

Edexcel Maths S1

Topic Questions from Papers

Probability

7. In a school there are 148 students in Years 12 and 13 studying Science, Humanities or Arts subjects. Of these students, 89 wear glasses and the others do not. There are 30 Science students of whom 18 wear glasses. The corresponding figures for the Humanities students are 68 and 44 respectively.

A student is chosen at random.

Find the probability that this student

(a) is studying Arts subjects, (4)

(b) does not wear glasses, given that the student is studying Arts subjects. (2)

Amongst the Science students, 80% are right-handed. Corresponding percentages for Humanities and Arts students are 75% and 70% respectively.

A student is again chosen at random.

(c) Find the probability that this student is right-handed. (3)

(d) Given that this student is right-handed, find the probability that the student is studying Science subjects. (3)



6. A group of 100 people produced the following information relating to three attributes. The attributes were wearing glasses, being left handed and having dark hair. Glasses were worn by 36 people, 28 were left handed and 36 had dark hair. There were 17 who wore glasses and were left handed, 19 who wore glasses and had dark hair and 15 who were left handed and had dark hair. Only 10 people wore glasses, were left handed and had dark hair.

(a) Represent these data on a Venn diagram.

(6)

A person was selected at random from this group.

Find the probability that this person

(b) wore glasses but was not left handed and did not have dark hair,

(1)

(c) did not wear glasses, was not left handed and did not have dark hair,

(1)

(d) had only two of the attributes,

(2)

(e) wore glasses given that they were left handed and had dark hair.

(3)



2. In a factory, machines A , B and C are all producing metal rods of the same length. Machine A produces 35% of the rods, machine B produces 25% and the rest are produced by machine C . Of their production of rods, machines A , B and C produce 3%, 6% and 5% defective rods respectively.
- (a) Draw a tree diagram to represent this information. (3)
- (b) Find the probability that a randomly selected rod is
- (i) produced by machine A and is defective,
 - (ii) is defective. (5)
- (c) Given that a randomly selected rod is defective, find the probability that it was produced by machine C . (3)



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Question 4 continued

Q4

(Total 9 marks)



5. The following shows the results of a wine tasting survey of 100 people.

- 96 like wine *A*,
- 93 like wine *B*,
- 96 like wine *C*,
- 92 like *A* and *B*,
- 91 like *B* and *C*,
- 93 like *A* and *C*,
- 90 like all three wines.

(a) Draw a Venn Diagram to represent these data. (6)

Find the probability that a randomly selected person from the survey likes

(b) none of the three wines, (1)

(c) wine *A* but not wine *B*, (2)

(d) any wine in the survey except wine *C*, (2)

(e) exactly two of the three kinds of wine. (2)

Given that a person from the survey likes wine *A*,

(f) find the probability that the person likes wine *C*. (3)



7. Tetrahedral dice have four faces. Two fair tetrahedral dice, one red and one blue, have faces numbered 0, 1, 2, and 3 respectively. The dice are rolled and the numbers face down on the two dice are recorded. The random variable R is the score on the red die and the random variable B is the score on the blue die.

(a) Find $P(R=3 \text{ and } B=0)$. (2)

The random variable T is R multiplied by B .

(b) Complete the diagram below to represent the sample space that shows all the possible values of T .

3					
2		2			
1	0				
0					
<i>B</i>	<i>R</i>	0	1	2	3

Sample space diagram of T (3)

(c) The table below represents the probability distribution of the random variable T .

<i>t</i>	0	1	2	3	4	6	9
$P(T=t)$	<i>a</i>	<i>b</i>	1/8	1/8	<i>c</i>	1/8	<i>d</i>

Find the values of a , b , c and d . (3)

Find the values of

(d) $E(T)$, (2)

(e) $\text{Var}(T)$. (4)



1. A disease is known to be present in 2% of a population. A test is developed to help determine whether or not someone has the disease.

Given that a person has the disease, the test is positive with probability 0.95

Given that a person does not have the disease, the test is positive with probability 0.03

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

(3)

A person is selected at random from the population and tested for this disease.

- (b) Find the probability that the test is positive.

(3)

A doctor randomly selects a person from the population and tests him for the disease. Given that the test is positive,

- (c) find the probability that he does not have the disease.

(2)

- (d) Comment on the usefulness of this test.

(1)



1. A jar contains 2 red, 1 blue and 1 green bead. Two beads are drawn at random from the jar without replacement.
- (a) In the space below, draw a tree diagram to illustrate all the possible outcomes and associated probabilities. State your probabilities clearly. (3)
- (b) Find the probability that a blue bead and a green bead are drawn from the jar. (2)



4. There are 180 students at a college following a general course in computing. Students on this course can choose to take up to three extra options.

112 take systems support,
70 take developing software,
81 take networking,
35 take developing software and systems support,
28 take networking and developing software,
40 take systems support and networking,
4 take all three extra options.

- (a) In the space below, draw a Venn diagram to represent this information. (5)

A student from the course is chosen at random.

Find the probability that this student takes

- (b) none of the three extra options, (1)
- (c) networking only. (1)

Students who want to become technicians take systems support and networking. Given that a randomly chosen student wants to become a technician,

- (d) find the probability that this student takes all three extra options. (2)

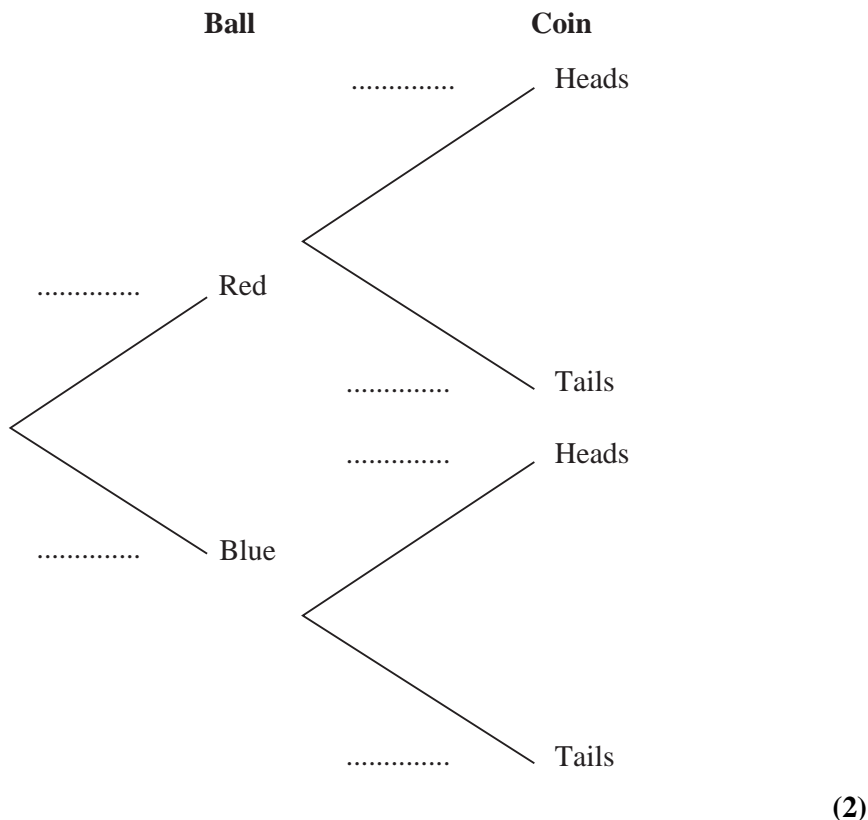


- 2. An experiment consists of selecting a ball from a bag and spinning a coin. The bag contains 5 red balls and 7 blue balls. A ball is selected at random from the bag, its colour is noted and then the ball is returned to the bag.

When a red ball is selected, a biased coin with probability $\frac{2}{3}$ of landing heads is spun.

When a blue ball is selected a fair coin is spun.

- (a) Complete the tree diagram below to show the possible outcomes and associated probabilities.



Shivani selects a ball and spins the appropriate coin.

- (b) Find the probability that she obtains a head. **(2)**

Given that Tom selected a ball at random and obtained a head when he spun the appropriate coin,

- (c) find the probability that Tom selected a red ball. **(3)**

Shivani and Tom each repeat this experiment.

- (d) Find the probability that the colour of the ball Shivani selects is the same as the colour of the ball Tom selects. **(3)**



4. The Venn diagram in Figure 1 shows the number of students in a class who read any of 3 popular magazines A , B and C .

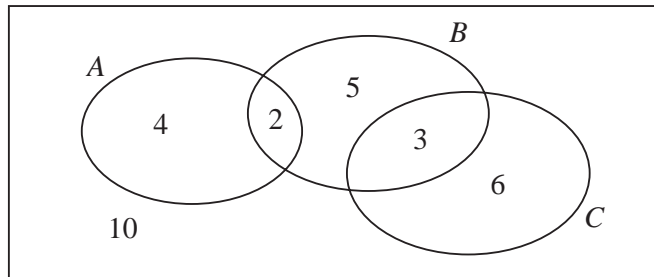


Figure 1

One of these students is selected at random.

- (a) Show that the probability that the student reads more than one magazine is $\frac{1}{6}$. (2)
- (b) Find the probability that the student reads A or B (or both). (2)
- (c) Write down the probability that the student reads both A and C . (1)

Given that the student reads at least one of the magazines,

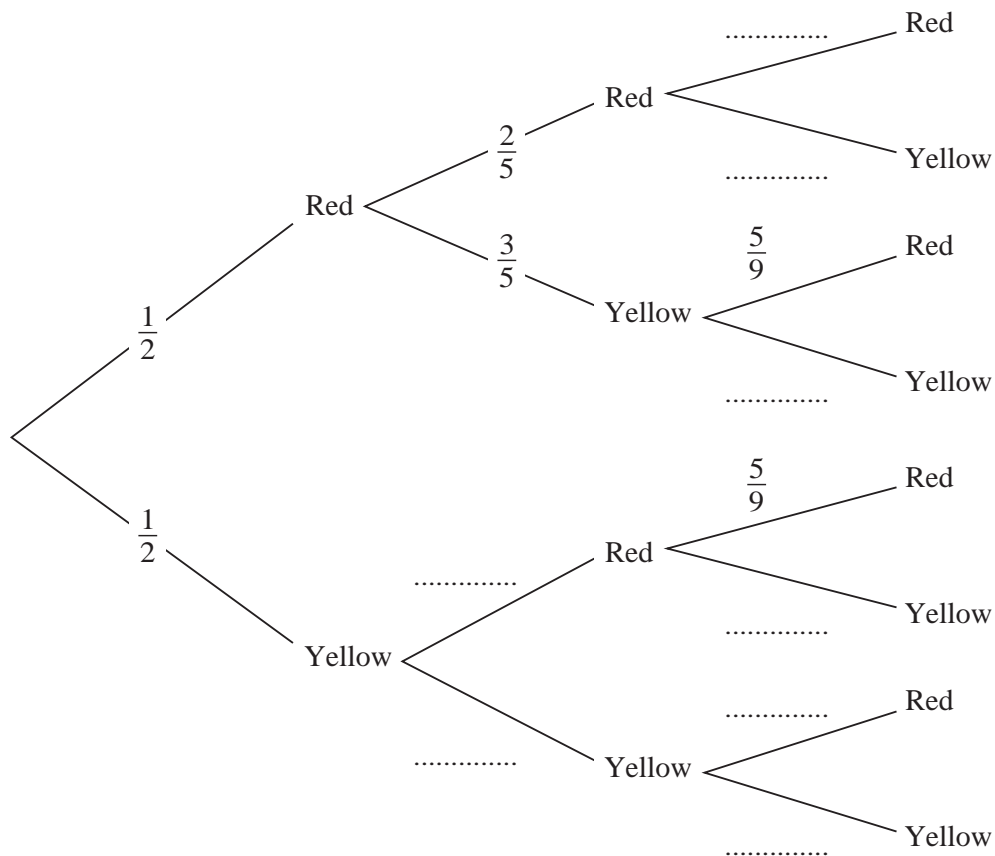
- (d) find the probability that the student reads C . (2)
- (e) Determine whether or not reading magazine B and reading magazine C are statistically independent. (3)



7. 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) 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)



- 6. 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

$P(J) = 0.25, P(J \cap K) = 0.15$ 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 (d). **(1)**



8. A spinner is designed so that the score S is given by the following probability distribution.

s	0	1	2	4	5
$P(S = s)$	p	0.25	0.25	0.20	0.20

(a) Find the value of p . (2)

(b) Find $E(S)$. (2)

(c) Show that $E(S^2) = 9.45$ (2)

(d) Find $\text{Var}(S)$. (2)

Tom and Jess play a game with this spinner. The spinner is spun repeatedly and S counters are awarded on the outcome of each spin. If S is even then Tom receives the counters and if S is odd then Jess receives them. The first player to collect 10 or more counters is the winner.

(e) Find the probability that Jess wins after 2 spins. (2)

(f) Find the probability that Tom wins after exactly 3 spins. (4)

(g) Find the probability that Jess wins after exactly 3 spins. (3)



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Question 8 continued

Lined area for writing the answer to Question 8.

Q8

(Total 17 marks)

TOTAL FOR PAPER: 75 MARKS

END



1. The histogram in Figure 1 shows the time, to the nearest minute, that a random sample of 100 motorists were delayed by roadworks on a stretch of motorway.

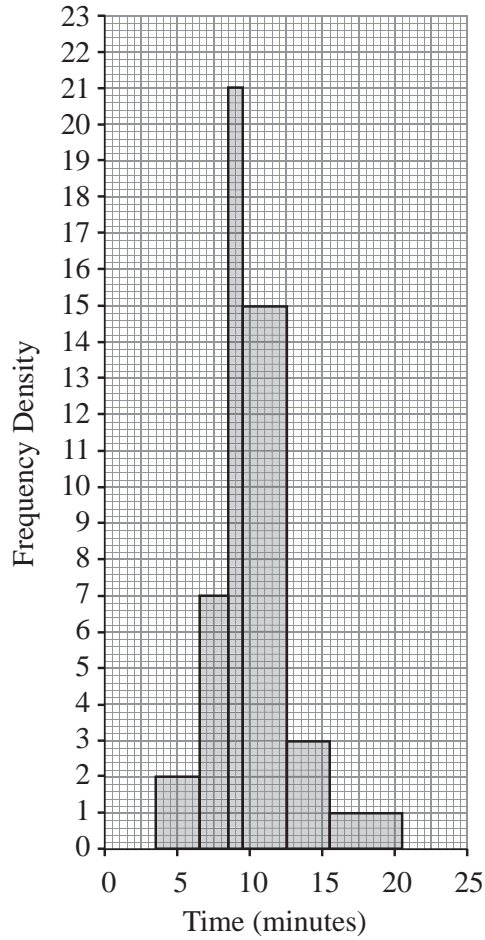


Figure 1

- (a) Complete the table.

Delay (minutes)	Number of motorists
4 – 6	6
7 – 8	
9	21
10 – 12	45
13 – 15	9
16 – 20	

(2)

- (b) Estimate the number of motorists who were delayed between 8.5 and 13.5 minutes by the roadworks.

(2)



6. 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)



4.

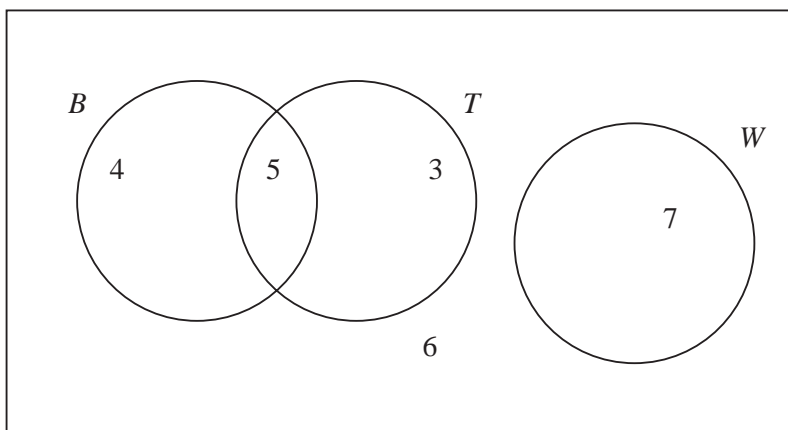


Figure 1

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)

(e) Given that this person travels to work by bicycle, find the probability that they will also take the train. (2)



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6.

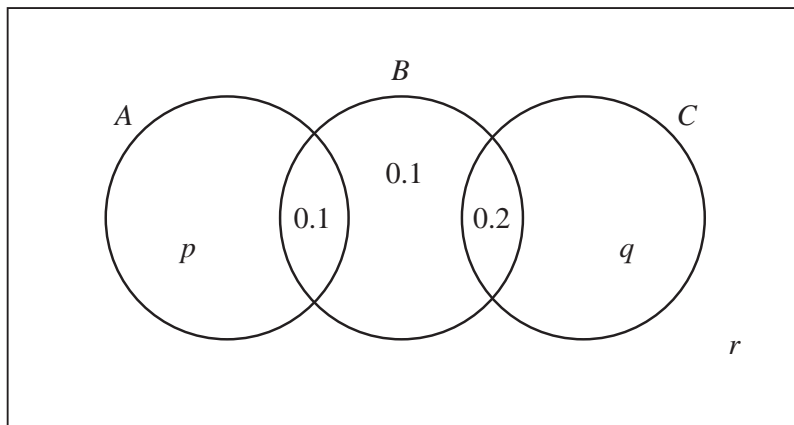


Figure 1

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)



3. 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)



