

Cambridge International AS & A Level

Mathematics

9709/52

Paper 5 Probability & Statistics 1

May/June 2024

Question No (5)

<https://kingcambridgesolutions.com>

Question No (5)

Jasmine has one \$5 coin, two \$2 coins and two \$1 coins. She selects two of these coins at random. The random variable X is the total value, in dollars, of these two coins.

- (a) Show that $P(X = 7) = 0.2$
- (b) Draw up the probability distribution table for X .
- (c) Find the value of $\text{Var}(X)$.

Solution:**(a)**

one coin \$5
two coins \$2
two coin \$1

As we shall select two coins to make $x=7$
so

$$P(X=7) = \frac{C_1^1 \times C_1^2}{C_2^5}$$

$$= \frac{1 \times 2}{\frac{5 \times 4}{2 \times 1}} = \frac{4}{20} = 0.2$$

(b)

Total coins 5

Number of ways to choose 2 = $\binom{5}{2} = \frac{5 \times 4}{2 \times 1} = 10$

As we shall select 2 coins, the possible pair and their sum

$\textcircled{\$5}$ $\textcircled{\$2 \ \$2}$ $\textcircled{\$1 \ \$1}$

$\$5 + \$2 = 7$ $\$5 + \$1 = 6$ $\$2 + 1 = 3$ $\$2 + 1 = 2$
 $\$5 + \$2 = 7$ $\$2 + \$2 = 4$ $\$2 + 1 = 3$
 $\$5 + \$1 = 6$ $\$2 + 1 = 3$ $\$2 + 1 = 3$

x	2	3	4	6	7
K	1	4	1	2	2
$P(X=x)$	$\frac{1}{10} = 0.1$ $\frac{1}{10} = 0.1$	$\frac{4}{10} = 0.4$	$\frac{1}{10} = 0.1$	$\frac{2}{10} = 0.2$	$\frac{2}{10} = 0.2$

(c)

Formula

$$E(X) = \sum_i x_i \cdot P(X = x_i)$$

$$E(X) = 2 \times 0.1 + 3 \times 0.4 + 4 \times 0.1 + 6 \times 0.2 + 7 \times 0.2$$

$$E(X) = 0.2 + 1.2 + 0.4 + 1.2 + 1.4$$

$$E(X) = 4.4$$

Formula

$$\text{Var}(X) = \sum_i x_i^2 \cdot P(X = x_i) - [E(X)]^2$$

$$\text{Var}(X) = 2^2 \times 0.1 + 3^2 \times 0.4 + 4^2 \times 0.1 + 6^2 \times 0.2 + 7^2 \times 0.2 - (4.4)^2$$

$$= 0.4 + 3.6 + 1.6 + 7.2 + 9.8 - 19.36$$

$$\text{Var}(X) = 3.24$$