Probability – Tables & Tree Diagrams

1. Non Calculator. In a survey, 100 students were asked 'do you prefer to watch television or play sport?' Of the 46 boys in the survey, 33 said they would choose sport, while 29 girls made this choice.

	Boys	Girls	Total
Television			
Sport	33	29	
Total	46		100

By completing this table or otherwise, find the probability that

(a) a student selected at random prefers to watch television;

(b) a student prefers to watch television, given that the student is a boy.

(Total 4 marks)

2. Non Calculator. In a survey of 200 people, 90 of whom were female, it was found that 60 people were unemployed, including 20 males.

(a) Using this information, complete the table below.

	Males	Females	Totals
Unemployed			
Employed			
Totals			200

(b) If a person is selected at random from this group of 200, find the probability that this person is

(i) an unemployed female;

(ii) a male, given that the person is employed.

(Total 4 marks)

3. The table below shows the subjects studied by 210 students at a college.

	Year 1	Year 2	Totals
History	50	35	85
Science	15	30	45
Art	45	35	80
Totals	110	100	210

(a) A student from the college is selected at random.
Let A be the event the student studies Art.
Let B be the event the student is in Year 2.
(i) Find $P(A)$.
(ii) Find the probability that the student is a Year 2 Art student.
(iii) Are the events A and B independent? Justify your answer.

(6)

(b) Given that a History student is selected at random, calculate the probability that the student is in Year 1.

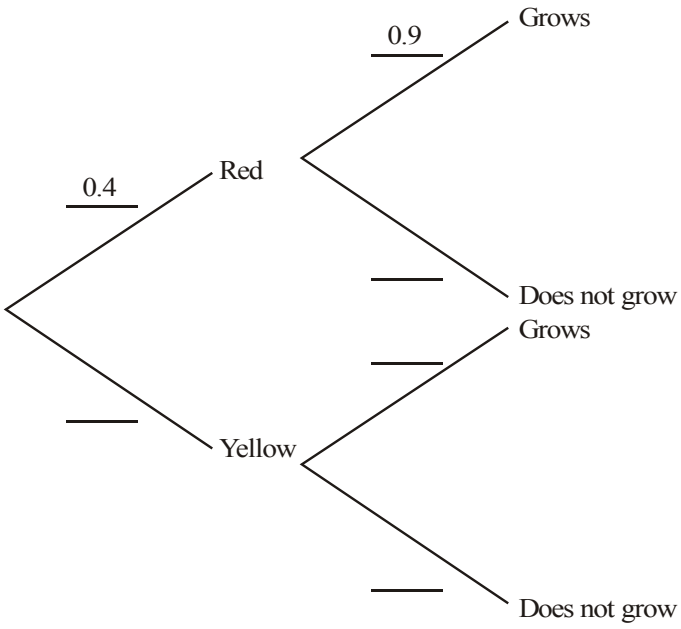
(2)

(c) Two students are selected at random from the college. Calculate the probability that one student is in Year 1, and the other in Year 2.

(4)
(Total 12 marks)

4. A packet of seeds contains 40 % red seeds and 60 % yellow seeds. The probability that a red seed grows is 0.9, and that a yellow seed grows is 0.8. A seed is chosen at random from the packet.

(a) Complete the probability tree diagram below.



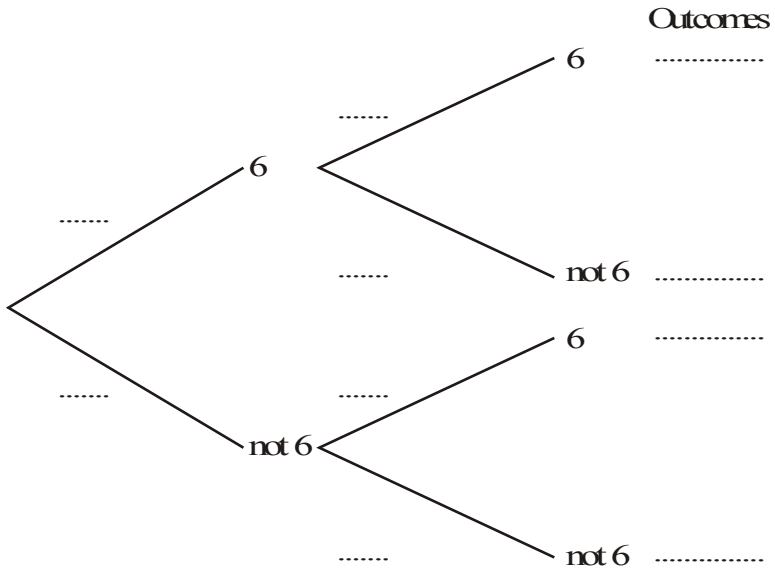
(3)

(b) (i) Calculate the probability that the chosen seed is red and grows.
(ii) Calculate the probability that the chosen seed grows.
(iii) Given that the seed grows, calculate the probability that it is red.

(7)
(Total 10 marks)

5. Non Calculator. Two ordinary, 6-sided dice are rolled and the total score is noted.

(a) Complete the tree diagram by entering probabilities and listing outcomes.



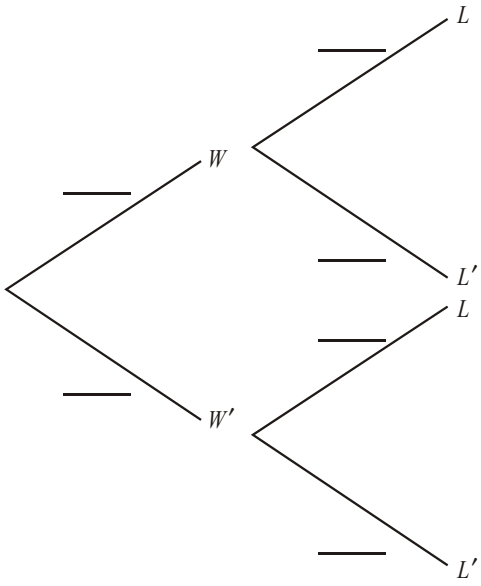
(b) Find the probability of getting one or more sixes.

(Total 4 marks)

6. Dumisani is a student at IB World College. The probability that he will be woken by his alarm clock is $\frac{7}{8}$. If he is woken by his alarm clock the probability he will be late for school is $\frac{1}{4}$. If he is not woken by his alarm clock the probability he will be late for school is $\frac{3}{5}$.

Let W be the event "Dumisani is woken by his alarm" and L be the event "Dumisani is late".

(a) Copy and complete the tree diagram below.



(4)

(b) Calculate the probability that Dumisani will be late for school.

(3)

(c) Given that Dumisani is late for school what is the probability that he was woken by his alarm clock?

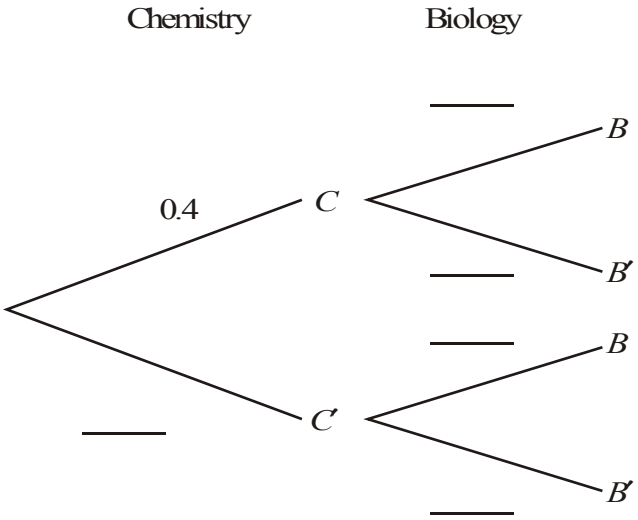
(4)

(Total 11 marks)

7. The events B and C are dependent, where C is the event "a student takes Chemistry", and B is the event "a student takes Biology". It is known that

$$P(C) = 0.4,\ P(B \mid C) = 0.6,\ P(B \mid C') = 0.5.$$

(a) Complete the following tree diagram.



(b) Calculate the probability that a student takes Biology.

(c) Given that a student takes Biology, what is the probability that the student takes Chemistry?

(Total 4 marks)

8. Non Calculator. A painter has 12 tins of paint. Seven tins are red and five tins are yellow. Two tins are chosen at random. Calculate the probability that both tins are the same colour.

(Total 6 marks)

9. A box contains 22 red apples and 3 green apples. Three apples are selected at random, one after the other, without replacement.

(a) The first two apples are green. What is the probability that the third apple is red?

(b) What is the probability that exactly two of the three apples are green?

(Total 6 marks)

10. A bag contains 10 red balls, 10 green balls and 6 white balls. Two balls are drawn at random from the bag without replacement. What is the probability that they are of different colours?

(Total 4 marks)

11. Bag A contains 2 red balls and 3 green balls. Two balls are chosen at random from the bag without replacement. Let X denote the number of red balls chosen. The following table shows the probability distribution for X

X	0	1	2
$P(X = x)$	$\frac{3}{10}$	$\frac{6}{10}$	$\frac{1}{10}$

(a) Calculate E(X), the mean number of red balls chosen.

(3)

Bag B contains 4 red balls and 2 green balls. Two balls are chosen at random from bag B.

(b) (i) Draw a tree diagram to represent the above information, including the probability of each event.

(ii) Hence find the probability distribution for Y, where Y is the number of red balls chosen.

(8)

A standard die with six faces is rolled. If a 1 or 6 is obtained, two balls are chosen from bag A, otherwise two balls are chosen from bag B.

(c) Calculate the probability that two red balls are chosen.

(5)

(d) Given that two red balls are obtained, find the conditional probability that a 1 or 6 was rolled on the die.

(3)

(Total 19 marks)