<u>Doubles Tracking Test 2 part B</u> (37 marks 44 minutes)

Name:

Teacher:_____

Probability		
$\mathbf{P}(A') = 1 - \mathbf{P}(A)$		
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$		
$P(A \cap B) = P(A)P(B \mid A)$		
$P(A \mid B) = \frac{P(B \mid A)P(A)}{P(B \mid A)P(A) + P(B \mid A')P(A')}$		
For independent events A and B ,		
$P(B \mid A) = P(B)$ $P(A \mid B) = P(A)$ $P(A \cap B) = P(A) P(B)$		

Kinematics

For motion in a straight line with constant acceleration:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^{2}$$

$$s = vt - \frac{1}{2}at^{2}$$

$$v^{2} = u^{2} + 2as$$

$$s = \frac{1}{2}(u + v)t$$

1) Given that

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

Find

(a)
$$P(A'|B')$$

(4)

(2)

(4)

(2)

The event C has P(C) = 0.20

The events A and C are mutually exclusive and the event B and C are independent.

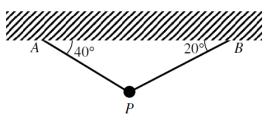
- (b) Find $P(B \cap C)$
- (c) Draw a Venn diagram to illustrate the events A, B and C and the probabilities for each region.
- (d) Find $P([B \cup C]')$

2) The mass of a piece of plutonium (M grams) after t seconds is given by $M = ke^{-0.01t}$.

a)	Sketch the graph of M against t	
b) Given tha	Given that the initial mass is 10g , how long will it take to reach 25% of its original mass	(2 marks)
5)	Given that the initial mass is rog , now long with trace to reach 25% of its original mass	(5 marks)

3) A cricket ball is struck from a point *A* which is 1m above level horizontal ground with speed of $25ms^{-1}$ 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 $g = 9.8ms^{-2}$.

a)	Determine the horizontal distance from A to B.	(5 marks)
b)	Calculate the speed of the ball as it reaches <i>B</i>	(6 marks)



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° and 20° to the ceiling, as shown in the figure above.

Find the tension in each of the two strings.

(7 marks)

(a)	$P(A \cup B) = 0.35 + 0.45 - 0.13 = \underbrace{\text{or}}_{= 0.67} 0.22 + 0.13 + 0.32$	M1 A1	(2)
(b)	$P(A' B') = \frac{P(A' \cap B')}{P(B')} \text{ or } \frac{0.33}{0.55}$	M1	(2)
	$=\frac{3}{5}$ or 0.6	A1	
(c)	$P(B \cap C) = 0.45 \times 0.2$ $= 0.09$	M1 A1	(2)
(d)	Allow 1 st B1 for 3 intersecting circles in a box with zeros in the regions for $A \cap C$ Do not accept "blank" for zero	B1 B1ft B1 B1	(2)
(e)	$P(B \cup C)' = 0.22 + 0.22$ or $1 - [0.56]$ or $1 - [0.13 + 0.23 + 0.09 + 0.11]$ o.e. = 0.44	M1 A1	(4) (2) <u>12</u>

2a		B1exponential shape
20		B1 correct graph
2b	$10 = ke^{-0.01t}$	M1 attempt to find k
	k = 10	A1 correct k
	$2.5 = 10e^{-0.01t}$	
	$\frac{\frac{1}{4}}{\frac{1}{4}} = e^{-0.01t}$ $\frac{1}{4} = e^{-0.01t}$	M1
	4	
	$\frac{1}{4} = e^{-0.01t}$	
	$t = 100 \ln 4 \text{ or } 139$	M1 A1
За	$-1 = 12.5t - 4.9t^2$	M1A1
	t = 2.628	A1
	$s = \left(\frac{25\sqrt{3}}{2}\right)2.628$	M1
	$3 - \left(\frac{1}{2}\right)^{2.020}$	
	= 57	A1
3b	v = 12.5 - 9.8(2.628)	B1 12.5
00	= -13.25	M1A1
	$(25\sqrt{3})^{2}$	
	$V^2 = (-13.75)^2 + \left(\frac{25\sqrt{3}}{2}\right)^2$	M1A1
	V = 25	
		A1
4		M1 Resolving
	$60 = T_1 \sin 40 + T_2 \sin 20$	M1A1
	$T_1 \cos 40 = T_2 \cos 20$	M1A1
	$T_1 = 53$	M1A1
	$T_2 = 65$	