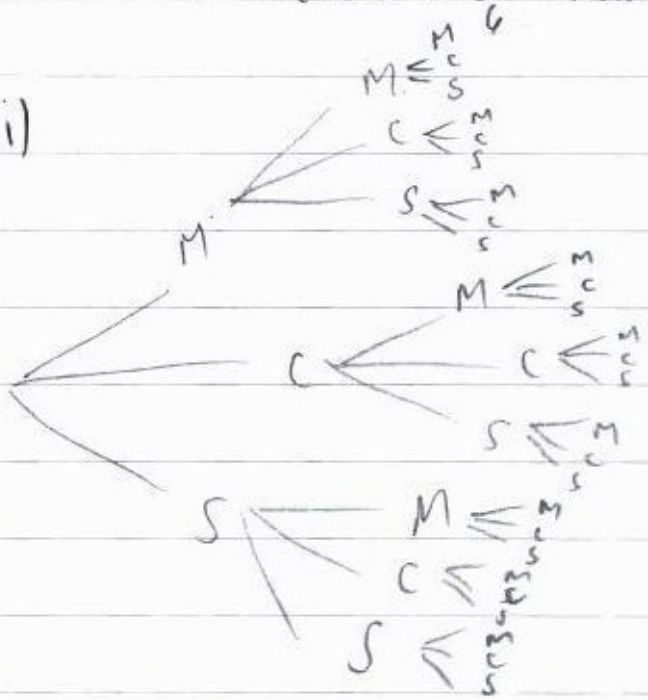
(-2 raindo).
$2/12 = \frac{1}{6}$

$\frac{4}{12} = \frac{1}{3}$

$\frac{1}{3} - \frac{1}{6} = \frac{1}{6}$

∴ there is a $\frac{1}{6}$ chance of 2 chocolates with mint centres

(ii)



$\frac{3}{9} = \frac{1}{3}$

$\frac{1}{3} - \frac{1}{6} = \frac{1}{6}$

∴ there is a $\frac{1}{6}$ chance of getting the same centre.

(iii) $\frac{6}{9} = \frac{2}{3}$

$\frac{2}{3} - \frac{1}{6} = \frac{1}{2}$

∴ there is $\frac{1}{2}$ chances of getting two different centres.

Additional writing space on back page.

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

$f(-x) = -(1 + e^x)$ $\quad f(-x) = 1 + e$

$= -1 - e^x$

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

RHS $= 1 + e^x + (-1 - e^x)$

$= 1 + e^x - 1 - e^x$

$= 0$

LHS $= (1 + e^x)(-1 - e^x)$

$= -1 - e^x - e^x - (e^x)^2$

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

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