A Level · CIE · Maths

50 mins 8 questions

Practice Paper 5 (Probability & Statistics 1)

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Total Marks /50

1 (a) Leonardo has constructed a biased spinner with six sectors labelled 0,1, 1, 2, 3 and 5. The probability of the spinner landing on each of the six sectors is shown in the following table:

number on sector	0	1	1	2	3	5
probability	$\frac{6}{20}$	p	$\frac{3}{20}$	$\frac{5}{20}$	$\frac{3}{20}$	$\frac{1}{20}$

Find the value of p.

(1 mark)

(b) Leonardo is playing a game with his biased spinner. The score for the game, is the number which the spinner lands on after being spun.

Find the probability that Leonardo's score is

(i) no more than 1

(ii) at least 3.

(2 marks)

(c) (i) Find the expected value for Leonardo's score in a game.

(ii) Find the standard deviation of Leonardo's scores.

(4 marks)

2 (a) How many ways are there to rearrange the ten letters in the word POSITIVITY?

(2 marks)

(b) How many ways are there to rearrange the ten letters in the word POSITIVITY if

i) the three Is must all be together

ii) the two Ts are not together.

(5 marks)

3 (a) The random variable X has the probability function

$$P(X=x)=\begin{cases}0.21 & x=0,1\\ kx & x=3,6\\ 0.11 & x=10,15\\ 0 & \text{otherwise}\end{cases}$$

Find the value of k.

(2 marks)

(b) Construct a table giving the probability distribution of X.

(2 marks)

(c) Find $\mathrm{P}(3<X\leq 14)$

(1 mark)

4 (a) A mixed relay team must consist of four competitors two of whom must be male and two of whom must be female. There are nine men and six women trying out for a place on a new team.

During the try-outs the fifteen candidates are split into three groups of four and one group of three. How many ways can this be done if the candidates are divided randomly?

(3 marks)

(b) Two of the candidates are brother and sister and have agreed they will only be in the final relay team if they are both successful. How many ways can the final relay team be chosen if the brother and sister are either both in or both out?

(3 marks)

5 (a) Katin is collecting tadpoles for her biology project. In the pond there are five female tadpoles and six male tadpoles, however they all look the same. She takes two tadpoles at random from the pond, without replacement.

Draw a tree diagram to represent this information.

(3 marks)

(b) Find the probability that Katin's two tadpoles are

i) either both female or both male.

ii) both female, given that they are the same sex.

(3 marks)

6 (a) The test scores, X, of a group of RAF recruits in an aptitude test are modelled as a normal distribution with $X \sim N(210, 27.8^2)$.

i) Find the values of a and b such that $P(X < a) = 0.25$ and $P(X > b) = 0.25$.

ii) Hence find the interquartile range of the scores.

(5 marks)

(b) Those who score in the top 30% on the test move on to the next stage of training.

One of the recruits, Amelia, achieves a score of 231. Determine whether Amelia will move on to the next stage of training.

(3 marks)

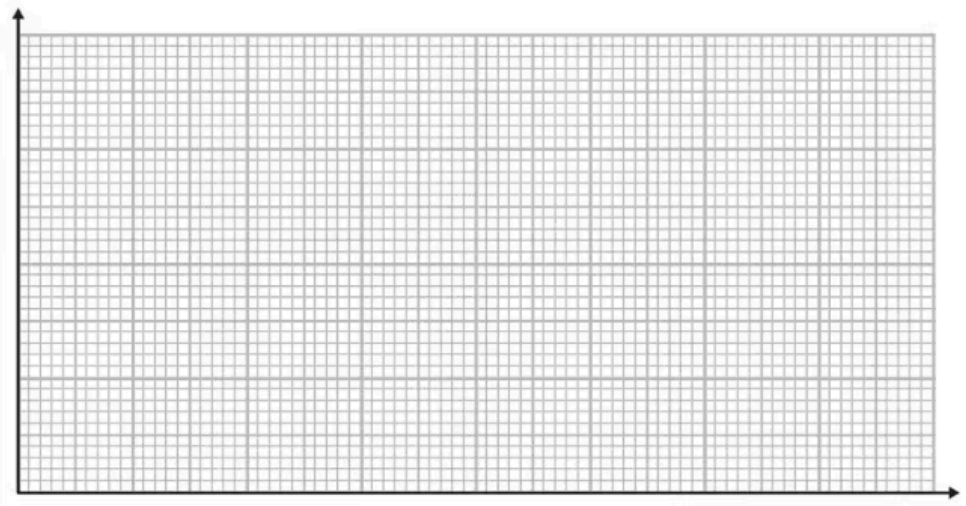
7 (a) The amounts of time engineers spent dealing with individual faults in a power plant were recorded to the nearest minute. Data on 30 different faults is summarised in the table below.

Time t (minutes)	Frequency f
90 - 129	6
130 - 169	8
170 - 199	12
200 - 249	4

Give a reason to support the use of a histogram to represent these data.

(1 mark)

(b) On the grid below, draw a histogram to represent the data.



(4 marks)

(c) Estimate the proportion of individual faults on which engineers spent longer than three hours.

(3 marks)

8 Two fair dice are rolled and the numbers showing on the dice are added together. This is done 18 times and the number of times the sum is *not* equal to 7 or 11 is recorded.

Define a suitable distribution to model the number of times the sum is *not* equal to 7 or 11, and justify your choice.

(3 marks)