BOARD OF STUDIES
NEW SOUTH WALES

Q·7

a) i) the terms of the geometric series can't exceed infinity (∞).

ii) GP with $r = (\sqrt{5}-2)$

$$S_\infty = \frac{1-0}{1-(\sqrt{5}-2)}$$

$$= \frac{1}{1-\sqrt{5}+2}$$

$$= \frac{1}{(3-\sqrt{5})} \times \frac{(3+\sqrt{5})}{(3+\sqrt{5})}$$

$$= \frac{(3+\sqrt{5})}{9-5}$$

$$S_\infty = \frac{3+\sqrt{5}}{4}$$

b) $V = 25\left(1+\frac{t}{60}\right)^2 \quad 0 \le t \le 60$

i) at $t=0$, $V = 25(1+0)^2$

$V = 25$

∴ there was initially 25 L.

ii) $6\frac{1}{4} = 25\left(1 - \frac{t}{60}\right)^2$

$\frac{1}{4} = \frac{1}{25}\left(1 - \frac{t}{60}\right)^2$

$\sqrt{\frac{1}{4}} = 1 - \frac{t}{60}$

$-\frac{t}{60} = -\frac{1}{2}$

$t = 30$

$\therefore$ it was $\frac{1}{4}$ full after 30 seconds.

iii) ~~$V = 25\left(1 - \frac{1}{2}\right)^2$~~

~~$= 25 \times \frac{1}{4}$~~

$\frac{dV}{dt} = 50\left(1 - \frac{t}{60}\right) \times \left(\frac{60 \times 1}{-60} + t \times 0\right)$

$= 50\left(1 - \frac{t}{60}\right) 60$

$= 3000\left(1 - \frac{t}{60}\right)$

$= 3000\left(1 - \frac{1}{2}\right)$

$= 15000$

$\therefore$ it was draining at $15000\ cm^3 s^{-1}$

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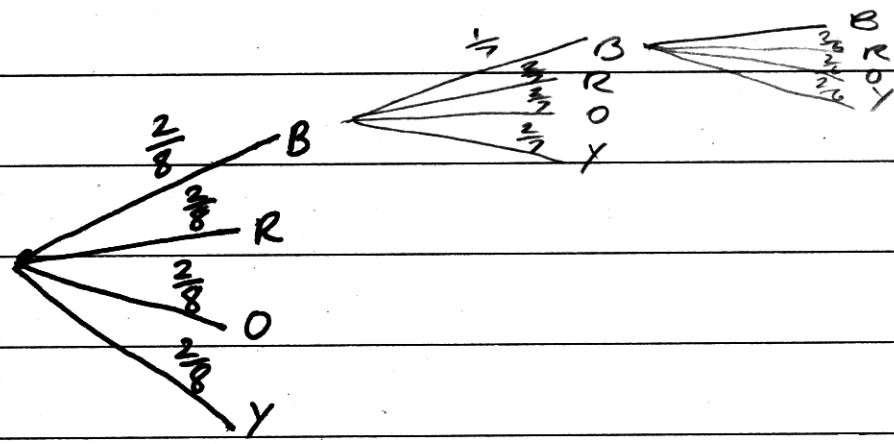
c). Start 1st draw 2nd draw 3rd draw



i) after 1st draw, only 7 socks are left
∴ selecting one at a time means he has a 1/7 chance of getting the same colour.
∴ he has a 6/7 chance of a different colour.

ii) $\frac{6}{7} \times \frac{5}{6}$
$= \frac{5}{7}$

iii) $\frac{2}{8} \times \frac{1}{7}$
$= \frac{1}{28}$