Statistics 9 – Conditional Probability

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please complete all questions.

1. An object is dropped from a height of 4 metres above ground level. Calculate
   (a) The time it takes to reach the ground,
   (b) The speed with which it hits the ground.

2. A car starts from rest and accelerates at a constant rate of $2ms^{-2}$. Calculate
   (a) Its speed after 3 seconds,
   (b) The distance it travels during the third second of its motion.

3. A car is travelling at $30ms^{-1}$ along a street which has a series of lampposts 100m apart. As it passes one post the brakes are applied, giving a constant deceleration of $4.8ms^{-2}$. Will it come to rest before reaching the next lamppost? How far before or after the next post does it stop? Write down a possible reason why your answer may not be accurate.

4. Two stones are simultaneously projected vertically from a point 8 metres above the ground. The first is projected upwards with initial speed of $10ms^{-1}$ whilst the second is projected downwards at $5\ ms^{-1}$. Find the length of time between the first stone and the second stone hitting the floor.

5. A particle is travelling with constant acceleration along a straight line. It passes a point A and then after 5 seconds passes a second point, B, 50 metres away. After a further 10 seconds it passes a third point C. If the distance BC = 160 metres find the speed of the particle at A and at C.

Section 2 – Consolidation of this week's topic. Please complete all questions.

1. The two-way table shows the favourite sports of 100 students in a college

	Football	Rugby	Cricket	Golf	Total
Female	21	11	10	8	50
Male	24	6	13	7	50
Total	45	17	23	15	100

A student is chosen at random. What is the probability that the student
(a) prefers golf   (2)
(b) is male   (2)
(c) prefers football, given that they are female   (2)
(d) is male, given that they prefer cricket?   (2)

$(\boldsymbol{8\ \ marks})$

2. A group of 120 students in year 12 and year 13 at a college were asked how they generally travelled to college – all of them either came by car, by train or walked. Of the 70 year 12 student asked, 25 came by car and 30 walked. 60 students in total came by car and 40 students in total walked.

Complete a two-way table to show this information. (3)

If a student is selected at random, find the following probabilities:
(a) P(train) (2)
(b) P(Year 12|car) (2)
(c) P(car|Year 12) (2)
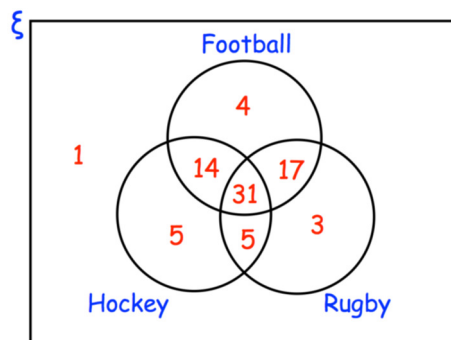(d) P(Year 13|not train) (2)

(**11 marks**)

3. The events A and B are independent, with $P(A) = \frac{1}{2}$ and $P(A \cup B) = \frac{2}{3}$.
Find
(a) $P(B)$ (4)
(b) $P(A|B)$ (2)
(c) $P(B'|A)$ (2)

(**8 marks**)

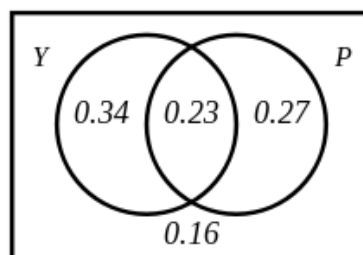**4.** The diagram below shows the numbers of people in a survey who enjoyed particular sports.

If a person is selected at random, what is the probability that they
(a) enjoy football, (2)
(b) enjoy both hockey and rugby, (2)
(c) enjoy hockey, given that they enjoy football, (2)
(d) do **not** enjoy football, given that they enjoy rugby, (2)
(e) do not enjoy football, given that they do not enjoy hockey? (2)

(**10 marks**)

5. The diagram below shows the probabilities for two events *Y* and *P*.
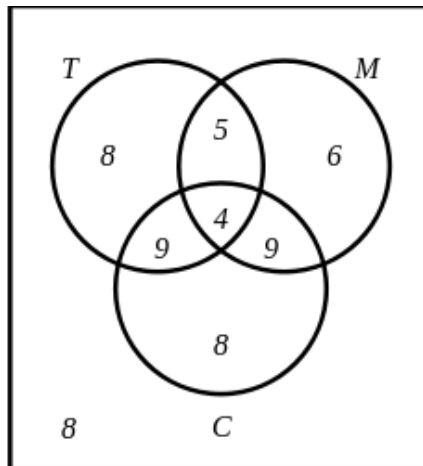

Write down the probability of
(a) $P(Y \cap P)$ (2)
(b) $P(P')$ (2)
(c) $P(P'|Y')$ (2)
(d) $P(Y'|P \cup Y)$ (2)

(**8 marks**)

6. The diagram below shows the number of people who like milk (M), tea (T) and coffee (C) in a survey.

For a randomly selected person, write down the probability of
(a) $P(T' \cap M')$ (2)
(b) $P(C \cup T)$ (2)
(c) $P(M'|C)$ (2)
(d) $P(T'|M \cup C)$ (2)
(e) $P(C|M' \cup T')$ (2)

$$(10 \ \ marks)$$

Total 55 marks

Section 3 – Extension question. If you are aiming for a top grade, you should attempt this question.

Exam Question June 2001

State in words the relationship between the two events A and B when

(a) $P(A \cap B) = P(A) \times P(B)$
(b) $P(A \cap B) = 0$

Given that $P(A) = \frac{1}{4}, P(B) = \frac{1}{3}, P(A \cap B') = \frac{1}{4}$, find
(c) The relationship between A and B,
(d) $P(A|B)$,
(e) $P(A' \cap B')$