Topic test | Probability

Probability - Applications test

Name: _____ Date: _____

16 questions | 48 marks | 60 minutes

Apply compound-event models to games, collections and evidence, then defend assumptions and conclusions.

A scientific calculator may be used.

1. A computer model gives success probability 0.3 on each of two independent days. Find $P(\text{success on both days})$. [2 marks]

2. A lunch bundle offers 3 sandwiches, 2 drinks and 2 snacks. Every combination is equally likely. Find $P(\text{vegetarian sandwich and water})$ if exactly one sandwich is vegetarian and exactly one drink is water. [3 marks]

3. A box has five 10-dollar vouchers and three 20-dollar vouchers. Choose two at random without replacement. Find $P(\text{two } 20-\text{dollar vouchers})$. [2 marks]

4. A game uses a fair die and an independent equal spinner labelled A and B. A player wins only with an even die result and A. [4 marks]

(a) Find the win probability. [2 marks]

(b) Predict the wins in 200 plays. Is this count guaranteed? [2 marks]

5. A tray has 8 good parts and 2 faulty parts. Choose two at random without replacement. Find $P(\text{no faulty parts})$. [2 marks]

6. A tray has 8 good parts and 2 faulty parts. Choose two at random without replacement. Find $P(\text{at least one faulty part})$. [3 marks]

7. Among 40 students, 22 used a bus this week, 16 used a bike and 6 used both. Find $P(\text{neither})$ for one randomly selected student. [3 marks]

8. Among 40 students, 22 used a bus this week, 16 used a bike and 6 used both. One student is chosen at random. Find $P(\text{exactly one of bus or bike})$. [3 marks]

9. A drawer holds 4 blue and 2 red socks. Two are chosen at random without replacement. Find $P(\text{matching colours})$. [3 marks]

10. A two-stage game is won 36 times in 90 plays. Use these results to estimate wins in another 120 similar plays. [2 marks]

11. A class simulation records 40 successes in 300 trials. A fair-model probability is $\frac{1}{8}$. Compare the observed and model rates. [3 marks]

12. Group A simulates two draws with replacement; Group B simulates two draws without replacement. Why should their success counts not be pooled as an estimate for one unchanged game? [3 marks]

13. Use independent equally likely random digits. Digits 0-3 mean S and 4-9 mean F. Read pairs 12, 74, 06, 39, 88, 45. [6 marks]

(a) Write the six outcomes and estimate $P(\text{exactly one S})$. [3 marks]

(b) Find the theoretical probability of exactly one S. [3 marks]

14. A class correctly removes the first counter during each two-draw trial, but never restores the full bag between trials. Explain why this changes the intended simulation. [3 marks]

15. A fair coin chooses bag A or bag B. A has 3 red and 1 blue counter; B has 1 red and 3 blue. Draw one counter at random from the chosen bag. Find $P(\text{red})$. [3 marks]

16. A model predicts win probability $\frac{2}{5}$. In 200 plays there are 73 wins. Give a justified short conclusion and one useful next step. [3 marks]