# Doubles Tracking Test 2 part B <br> (37 marks 44 minutes) 

## Name:

## Teacher:

> Probability
> $\mathrm{P}\left(A^{\prime}\right)=1-\mathrm{P}(A)$
> $\mathrm{P}(A \cup B)=\mathrm{P}(A)+\mathrm{P}(B)-\mathrm{P}(A \cap B)$
> $\mathrm{P}(A \cap B)=\mathrm{P}(A) \mathrm{P}(B \mid A)$
> $\mathrm{P}(A \mid B)=\frac{\mathrm{P}(B \mid A) \mathrm{P}(A)}{\mathrm{P}(B \mid A) \mathrm{P}(A)+\mathrm{P}\left(B \mid A^{\prime}\right) \mathrm{P}\left(A^{\prime}\right)}$

For independent events $A$ and $B$

## Kinematics

For motion in a straight line with constant acceleration:
$v=u+a t$
$s=u t+\frac{1}{2} a t^{2}$
$s=v t-\frac{1}{2} a t^{2}$
$v^{2}=u^{2}+2 a s$
$s=\frac{1}{2}(u+v) t$
$\mathrm{P}(B \mid A)=\mathrm{P}(B)$
$\mathrm{P}(A \mid B)=\mathrm{P}(A)$
$\mathrm{P}(A \cap B)=\mathrm{P}(A) \mathrm{P}(B)$

1) Given that

$$
P(A)=0.35, P(B)=0.45 \text { and } P(A \cap B)=0.13
$$

Find
(a) $P\left(A^{\prime} \mid B^{\prime}\right)$

The event C has $P(C)=0.20$
The events A and C are mutually exclusive and the event B and C are independent.
(b) Find $P(B \cap C)$
(c) Draw a Venn diagram to illustrate the events $\mathrm{A}, \mathrm{B}$ and C and the probabilities for each region.
(d) Find $P\left([B \cup C]^{\prime}\right)$
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2) The mass of a piece of plutonium ( $M$ grams) after $t$ seconds is given by $M=k e^{-0.01 t}$.
a) Sketch the graph of $M$ against $t$
b) Given that the initial mass is 10 g , how long will it take to reach $25 \%$ of its original mass
3) A cricket ball is struck from a point $A$ which is 1 m above level horizontal ground with speed of $25 \mathrm{~ms}^{-1}$ at angle $30^{0}$ above the horizontal. The ball first hits the ground at point $B$. The ball is modelled as a particle moving through still air without any resistance. Take $g=9.8 \mathrm{~ms}^{-2}$.
a) Determine the horizontal distance from $A$ to $B$.
b) Calculate the speed of the ball as it reaches $B$
4)


A particle $P$ of weight 60 N is suspended by two strings from a fixed horizontal ceiling. The particle hangs in equilibrium.

The strings are light and inextensible and are inclined at $40^{\circ}$ and $20^{\circ}$ to the ceiling, as shown in the figure above.

Find the tension in each of the two strings.
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(a) $\begin{aligned} \mathrm{P}(A \cup B)=0.35+0.45-0.13 & \underline{\text { or }} 0.22+0.13+0.32 \\ & =\underline{\mathbf{0 . 6 7}}\end{aligned}$
(b) $\mathrm{P}\left(A^{\prime} \mid B^{\prime}\right)=\frac{\mathrm{P}\left(A^{\prime} \cap B^{\prime}\right)}{\mathrm{P}\left(B^{\prime}\right)}$ or $\frac{0.33}{0.55}$ $=\frac{3}{5}$ or 0.6
(c) $\mathrm{P}(B \cap C)=0.45 \times 0.2$

$$
=\underline{\mathbf{0 . 0 9}}
$$

(d)


Allow $1^{\text {st }} \mathrm{B} 1$ for 3 intersecting circles in a box with zeros in the regions for $A \cap C$
Do not accept "blank" for zero
(e) $\mathrm{P}(B \cup C)^{\prime}=0.22+\underline{0.22}$ or $1-[0.56]$ or $1-[0.13+0.23+0.09+0.11]$ o.e. $=0.44$
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| 2a |  |  | B1 exponential shape <br> B1 correct graph |
| :--- | :--- | :--- | :--- |
| 2b |  |  |  |

