

SAMPLE PAPER 4: PAPER 2

QUESTION 7 (50 MARKS)

Question 7 (a)

- (i) A random variable is a function that associates a unique numerical value with every outcome of an experiment. It may vary from trial to trial as the experiment is repeated.
- (ii) DISCRETE: **Ex.** A coin is tossed five times. The random variable is the number of heads. Its values can be 0, 1, 2, 3, 4, 5.
CONTINUOUS: **Ex.** The temperature in a house during the day can take any positive or negative value within a certain range.
- (iii) Expected value $\mu = \sum xP(x)$ = Mean of a probability distribution.

Question 7 (b)

- (i) A prime number is a whole positive integer (excluding 1) divisible by itself and 1 only.

(ii)

		Die A					
		1	2	3	4	5	6
Die B	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

- (iii) Primes in table: 2, 3, 5, 7, 11

Number of primes = 15

$$P(\text{Sum that is a prime}) = \frac{\text{Number of primes}}{\text{Number of numbers}} = \frac{15}{36} = \frac{5}{12}$$

- (iv) $P(\text{Sum that is **not** a prime}) = \frac{\text{Number of non-primes}}{\text{Number of numbers}} = \frac{21}{36} = \frac{7}{12}$

Question 7 (c)

Outcome	Not a Prime Sum	Prime Sum
P	$\frac{7}{12}$	$\frac{5}{12}$
Net income to Bob	-3	3
$xP(x)$	$-\frac{7}{4}$	$\frac{5}{4}$

Question 7 (d)

(i) $E = \sum xP(x) = -\frac{7}{4} + \frac{5}{4} = -\frac{1}{2}$

$E = -50$ c, on average Bob loses 50 c per game.

(ii) Expected losses: $30 \times (-\frac{1}{2}) = -\text{€}15$

Question 7 (e)

$$-3 \times \frac{7}{12} + \frac{5}{12}x = \frac{1}{2}$$

$$-21 + 5x = 6$$

$$5x = 27$$

$$x = \frac{27}{5} = \text{€}5.40$$
