Start here for Question Number: 4

(a) (i) $1000 + 1750 + 2500 + \ldots$

$T_9 = a + (n-1)d$

$= 1000 + (8 \times 750)$

$= 1000 + 6000$

$= 7000$

∴ In the 9th week she runs 7 kms

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

$10000 = 1000 + (n-1)750$

$10000 = 1000 + 750n - 750$

$10\,000 = 250 + 750n$

$750n = 10\,000 - 250$

$750n = 9750$

$n = \frac{9750}{750}$

$n = 13$

∴ She runs 10kms in the 13th week

(iii) $1000 + 1750 + 2500 + \ldots + 10\,000$

$\therefore S_{13} = \frac{n}{2}(a + L)$

$= \frac{13}{2}(1000 + 10\,000)$

$= 71500$

$= 71.5$ kms

$\therefore$ total distance $= 71.5 + (10 \times 13)$

$= 71.5 + 130$

$= 201.5$ kms

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

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

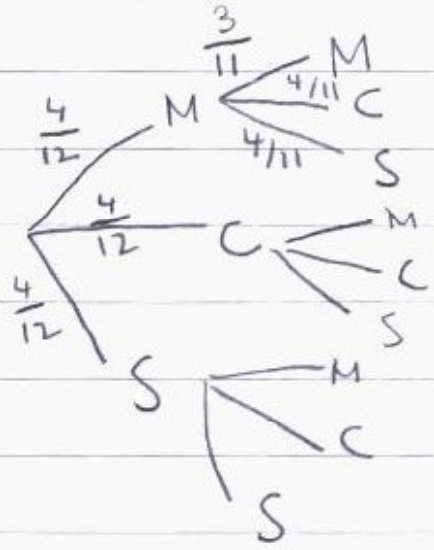
$= \left(\frac{e^4}{2} - \frac{e^{-2}}{-1}\right) + \left(\frac{e^0}{2} - \frac{e^0}{-1}\right)$

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

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

Additional writing space on back page.

(c) (i)



$$P(\text{2 mint chocs}) = \frac{4}{12} \times \frac{3}{11}$$

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

(ii) $P(\text{2 have same centre}) = \left(\frac{4}{12} \times \frac{3}{11}\right) + \left(\frac{4}{12} \times \frac{3}{11}\right) + \left(\frac{4}{12} \times \frac{3}{11}\right)$

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

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

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

Start here.

(c) (iii) P (2 have different centres)

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

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

$= \frac{8}{11}$

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

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

$= 1 + \frac{1}{e^x}$

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

$(1+e^x) \times \left(1 + \frac{1}{e^x}\right) = 1 + e^x + 1 + \frac{1}{e^x}$

$1 + \frac{1}{e^x} + e^x + 1 = 2 + e^x + \frac{1}{e^x}$

$2 + e^x + \frac{1}{e^x} = 2 + e^x + \frac{1}{e^x}$