eClassroom

GCSE Mathematics

Systematic Listing

Questions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation

Worked Examples

[Fluency]

A bag contains a red (R), blue (B) and green (G) counter. A counter is picked, replaced, then a second is picked. List all possible outcomes.

Use a systematic approach — fix the first pick and vary the second:

RR, RB, RG

BR, BB, BG

GR, GB, GG

Total: **9 outcomes**

[Reasoning]

A fair coin is flipped and a fair six-sided die is rolled. How many outcomes give Heads and an even number?

List all Heads outcomes: H1, H2, H3, H4, H5, H6

Even numbers: H2, H4, H6 → **3 outcomes** out of 12 total.

P(Heads and even) = 3/12 = **1/4**

[Problem Solving]

A restaurant offers 3 starters, 4 mains and 2 desserts. How many different 3-course meals are possible?

Use the multiplication principle:

3 × 4 × 2 = **24 different meals**

[Fluency]

1. A fair coin is flipped and a fair six-sided die is rolled.
List all possible outcomes systematically.

(2 marks)

[Fluency]

2. An ice cream parlour has three flavours: Vanilla (V), Chocolate (C) and Strawberry (S). A customer chooses 2 scoops where the order matters (V then C is different from C then V).
List all possible choices of 2 different flavours.

(2 marks)

[Fluency]

3. A 2-digit PIN is formed from the digits 1, 2, 3 and 4. No digit may be repeated.

(a) List all possible PINs that start with 1. **(b)** How many 2-digit PINs are possible in total?

(3 marks)

[Fluency]

4. A meal deal consists of one sandwich, one snack and one drink.

There are 4 sandwiches, 3 snacks and 2 drinks available.

How many different meal deals are possible?

(2 marks)

[Fluency]

5. The digits 3, 5 and 7 can each be used more than once.

List all possible 2-digit numbers that can be made using these digits.

(2 marks)

[Reasoning]

6. Two fair spinners each have sections numbered 1, 2 and 3.

Both spinners are spun at the same time.

(a) List all the possible outcomes. **(b)** Find the probability that the two numbers add up to 5.

(3 marks)

[Reasoning]

7. Four students — Alex (A), Beth (B), Cara (C) and Dan (D) — need to choose a pair to represent their class.

List all the possible pairs. Order does not matter.

(2 marks)

[Reasoning]

8. How many different arrangements are there of the four letters M, A, T, H?

You do not need to list them all — show your method clearly.

(2 marks)

[Problem Solving]

9. The digits 2, 4 and 7 are each used exactly once to form a 3-digit number.

(a) List all possible 3-digit numbers. (2)

(b) How many of these numbers are divisible by 3? Justify your answer. (2)

(4 marks)

[Problem Solving]

10. A bag contains 2 red counters and 1 blue counter and 1 green counter. Two counters are drawn at random without replacement.

(a) List all the possible pairs of counters that could be drawn. (2)

(b) Find the probability that both counters are the same colour. (1)

(3 marks)

Section B — Higher

Worked Examples

[Fluency]

How many 3-digit numbers can be formed from the digits 1, 2, 3, 4, 5 if no digit is repeated?

1st digit: 5 choices 2nd digit: 4 choices 3rd digit: 3 choices

Total = 5 × 4 × 3 = **60**

[Reasoning]

In how many ways can 4 people be arranged in a line if person A must always be last?

A is fixed at the end. The remaining 3 people fill the first 3 positions:

3 × 2 × 1 = 3! = **6 arrangements**

[Problem Solving]

A committee of 3 is chosen from 5 men and 4 women. How many committees contain at least 1 woman?

Total committees: C(9,3) = 84

All male committees: C(5,3) = 10

At least 1 woman: 84 – 10 = **74**

[Fluency]

1. Four-digit numbers are formed using the digits 1, 2, 3, 4 and 5. No digit may be repeated.
How many four-digit numbers can be formed?

(2 marks)

[Fluency]

2. Five people are arranged in a line for a photograph.
How many different arrangements are possible?

(2 marks)

[Fluency]

3. A committee of 3 people is chosen from a group of 7.
How many different committees are possible?
Show your method clearly.

(2 marks)

[Reasoning]

4. Five friends — A, B, C, D and E — stand in a line for a photo.

How many arrangements are possible if A must always stand first?

Explain your reasoning.

(3 marks)

[Reasoning]

5. A password consists of 3 letters (chosen from the 26 letters of the alphabet, with repetition allowed) followed by 2 digits (0–9, with repetition allowed).

How many different passwords are possible? Give your answer in standard form correct to 3 significant figures.

(3 marks)

[Reasoning]

6. Six football teams each play each other exactly once in a league.

(a) How many matches are played in total? (2)

(b) Explain why the formula C(n, 2) gives the number of matches for n teams. (2)

(4 marks)

[Problem Solving]

7. A team of 3 is selected from 4 boys and 3 girls.

The team must contain at least 1 girl.

How many different teams are possible?

(3 marks)

[Problem Solving]

8. A 5-digit security code is formed from the digits 0–9 with repetition allowed. The first digit cannot be 0.

How many different codes are possible?

(3 marks)

[Problem Solving]

9. A committee of 4 is chosen from 6 men and 5 women.

The committee must contain exactly 2 women.

(a) Show that the number of possible committees is 150. (3)

(b) Find the probability that a randomly chosen committee of 4 contains exactly 2 women. (2)

(5 marks)

[Problem Solving]

10. Eight points are marked on the circumference of a circle, and no three points are collinear.

(a) How many straight lines can be drawn by connecting pairs of points? (1)

(b) How many triangles can be formed using these points as vertices? (2)

(c) Write a general expression for the number of triangles that can be formed from n points on a circle (no three collinear). (2)

(5 marks)