

Write your name here	
Surname	Other names
Pearson Edexcel GCE	Centre Number Candidate Number
A level Mathematics Practice Paper Statistics – Probability	
You must have: Mathematical Formulae and Statistical Tables (Pink)	Total Marks

Instructions

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all the questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided – there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.
- There are 14 questions in this question paper. The total mark for this paper is 150.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Calculators must not be used for questions marked with a * sign.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

1. (a) State in words the relationship between two events R and S when $P(R \cap S) = 0$. (1)

The events A and B are independent with $P(A) = \frac{1}{4}$ and $P(A \cup B) = \frac{2}{3}$.

Find

- (b) $P(B)$, (4)

- (c) $P(A' \cap B)$, (2)

- (d) $P(B' | A)$. (2)

(Total 9 marks)

2. A college has 80 students in Year 12.

20 students study Biology.

28 students study Chemistry.

30 students study Physics.

7 students study both Biology and Chemistry.

11 students study both Chemistry and Physics.

5 students study both Physics and Biology.

3 students study all 3 of these subjects.

- (a) Draw a Venn diagram to represent this information. (5)

A Year 12 student at the college is selected at random.

- (b) Find the probability that the student studies Chemistry but not Biology or Physics. (1)

- (c) Find the probability that the student studies Chemistry or Physics or both. (2)

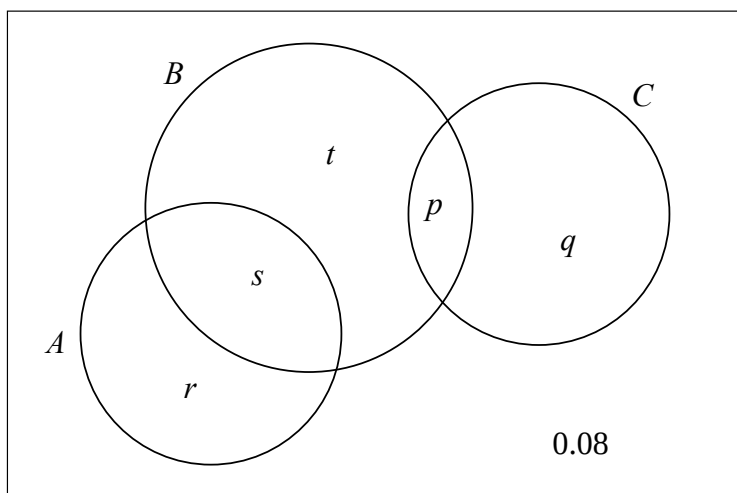
Given that the student studies Chemistry or Physics or both,

- (d) find the probability that the student does not study Biology. (2)

- (e) Determine whether studying Biology and studying Chemistry are statistically independent. (3)

(Total 13 marks)

3. The Venn diagram shows three events A , B and C , where p , q , r , s and t are probabilities.



$P(A) = 0.5$, $P(B) = 0.6$ and $P(C) = 0.25$ and the events B and C are independent.

- (a) Find the value of p and the value of q . (2)
- (b) Find the value of r . (2)
- (c) Hence write down the value of s and the value of t . (2)
- (d) State, giving a reason, whether or not the events A and B are independent. (2)
- (e) Find $P(B | A \cap C)$. (3)

(Total 11 marks)

4. In a company the 200 employees are classified as full-time workers, part-time workers or contractors.

The table below shows the number of employees in each category and whether they walk to work or use some form of transport.

	Walk	Transport
Full-time worker	2	8
Part-time worker	35	75
Contractor	30	50

The events F , H and C are that an employee is a full-time worker, part-time worker or contractor respectively. Let W be the event that an employee walks to work.

An employee is selected at random.

Find

(a) $P(H)$ (2)

(b) $P([F \cap W]')$ (2)

(c) $P(W|C)$ (2)

Let B be the event that an employee uses the bus.

Given that 10% of full-time workers use the bus, 30% of part-time workers use the bus and 20% of contractors use the bus,

(d) draw a Venn diagram to represent the events F , H , C and B , (4)

(e) find the probability that a randomly selected employee uses the bus to travel to work. (2)

(Total 12 marks)

5. A and B are two events such that

$$P(B) = \frac{1}{2} \qquad P(A | B) = \frac{2}{5} \qquad P(A \cup B) = \frac{13}{20}$$

- (a) Find $P(A \cap B)$. (2)
- (b) Draw a Venn diagram to show the events A , B and all the associated probabilities. (3)
- Find
- (c) $P(A)$ (1)
- (d) $P(B | A)$ (2)
- (e) $P(A' \cap B)$ (1)

(Total 9 marks)

6. In a factory, three machines, J , K and L , are used to make biscuits.

Machine J makes 25% of the biscuits.

Machine K makes 45% of the biscuits.

The rest of the biscuits are made by machine L .

It is known that 2% of the biscuits made by machine J are broken, 3% of the biscuits made by machine K are broken and 5% of the biscuits made by machine L are broken.

- (a) Draw a tree diagram to illustrate all the possible outcomes and associated probabilities. (2)

A biscuit is selected at random.

- (b) Calculate the probability that the biscuit is made by machine J and is not broken. (2)
- (c) Calculate the probability that the biscuit is broken. (2)
- (d) Given that the biscuit is broken, find the probability that it was not made by machine K . (3)

(Total 9 marks)

7.

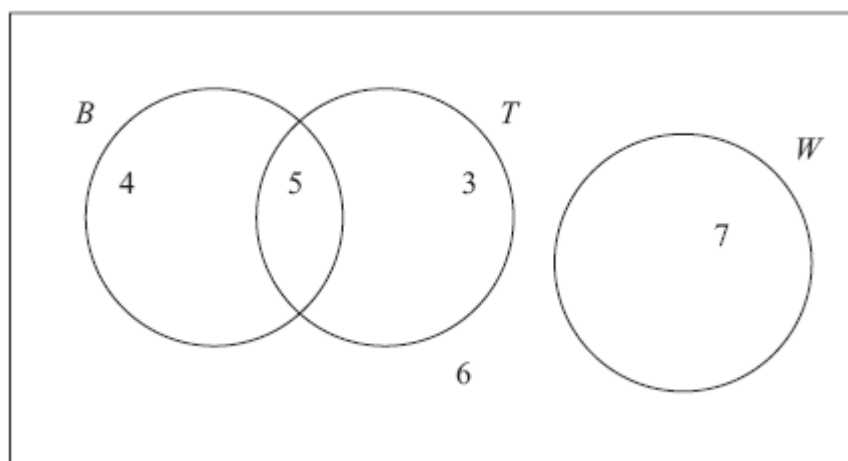


Figure 1

Figure 1 shows how 25 people travelled to work.

Their travel to work is represented by the events

B bicycle

T train

W walk

(a) Write down 2 of these events that are mutually exclusive. Give a reason for your answer. (2)

(b) Determine whether or not B and T are independent events. (3)

One person is chosen at random.

Find the probability that this person

(c) walks to work, (1)

(d) travels to work by bicycle and train. (1)

Given that this person travels to work by bicycle,

(e) find the probability that they will also take the train. (2)

(Total 9 marks)

8.

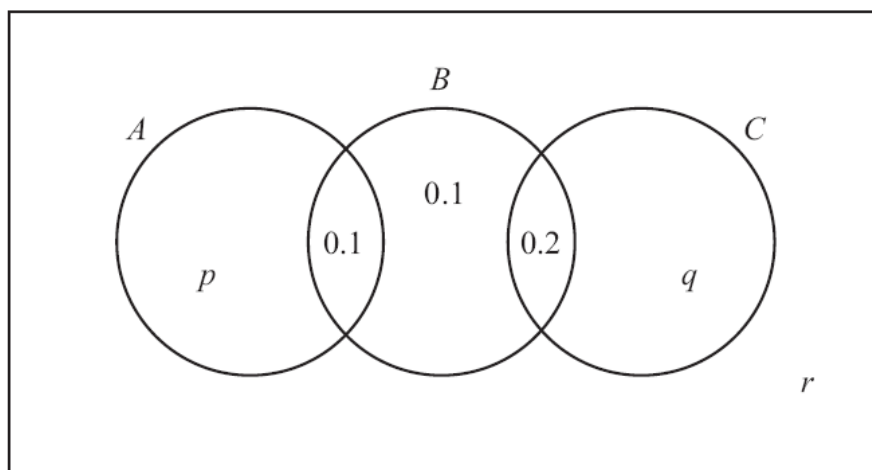


Figure 1

The Venn diagram in Figure 1 shows three events A , B and C and the probabilities associated with each region of B . The constants p , q and r each represent probabilities associated with the three separate regions outside B .

The events A and B are independent.

(a) Find the value of p . (3)

Given that $P(B|C) = \frac{5}{11}$,

(b) find the value of q and the value of r . (4)

(c) Find $P(A \cup C | B)$. (2)

(Total 9 marks)

9. Jake and Kamil are sometimes late for school.

The events J and K are defined as follows

J = the event that Jake is late for school,
 K = the event that Kamil is late for school.

$$P(J) = 0.25, P(J \cap K) = 0.15 \text{ and } P(J' \cap K') = 0.7.$$

On a randomly selected day, find the probability that

(a) at least one of Jake or Kamil are late for school, (1)

(b) Kamil is late for school. (2)

Given that Jake is late for school,

(c) find the probability that Kamil is late. (3)

The teacher suspects that Jake being late for school and Kamil being late for school are linked in some way.

(d) Determine whether or not J and K are statistically independent. (2)

(e) Comment on the teacher's suspicion in the light of your calculation in part (d). (1)

(Total 9 marks)

10. The following shows the results of a survey on the types of exercise taken by a group of 100 people.

65 run
48 swim
60 cycle
40 run and swim
30 swim and cycle
35 run and cycle
25 do all three

- (a) Draw a Venn Diagram to represent these data. (4)

Find the probability that a randomly selected person from the survey

- (b) takes none of these types of exercise, (2)

- (c) swims but does not run, (2)

- (d) takes at least two of these types of exercise. (2)

Jason is one of the above group.

Given that Jason runs,

- (e) find the probability that he swims but does not cycle. (3)

(Total 13 marks)

11. A manufacturer carried out a survey of the defects in their soft toys. It is found that the probability of a toy having poor stitching is 0.03 and that a toy with poor stitching has a probability of 0.7 of splitting open. A toy without poor stitching has a probability of 0.02 of splitting open.

(a) Draw a tree diagram to represent this information. (3)

(b) Find the probability that a randomly chosen soft toy has exactly one of the two defects, poor stitching or splitting open. (3)

The manufacturer also finds that soft toys can become faded with probability 0.05 and that this defect is independent of poor stitching or splitting open. A soft toy is chosen at random.

(c) Find the probability that the soft toy has none of these 3 defects. (2)

(d) Find the probability that the soft toy has exactly one of these 3 defects. (4)

(Total 12 marks)

12. The bag P contains 6 balls of which 3 are red and 3 are yellow.

The bag Q contains 7 balls of which 4 are red and 3 are yellow.

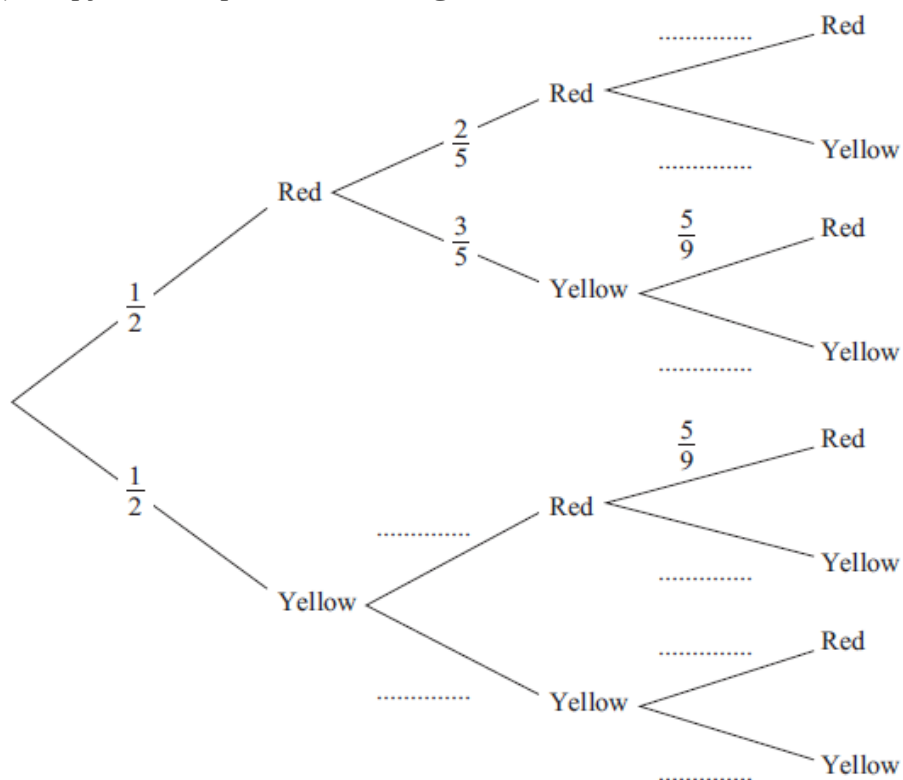
A ball is drawn at random from bag P and placed in bag Q . A second ball is drawn at random from bag P and placed in bag Q .

A third ball is then drawn at random from the 9 balls in bag Q .

The event A occurs when the 2 balls drawn from bag P are of the same colour.

The event B occurs when the ball drawn from bag Q is red.

- (a) Copy and complete the tree diagram shown below.



(4)

- (b) Find $P(A)$.

(3)

- (c) Show that $P(B) = \frac{5}{9}$.

(3)

- (d) Show that $P(A \cap B) = \frac{2}{9}$.

(2)

- (e) Hence find $P(A \cup B)$.

(2)

- (f) Given that all three balls drawn are the same colour, find the probability that they are all red.

(3)

(Total 10 marks)

13. In a large company,

78% of employees are car owners,
30% of these car owners are also bike owners,
85% of those who are not car owners are bike owners.

(a) Draw a tree diagram to represent this information.

(3)

An employee is selected at random.

(b) Find the probability that the employee is a car owner or a bike owner but not both.

(2)

Another employee is selected at random.

Given that this employee is a bike owner,

(c) find the probability that the employee is a car owner.

(3)

Two employees are selected at random.

(d) Find the probability that only one of them is a bike owner.

(3)

(Total 11 marks)

14. For the events A and B ,

$$P(A' \cap B) = 0.22 \quad \text{and} \quad P(A' \cap B') = 0.18$$

(a) Find $P(A)$.

(1)

(b) Find $P(A \cup B)$.

(1)

Given that $P(A | B) = 0.6$,

(c) find $P(A \cap B)$.

(3)

(d) Determine whether or not A and B are independent.

(2)

(Total 7 marks)

TOTAL FOR PAPER: 150 MARKS