Probability: exam practice

10 questions · 39 marks · worked solutions and markschemes

Name _____ Date _____ Score / 39

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/slai/probability-exam-practice

1. **2 marks · Paper 1 style · calculator allowed**

The probability that a light bulb from a factory is faulty is 0.015.

Find the expected number of faulty bulbs in a box of 400. **[2]**

2. **3 marks · Paper 1 style · calculator allowed**

In a class of 30 students, 19 play tennis, 17 play volleyball, and 4 play neither of these sports. Find the exact probability that a randomly chosen student plays tennis, given that they play volleyball.

3. **4 marks · Paper 1 style · calculator allowed**

Events A and B are mutually exclusive. It is known that $P(A) = 2x$ and $P(B) = x$. Given that $P(A \cup B) = 0.9$, find the value of x.

4. **4 marks · Paper 1 style · calculator allowed**

The number of goals X scored by a team in a match has the distribution $P(X = 0) = 0.25$, $P(X = 1) = 0.35$, $P(X = 2) = 0.25$, $P(X = 3) = 0.15$.

a. Find $P(X \geq 2)$. **[1]**

b. Find the expected number of goals per match. **[2]**

c. Estimate the total number of goals the team will score in a 38-match season. **[1]**

5. **3 marks · Paper 1 style · calculator allowed**

The random variable X has the distribution shown.

x	1	2	3	4
$P(X = x)$	0.1	0.3	k	0.25

(a) Find k. **[1]**

(b) Find $\mathrm{E}(X)$. **[2]**

6. **4 marks · Paper 2 style · calculator allowed**

60% of a firm's orders are online (O) and the rest by phone. 30% of online orders and 50% of phone orders are late (L).

a. Find $P(L)$. **[2]**

b. A late order is chosen at random. Find the probability that it was online. **[2]**

7. **4 marks · Paper 1 style · calculator allowed**

Maya rolls a fair four-sided dice, numbered 1 to 4, and a fair six-sided dice, and adds the two scores.

(a) Show the sample space and find the probability that the total is 7. **[2]**

(b) Find the probability that the total is an even number. **[2]**

8. **5 marks · Paper 1 style · calculator allowed**

Two fair 5-sided dice, each numbered 1 to 5, are rolled. The sum of the two numbers shown is recorded.

1. Find the probability that the sum of the two dice is strictly greater than 7.
2. Given that the sum of the two dice is strictly greater than 7, find the probability that the sum is exactly 9.

9. **5 marks · Paper 1 style · calculator allowed**

200 students were asked whether they prefer football or basketball.

	Football	Basketball	Total
Year 11	62	38	100
Year 12	48	52	100
Total	110	90	200

(a) Find the probability that a randomly chosen student prefers football. **[1]**

(b) Find the probability that a student prefers football, given that they are in Year 12. **[2]**

(c) State, with a reason, whether preferring football is independent of year group. **[2]**

10. **5 marks · Paper 1 style · calculator allowed**

The probability that it rains on a school day is 0.3. If it rains, the probability that Tom is late is 0.4. If it does not rain, the probability that he is late is 0.1.

(a) Find the probability that Tom is late. **[3]**

(b) Given that Tom is late, find the probability that it rained. **[2]**

Answers and worked solutions

Question 1

2 marks

Answer: 6

400×0.015 (M1)

6 A1

Question 2

3 marks

Answer: $10/17$

Students playing at least one sport:

$30 - 4 = 26$

Students playing both:

$n(T \cap V) = 19 + 17 - 26$ M1

$n(T \cap V) = 10$ A1

Divide by the number of volleyball players: $P(T \mid V) = \frac{10}{17}$ A1

Question 3

4 marks

Answer: 0.3

Mutually exclusive means

$P(A \cap B) = 0$. (M1)

$P(A \cup B) = P(A) + P(B)$. (M1)

$0.9 = 2x + x \implies 3x = 0.9$. (A1)

$x = 0.3$. A1

Question 4

4 marks

Answer: (a) 0.4; (b) 1.3; (c) 49.4

a. 0.4 A1

b. $0.35 + 0.5 + 0.45$ (M1)
$= 1.3$ A1

c. $38 \times 1.3 = 49.4 \approx 49$ A1

Question 5

3 marks

Answer: (a) $k = 0.35$; (b) 2.75

(a)

$k = 1 - 0.65 = 0.35$ A1

(b)

$0.1 + 0.6 + 1.05 + 1$ (M1)

2.75 A1

Question 6

4 marks

Answer: (a) 0.38; (b) 0.474

a. $0.6 \times 0.3 + 0.4 \times 0.5$ (M1)
$= 0.38$ A1

b. $\frac{0.18}{0.38}$ (M1)
$= 0.474$ A1

Question 7

4 marks

Answer: (a) $\frac{1}{6}$; (b) $\frac{1}{2}$

(a)

24 outcomes;

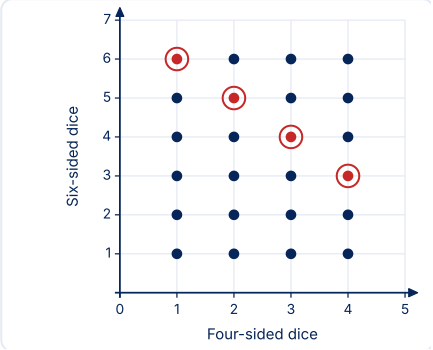
$(1,6), (2,5), (3,4), (4,3)$ (M1)

$\frac{4}{24} = \frac{1}{6}$ A1

(b)

12 of the 24 outcomes (M1)

$\frac{1}{2}$ A1



4 of the 24 outcomes total 7

Question 8

5 marks

Answer: (a) 0.24; (b) $1/3$

1. Total number of equally likely outcomes $= 5 \times 5 = 25$.
   Sums strictly greater than 7 are 8, 9 and 10. (M1)
   Sum 8: (3,5), (4,4), (5,3); sum 9: (4,5), (5,4); sum 10: (5,5).
   Total $= 6$ outcomes. (A1)
   $P(\text{Sum} > 7) = \frac{6}{25} = 0.24$. A1
2. The reduced sample space is the 6 outcomes with sum > 7. (M1)
   Of these, 2 have a sum of exactly 9.
   Probability $= \frac{2}{6} = \frac{1}{3} \approx 0.333$. A1

Question 9

5 marks

Answer: (a) 0.55; (b) 0.48

(a)

$\frac{110}{200} = 0.55$ A1

(b)

$\frac{48}{100}$ (M1)

0.48 A1

(c)

$0.48 \neq 0.55$ R1

not independent A1

Question 10

5 marks

Answer: (a) 0.19; (b) 0.632

(a)

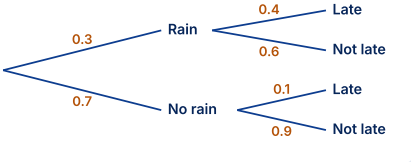
$0.3 \times 0.4 + 0.7 \times 0.1$ (M1)(A1)

0.19 A1

(b)

$\frac{0.12}{0.19}$ (M1)

0.632 A1



Weather first, then late or not

Every solution is also on ibmathrevision.com/slai/probability-exam-practice
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