AQA – Statistical distributions – A2 Mathematics P3

1. June/2021/Paper_7357/3/No.11

The random variable X is such that $X \sim \text{B}(n, p)$

The mean value of X is 225

The variance of X is 144

Find p.

Circle your answer.

[1 mark]

0.36 0.6 0.64 0.8

2. June/2021/Paper_7357/3/No.16

The discrete random variable X has the probability function

$$\mathrm{P}(X = x) = \begin{cases} c(7 - 2x) & x = 0,\ 1,\ 2,\ 3 \\ k & x = 4 \\ 0 & \text{otherwise} \end{cases}$$

where c and k are constants.

(a) Show that $16c + k = 1$

[2 marks]

(b) Given that $\mathrm{P}(X \geq 3) = \frac{5}{8}$

find the value of c and the value of k.

[2 marks]

3. June/2021/Paper_7357/3/No.17

James is playing a mathematical game on his computer.

The probability that he wins is 0.6

As part of an online tournament, James plays the game 10 times.

Let Y be the number of games that James wins.

(a) State two assumptions, in context, for Y to be modelled as $B(10, 0.6)$

[2 marks]

(b) Find $P(Y = 4)$

[1 mark]

(c) Find $P(Y \geq 4)$

[2 marks]

(d) After practising the game, James claims that he has increased his probability of winning the game.

In a random sample of 15 subsequent games, he wins 12 of them.

Test a 5% significance level whether James's claim is correct.

[6 marks]

4. June/2021/Paper_7357/3/No.18

A factory produces jars of jam and jars of marmalade.

(a) The weight, X grams, of jam in a jar can be modelled as a normal variable with mean 372 and a standard deviation of 3.5

(a) (i) Find the probability that the weight of jam in a jar is equal to 372 grams.

[1 mark]

(a) (ii) Find the probability that the weight of jam in a jar is greater than 368 grams.

[2 marks]

(b) The weight, Y grams, of marmalade in a jar can be modelled as a normal variable with mean μ and standard deviation σ

(b) (i) Given that $P(Y < 346) = 0.975$, show that

$$346 - \mu = 1.96\sigma$$

Fully justify your answer.

[3 marks]

(b) (ii) Given further that

$$P(Y < 336) = 0.14$$

find μ and σ

[4 marks]