Topic Test: Probability

Total time allowed: 45 minutes **Total marks:** 35

1 Which of the following could not be the probability of an event?

A 35% B 0.02

C $\frac{7}{5}$ D 1

2 From a normal pack of 52 playing cards, one card is selected at random. Find the probability that it is a spade.

A $\frac{1}{13}$ B $\frac{2}{13}$

C $\frac{1}{4}$ D $\frac{3}{4}$

3 How many different ways can four people stand in a queue?

A 4 B 16

C 24 D 256

4 A bag contains four white, three red and two black balls. If a ball is drawn at random, find the probability that it is white.

A $\frac{4}{9}$ B $\frac{1}{3}$

C $\frac{2}{9}$ D $\frac{5}{9}$

5 Three boys decide to play against each other in a tennis round robin. If the probability of Rob winning is 32% and the probability of Tim winning is 0.43, then the probability that Matt wins is:

A $\frac{1}{4}$ B 0.6575

C $\frac{1}{3}$ D 0.75

6 In a single throw of one die, find the probability of having an even number.

A $\frac{1}{6}$ B $\frac{1}{3}$

C $\frac{1}{2}$ D $\frac{2}{3}$

7 The number of different number plates possible that can be made from three letters followed by three numbers is given by:

A $26 \times 25 \times 24 \times 10 \times 9 \times 8$

B $26 \times 26 \times 26 + 10 \times 10 \times 10$

C $26^3 \times 10^3$

D $26^3 \times 9^3$

8 A three-digit number is to be formed from the digits 4, 5 and 6 that are written on cards. What is the probability that the number will be even?

A $\frac{1}{3}$ B $\frac{2}{3}$

C $\frac{3}{3}$ D None of these

9 From the data recorded, what is the relative frequency of owning a dog?

Type of pet	Cat	Dog	Horse	Hermit crabs	Fish
Number of students who own one	8	12	3	2	5

A 12 B $\frac{1}{5}$

C 0.4 D None of these

10 A card is chosen at random from a pack of 52 cards. What is the probability that the card is red or a king?

A $\frac{1}{4}$ B $\frac{1}{13}$

C $\frac{9}{13}$ D $\frac{7}{13}$

11 Which of these experiments does *not* have equally likely outcomes?

A Tossing an unbiased coin

B Choosing a letter from the word SCHOOL

C Choosing a letter at random from the numbers 1 to 8

D Drawing a card from a standard pack of playing cards.

12 A letter is chosen at random from the word 'MATHEMATICS'. What is the probability that it will be a vowel?

A $\frac{1}{11}$ B $\frac{2}{11}$

C $\frac{3}{11}$ D $\frac{4}{11}$

13 Four students flipped a coin for 1 minute and recorded the number of heads and tails obtained. Which student's experimental results are closest to the theoretical probability?

A Madeline

H	T
34	38

B Daniel

H	T
28	31

C Violet

H	T
32	42

D Amber

H	T
18	23

14 A pair of dice is thrown, find the probability of getting a double six.

A $\frac{1}{6}$ B $\frac{1}{36}$

C $\frac{1}{4}$ D $\frac{1}{9}$

15 How many different outcomes are there if a coin is tossed, and two dice are rolled?

A 3 B 4

C 14 D 72

16 A bag contains five red, seven white and eight green marbles. If one marble is selected at random from the bag, what is the probability of drawing:

a a white marble? 1 mark

b a red marble? 1 mark

c not a green marble? 1 mark

d a blue marble? 1 mark

17 Two fair dice are thrown.

a Draw a table to show all the possible outcomes. 1 mark

b Find the probability that:

i the sum of the two numbers shown is 9 1 mark

ii the two numbers are equal. 1 mark

18 Chelsea says: 'On any given day it is either raining or not raining, so the probability of it raining tomorrow is $\frac{1}{2}$.'
Is Chelsea correct? Briefly explain why or why not. 2 marks

19 Herman and Irene go out for dinner at a restaurant for their anniversary. On the menu there are three entrées, six main courses and five desserts to choose from.

a If both of them order a three-course meal, how many different combinations can they choose from? 1 mark

b Due to high demand, one of the entrées is sold out and now unavailable. What is the probability that Herman does *not* choose this entrée? 1 mark

20 Fifty families were surveyed to find out how many children in each family and the following set of data was tabulated:

Number of children	0	1	2	3	4	5
Number of families	5	10	13	13	4	5

a What is the relative frequency (as a fraction) of families having three children? 1 mark

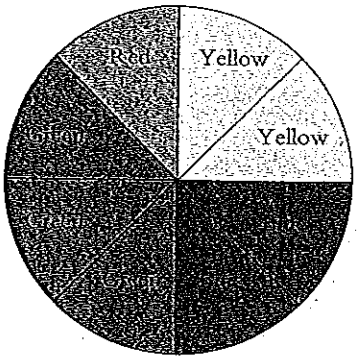
b Taking into consideration this survey, what would be the probability that a family selected at random has three children? 1 mark

c Is the probability of this survey the same as the relative frequency? 1 mark

d What is the probability of a family, selected at random, having two or less than two children? 1 mark

e What is the probability of a family having five children? 1 mark

21 The spinner shown is used in a game.



a What is the percentage probability of landing on red or yellow? 1 mark

b How many more times likely are you to spin green than red? 1 mark

c Jenn uses the spinner 50 times and records that she landed on blue 14 times. Which is greater: the theoretical probability of landing on blue or the relative frequency of landing on blue? 1 mark

d If Jenn spins the spinner 40 times, how many times should she expect to land on green? 1 mark

1 The answer $\frac{7}{5}$ could not be the probability of an event as $0 \leq P(E) \leq 1$. ✓

2 $P(E) = \frac{n(E)}{n(S)} = \frac{13}{52} = \frac{1}{4}$ ✓

3 Total $= 4 \times 3 \times 2 \times 1 = 24$ ✓

4 $P(E) = \frac{n(E)}{n(S)} = \frac{4}{9}$ ✓

5 Since the total probability of all outcomes is 1,
$P(\text{Rob}) + P(\text{Tim}) + P(\text{Matt}) = 1$.
$P(\text{Matt}) = 1 - [P(\text{Rob}) + P(\text{Tim})]$
$= 1 - [32\% + 0.43]$
$= \frac{1}{4}$ ✓

6 $P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$ ✓

7 Using the fundamental counting theorem, the number of choices for three letters followed by three numbers is $26 \times 26 \times 26 \times 10 \times 10 \times 10 = 26^3 \times 10^3$. ✓

8 $P(E) = \frac{n(E)}{n(S)} = \frac{4}{6} = \frac{2}{3}$ ✓

9 Relative frequency of owning a dog
$= \frac{\text{Frequency of scores for a dog}}{\text{Total number of scores}}$
$= \frac{12}{8 + 12 + 3 + 2 + 5}$
$= \frac{2}{5}$ or 0.4 ✓

10 $P(E) = \frac{n(E)}{n(S)} = \frac{28}{52} = \frac{7}{13}$ ✓

11 Choosing a letter from the word SCHOOL does *not* have equally likely outcomes as the letter O appears twice, giving it twice the chance of being selected. ✓

12 $P(E) = \frac{n(E)}{n(S)} = \frac{4}{11}$ ✓

13 The theoretical probability of outcomes for tossing a coin is 50% heads and 50% tails. Daniel's results are closest with 47.5% heads and 52.5% tails. ✓

14 $P(E) = \frac{n(E)}{n(S)} = \frac{1}{36}$ ✓

15 Using the fundamental counting theorem, the number of different outcomes is given by $2 \times 6 \times 6 = 72$. ✓

16 a $P(E) = \frac{n(E)}{n(S)} = \frac{7}{20}$ ✓

b $P(E) = \frac{n(E)}{n(S)} = \frac{5}{20} = \frac{1}{4}$ ✓

c $P(E) = \frac{n(E)}{n(S)} = \frac{12}{20} = \frac{3}{5}$ ✓

d $P(E) = \frac{n(E)}{n(S)} = \frac{0}{20} = 0$ ✓

17 a

·	1	2	3	4	5	6
1	1,1	1,2	1,3	1,4	1,5	1,6
2	2,1	2,2	2,3	2,4	2,5	2,6
3	3,1	3,2	3,3	3,4	3,5	3,6
4	4,1	4,2	4,3	4,4	4,5	4,6
5	5,1	5,2	5,3	5,4	5,5	5,6
6	6,1	6,2	6,3	6,4	6,5	6,6

✓

b i $P(E) = \frac{n(E)}{n(S)} = \frac{4}{36} = \frac{1}{9}$ ✓

ii $P(E) = \frac{n(E)}{n(S)} = \frac{6}{36} = \frac{1}{6}$ ✓

18 Chelsea is not correct. ✓
The outcomes of raining or not raining on a given day are not guaranteed to be equally likely, so the probability of rain is not $\frac{1}{2}$. ✓

19 a The number of combinations is given by:
Number of entrées × Number of mains
× Number of desserts
$= 3 \times 6 \times 5$
$= 90$ combinations ✓

b $P(\text{not choosing the sold out entrée})$
$= 1 - P(\text{choosing the sold out entrée})$
$= 1 - \frac{1}{3}$
$= \frac{2}{3}$ ✓

20 a $\frac{13}{50}$ ✓

b $\frac{13}{50}$ ✓

c Yes ✓

d $P(E) = \frac{n(E)}{n(S)} = \frac{28}{50} = \frac{14}{25}$ ✓

e $P(E) = \frac{n(E)}{n(S)} = \frac{5}{50} = \frac{1}{10}$ ✓

24 a $P(\text{red or yellow}) = \frac{1+2}{8} \times 100\%$

$= 37.5\%$ ✓

b Green occurs three times and red occurs once, so you are three times more likely to spin green than red. ✓

c Theoretical probability of landing on blue $= \frac{2}{8}$ or 0.25.

The relative frequency of landing on blue was $\frac{14}{50}$ or 0.28. Therefore the relative frequency is greater. ✓

d Since green occurs $\frac{3}{8}$ times, Jenn should expect to land on green $\frac{3}{8} \times 40 = 15$ times. ✓