Answers

1. Given that it takes 10 minute to burn 1 rope from one end to the other. burn one rope on both ends and at the same time burn one end of the other rope.
- The rope burning both sides will take 5 minu to completely burn, the other rope will be left with 5 minutes to completely burn.
- As soon as the 1st rope finish burning, burn the other side of rope 2, such that now both it's ends are burning. Now it will take half the time left to completely burn the remain part of rope 2 (2.5 minutes)

After finishes burning 5 + 2.5 = 7.5 minute would have passed.

2. (a)
- it takes 15 to cover 100% course work
- the student has 16 hours.

The scoring rate can be represent as a function as follow:

n = number of hours slept.

$$S_n = 0.87(1 - 0,079)^{8-n}$$
$$\therefore S_8 = 0.87(0,921)^{8-n}$$

to get the mark that a student needs to get 50% at a certain scoring rate is

given by:

$$y = \frac{50\%}{58} = \frac{50}{0.87(0.921)^{8-n}}$$

to get the time it takes to get y marks using ratios:

time	:	Mark
15 hr	:	100 %
x	:	y

$$x = \frac{15}{100} y$$

$$\therefore x = \frac{15}{100}\left(\frac{50}{0.87(0.921)^{8-n}}\right)$$

$$\therefore x = \frac{8.62}{(0.921)^{8-n}} \text{ hr}$$

- n must meet the following requirement

$n + x \leq 16$

n	0	1	2	3	4	5	6	7	8
x	16,05	15.33	14.12	13,01	11.98	11.03	10.16	9.36	8.162
$n+x$	16,05	16,33	16,12	16,01	15,98	16,03	16,16	16,36	16,62

to get 50 %, the student must sleep for 4 hours

(ii) to get 100% ✓maximum mark

$$y = \frac{100}{sc} = \frac{100}{0.87(0.921)^{8-n}}$$

$$x = \frac{15}{100}y = \frac{15}{100}\left(\frac{100}{0.87(0,921)^{8-n}}\right)$$

$$x = \frac{17.24}{(0,921)^{8-n}}$$

n(hr)	0	1	2	3	4	5	6	7	8
x(hr)	33.3	30,67	28,24	26,01	27,96	22,06	20,32	18.7	17.24

the learner does not have enough time to get maximum marks, but if he can sleep for 8 hours, he will require 17.24hr to study to get maximum marks.

(b) Given: $P(\text{Shy}/\text{Math}) = 8\,P(\text{Shy}/\text{Business})$

$n(\text{maths}) = 29 \quad n(\text{Bussiness}) = 349$

$$P(\text{math}) = \frac{29}{29+349} = 0,18$$

$$P(\text{Business}) = \frac{349}{29+349} = 0.92.$$

using Baye's law;

$$P(A/B) = \frac{P(B/A)\,P(A)}{P(B)}$$

$$P(\text{Math}/\text{Shy}) = \frac{P(\text{Shy}/\text{math})\,P(\text{Math})}{P(\text{Shy}/\text{Business})P(\text{Business}) + P(\text{Shy}/\text{Math})P(\text{Ma}}$$

$$= \frac{P(\text{Shy}/\text{math}) \times 0.18}{P(\text{Shy}/\text{Bussines}) \times 0.92 + 0.18\,P(\text{Shy}/\text{Math})}$$

Divide num & den by $P(\text{Shy}/\text{Math})$:

$$= \frac{0.18}{\frac{P(\text{Shy}/\text{Business})}{P(\text{Shy}/\text{Math})} \times 0.92 + 0.18}$$

From given:

$$\frac{P(\text{Shy}/\text{Bus})}{P(\text{Shy}/\text{Math})} = \frac{1}{8}$$

$$\therefore P(\text{Math}/\text{Shy}) = \frac{0.18}{0.92 \times \frac{1}{8} + 0.18}$$

$$= 0,595$$

$\therefore$ 60% chance she belong to Math group

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