Counting and statistics - Applications test 3

Name: _____ Date: _____

10 questions | 52 marks | 70 minutes

Use counting and statistics to plan an event and judge operational data. State what each calculation counts and qualify the conclusions.

Use a graphics calculator or appropriate digital tool for labelled tasks.

1. A festival program has one music act, one demonstration and one food stall. There are 5 music acts,4 demonstrations and 3 stalls. [5 marks]

(a) Count programs when all combinations are available. [2 marks]

(b) One music act can only be paired with 2 of the demonstrations. All other combinations remain available. Count the programs. [3 marks]

2. Six distinct performers appear in a running order. A duo consists of two named performers who must appear consecutively. [4 marks]

(a) Count the running orders. [2 marks]

(b) The duo also insists that one named member appears before the other. Count the orders now. [2 marks]

3. A 3-person judging panel is chosen from 8 people, including two named teachers. [5 marks]

(a) Count panels containing exactly one of the two teachers. [3 marks]

(b) Count panels containing both teachers. [2 marks]

4. A design pattern is modelled by $(1+2x)^6$. [5 marks]

(a) Find the coefficient of x^2. [2 marks]

(b) Find the coefficient of x^4 and explain why it is not equal to the coefficient of x^2. [3 marks]

5. Organisers survey the first 80 people who enter at 9 am to estimate the satisfaction of all 2,000 attendees. [6 marks]

(a) Identify the target population and explain two potential biases. [3 marks]

(b) Suggest a more defensible sampling approach. [3 marks]

6. The waiting times in minutes are 2,4,4,5,5,6,7,15. [5 marks]

(a) Find the mean, median and modes. [3 marks]

(b) Explain which centre you would report for a typical wait. [2 marks]

7. The waiting times are 2,4,4,5,5,6,7,15 minutes. Use the median-of-halves convention. [6 marks]

(a) Find Q1, Q3, IQR and range. [3 marks]

(b) Draw a labelled min-max box plot. [3 marks]

8. A sample of 3 weighed parcels has masses 2,5,8 kg. [6 marks]

(a) Find the mean and sample standard deviation. [3 marks]

(b) A fourth parcel of 20 kg is added. Find the new mean and explain whether the old standard deviation still describes the new sample. [3 marks]

9. A normal packing model has mean 250 g and standard deviation 4 g. Packets are accepted from 244 to 258 g. Supplied $\Phi(2)=0.97725$ and $\Phi(-1.5)=0.06681$. [5 marks]

(a) Calculate the modelled acceptance proportion. [3 marks]

(b) Estimate the expected rejected packets in 10,000. [2 marks]

10. The organiser compares satisfaction scores from volunteers on an online poll with a random exit sample. [5 marks]

(a) The poll has more responses. Does that alone make it more trustworthy? Explain. [2 marks]

(b) Both distributions are strongly left-skewed. Should an empirical-rule normal estimate be used without checking? Explain. [3 marks]