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INTERNATIONAL A LEVEL MATHEMATICS • STATISTICS 1

Statistics 1

Exam Questions by Topic

Pearson Edexcel International Advanced Level (WST01/01) • Calculator and Statistical Tables allowed

Multi-step exam questions at the difficulty of the real WST01 paper, with a full mark scheme

Chapters (tap a chapter to jump to it)	Qs	Marks	Page	My score
1 Mathematical Modelling Not examined on its own: modelling ideas are tested within Chapters 2 to 7	—	—	Not applicable	
2 Measures of Location and Spread Averages, quartiles, interpolation, standard deviation, coding	10	83	own PDF	
3 Representations of Data Histograms, stem and leaf, box plots, outliers, skewness, comparisons	10	80	own PDF	
4 Probability Venn and tree diagrams, conditional probability, independence	10	80	2	
5 Correlation and Regression PMCC, least squares regression, interpretation, coding	10	84	own PDF	
6 Discrete Random Variables Probability and cumulative distributions, $E(X)$, $\text{Var}(X)$, uniform	10	82	own PDF	
7 The Normal Distribution Standardising, tables, finding μ and σ , conditional problems	10	83	own PDF	

[Full mark scheme](#)

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CHAPTER 4 • KEY SKILLS

Probability

Specification S1: probability • 10 questions • 80 marks • about 95 minutes

1 Venn diagrams

Fill from the middle outwards. Every region needs a value, including 0 and the region outside all sets.

2 The addition rule

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

3 Mutually exclusive

A and B cannot both happen:

$$P(A \cap B) = 0, \text{ so } P(A \cup B) = P(A) + P(B)$$

4 Independence

$P(A \cap B) = P(A)P(B)$, or $P(A|B) = P(A)$.
Show the numbers when testing it.

5 Conditional probability

$P(A|B) = \frac{P(A \cap B)}{P(B)}$: restrict to B , then
find the part that is also A .

6 Tree diagrams

Multiply along branches, add across outcomes. Complete every branch before you start.

7 Reverse conditionals

$P(\text{first} | \text{second}) = \frac{P(\text{both})}{P(\text{second})}$, adding
every route to the second event.

8 Sequences of trials

“Wins on the 2nd turn” needs every earlier failure: a product of several probabilities. Without replacement, change the numbers.

9 Equations for unknown regions

Write each given probability as a sum of regions; independence gives a product. Solve simultaneously and check that $0 \leq p \leq 1$.

Skills map every skill above is tested at least once; interleaved skills come from GCSE or other chapters

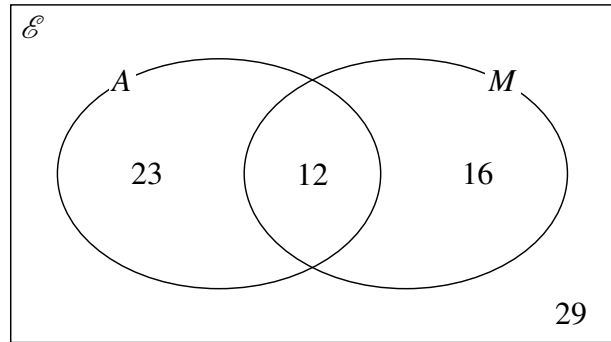
Skill	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Marks	5	5	5	5	5	11	11	10	11	12
1 Venn diagrams	•				•	•		•	•	
2 The addition rule		•		•	•	•			•	
3 Mutually exclusive						•				
4 Independence	•	•		•	•	•		•	•	•
5 Conditional probability	•					•	•		•	•
6 Tree diagrams			•				•			•
7 Reverse conditionals							•			•
8 Sequences of trials			•				•			•
9 Equations for unknown regions				•	•	•		•	•	•
Interleaved: quadratic equations (P1)				•	•					
Interleaved: linear and simultaneous equations (P1)						•		•	•	•
Interleaved: frequencies and counts (Chapters 2, 3)	•							•		

Exam difficulty. Questions 1 to 5 check each skill on its own. Questions 6 to 10 are multi-part questions built like the 11 to 14 mark questions on a real WST01 paper, where one part leads into the next and skills are combined.

Must learn. Never assume independence unless you are told it or have shown it. Label every probability you find, e.g. $P(A \cap B) = 0.21$, and give exact answers where they are simple fractions.



1.

**Figure 1**

The Venn diagram in Figure 1 shows the numbers of students in a group of 80 who study Art, A , and who study Music, M .

A student is chosen at random from the group.

- (a) Find the probability that the student studies neither Art nor Music. (1)
- (b) Given that the student studies Music, find the probability that the student also studies Art. (2)
- (c) Showing your working, determine whether the events A and M are independent. (2)



Question 1 continued

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(Total for Question 1 is 5 marks)



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2. The events A and B are such that $P(A) = 0.4$, $P(B) = 0.35$ and $P(A \cup B) = 0.61$

(a) Find $P(A \cap B)$

(2)

(b) Show that A and B are independent.

(2)

(c) Find $P(A' \cap B)$

(1)

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Question 2 continued

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(Total for Question 2 is 5 marks)



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3. A bag contains 5 red counters and 3 blue counters. Two counters are taken at random from the bag, one after the other, without replacement.

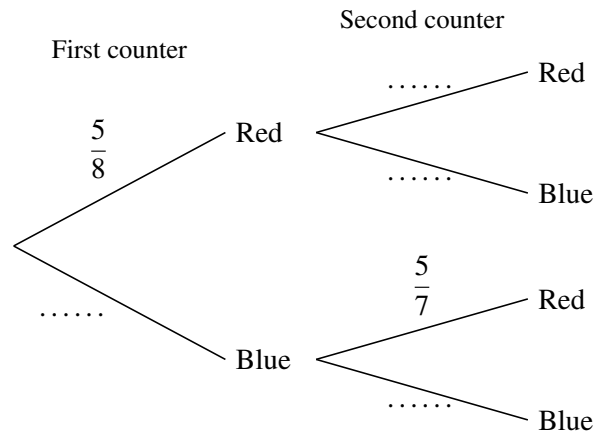


Figure 2

- (a) Complete the tree diagram in Figure 2.

(2)

- (b) Find the probability that both counters are the same colour.

(2)

- (c) Find the probability that at least one counter is blue.

(1)



Question 3 continued

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4. The events A and B are independent, with $P(A) = 3P(B)$ and $P(A \cup B) = 0.68$

Let $P(B) = p$

- (a) Show that $3p^2 - 4p + 0.68 = 0$

(2)

- (b) Hence find $P(B)$, explaining why one solution of the equation must be rejected.

(2)

- (c) Find $P(A' \cap B')$

(1)

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A Venn diagram with two overlapping circles, A and B. Circle A is on the left and circle B is on the right. The intersection of A and B is labeled x . The region of A that does not overlap with B is labeled 0.3. The region of B that does not overlap with A is labeled 0.2.

Figure 3

(a) Show that $x^2 - 0.5x + 0.06 = 0$

(3)

(b) find the value of x .

(2)

Question 5 continued

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(Total for Question 5 is 5 marks)



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6. The events F and G are independent, with

$$P(F) = \frac{2}{5} \quad P(F \cup G) = \frac{7}{10}$$

(a) Show that $P(G) = \frac{1}{2}$

(4)

The event K is such that $P(K) = \frac{1}{10}$ and $P(F \cap K) = P(K)$

(b) Find $P(K' | F)$

(2)

Given also that G and K are mutually exclusive,

(c) draw a Venn diagram to represent the events F , G and K , giving the exact probability of each region.

(5)

Question 6 continued

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Question 6 continued

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7. A factory tests every item it makes. 3% of the items are faulty.

The test correctly identifies a faulty item with probability 0.95. It wrongly identifies a good item as faulty with probability 0.04

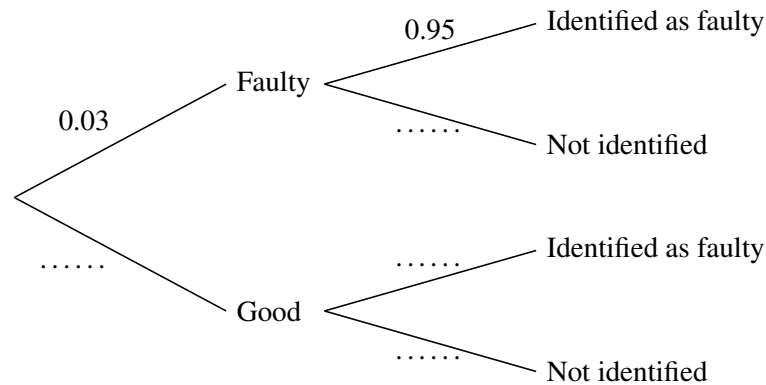


Figure 4

- (a) Complete the tree diagram in Figure 4. (2)
- (b) Find the probability that a randomly chosen item is identified as faulty. (2)
- (c) Given that an item is identified as faulty, find the probability that it really is faulty. (3)
- Every item identified as faulty is tested a second time. The second test is independent of the first and has the same probabilities.
- (d) Given that an item is identified as faulty by both tests, find the probability that it really is faulty. (4)



Question 7 continued

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Question 7 continued

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(Total for Question 7 is 11 marks)



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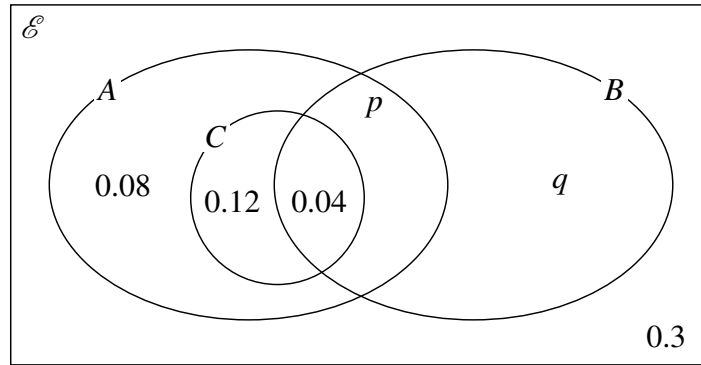


Figure 5

The Venn diagram in Figure 5 shows the probabilities of three events A , B and C , where p and q are probabilities.

The events A and B are independent.

(a) Find the value of p and the value of q . (4)

(b) Find the probability that exactly one of the events A and B occurs. (2)

(c) Showing your working, determine whether the events B and C are independent. (2)

In a survey of people using this model, 96 people are in the event C .

(d) Estimate the number of these people who are in both A and B . (2)



Question 8 continued

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Question 8 continued

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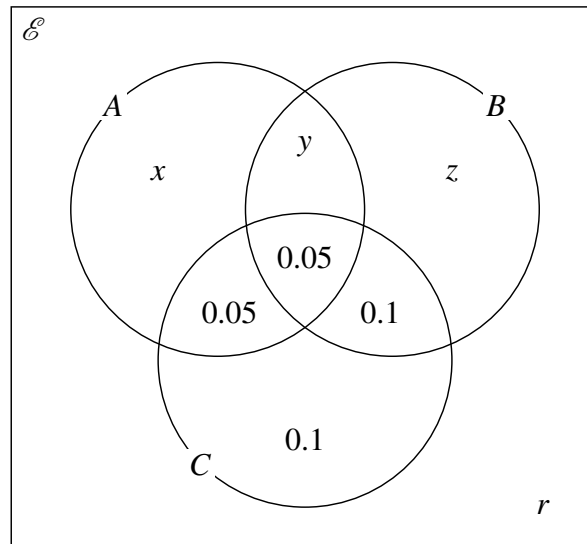


Figure 6

The Venn diagram in Figure 6 shows three events A , B and C and their probabilities, where x , y , z and r are probabilities.

Given that

- $P(A) = 0.4$ and $P(A \cup B) = 0.7$
- the events A and B are independent

(a) use $P(A)$ and $P(A \cup B)$ to show that $z = 0.2$

(2)

(b) find the value of y and the value of x ,

(4)

(c) write down the value of r .

(1)

(d) Determine whether the events B and C are independent. Show your working clearly.

(2)

(e) Find $P(A | B \cup C)$

(2)



Question 9 continued

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Question 9 continued

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(Total for Question 9 is 11 marks)



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10. On any day, the probability that it rains is x .

If it rains, the probability that Tom's bus is late is 0.4. If it does not rain, the probability that the bus is late is 0.1

The probability that the bus is late on a randomly chosen day is 0.19

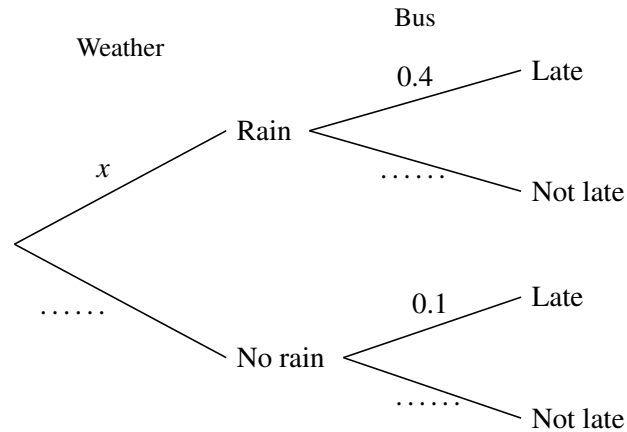


Figure 7

The tree diagram in Figure 7 shows this information.

- (a) Show that $x = 0.3$ (3)
- (b) Given that the bus is late, find the probability that it rained. (2)
- (c) Find the probability that the bus is late on exactly one of two randomly chosen days. You may assume that days are independent. (2)
- If the bus is late, Tom walks, and is then late for school with probability 0.5. If the bus is not late, Tom is late for school with probability 0.05
- (d) Find the probability that Tom is late for school on a randomly chosen day. (2)
- (e) Given that Tom is late for school, find the probability that it rained that day. (3)



Question 10 continued

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Question 10 continued

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(Total for Question 10 is 12 marks)**TOTAL FOR CHAPTER 4 IS 80 MARKS****Join students already acing their exams.**Book your FREE lesson at www.eclassroom.org.uk