Statistical distributions – A2 Mathematics P3

1. June/2022/Paper_7357/03/No.11

$X \sim N(14, 0.35)$

Find the standard deviation of X, correct to two decimal places.

Circle your answer.

[1 mark]

0.12 0.35 0.59 1.78

2. June/2022/Paper_7357/03/No.13

A reporter is writing an article on the CO_2 emissions from vehicles using the Large Data Set.

The reporter claims that the Large Data Set shows that the CO_2 emissions from all vehicles in the UK have declined every year from 2002 to 2016.

Using your knowledge of the Large Data Set, give **two** reasons why this claim is invalid.

[2 marks]

3. June/2022/Paper_7357/03/No.14

A customer service centre records every call they receive.

It is found that 30% of all calls made to this centre are complaints.

A sample of 20 calls is selected.

The number of calls in the sample which are complaints is denoted by the random variable X.

(a) State **two** assumptions necessary for X to be modelled by a binomial distribution.

[2 marks]

(b) Assume that X can be modelled by a binomial distribution.

(b) (i) Find $P(X = 1)$

[1 mark]

(b) (ii) Find $P(X < 4)$

[2 marks]

(b) (iii) Find $P(X \geq 10)$

[2 marks]

(c) In a random sample of 10 calls to a school, the number of calls which are complaints, Y, may be modelled by a binomial distribution

$$Y \sim B(10, p)$$

The standard deviation of Y is 1.5

Calculate the possible values of p.

[3 marks]

4. June/2022/Paper_7357/03/No.18

In a particular year, the height of a male athlete at the Summer Olympics has a mean 1.78 metres and standard deviation 0.23 metres.

The heights of 95% of male athletes are between 1.33 metres and 2.22 metres.

(a) Comment on whether a normal distribution may be suitable to model the height of a male athlete at the Summer Olympics in this particular year.

[3 marks]

(b) You may assume that the height of a male athlete at the Summer Olympics may be modelled by a normal distribution with mean 1.78 metres and standard deviation 0.23 metres.

(b) (i) Find the probability that the height of a randomly selected male athlete is 1.82 metres.

[1 mark]

(b) (ii) Find the probability that the height of a randomly selected male athlete is between 1.70 metres and 1.90 metres.

[1 mark]

(b) (iii) Two male athletes are chosen at random.

Calculate the probability that **both** of their heights are between 1.70 metres and 1.90 metres.

[1 mark]

(c) The summarised data for the heights, h metres, of a random sample of 40 male athletes at the Winter Olympics is given below.

$$\sum h = 69.2 \qquad \sum (h - \bar{h})^2 = 2.81$$

Use this data to calculate estimates of the mean and standard deviation of the heights of male athletes at the Winter Olympics.

[3 marks]

(d) Using your answers from **part (c)**, compare the heights of male athletes at the Summer Olympics and male athletes at the Winter Olympics.

[2 marks]