

Systematic Listing

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

A shop sells a phone in three colours: black (B), silver (S) or gold (G).

Each colour comes with 64 GB or 128 GB of storage.

The shop does **not** sell a gold phone with 64 GB of storage.

Write down all the different phones the shop sells.

Take each colour in turn, and pair it with each storage size.

Black: B-64 GB, B-128 GB

Silver: S-64 GB, S-128 GB

Gold: G-64 GB, G-128 GB

The shop does not sell gold with 64 GB, so cross out G-64 GB.

That leaves $6 - 1 = 5$ phones.

Answer: B-64 GB, B-128 GB, S-64 GB, S-128 GB, G-128 GB

Tip: Read every line of the question. Listing all 6 pairs and forgetting to remove gold with 64 GB is a common slip.

Marks: 2 marks for all 5 and no extras. 1 mark for at least 3 correct, or for all 6 pairs including gold 64 GB.

2 (2 marks)

Kwame plays three games of chess.

Each game ends in a win (W) or a loss (L). There are no draws.

For example, WLL means he wins the first game and loses the second and third games.

List all the possible results of the three games.

Work systematically by the number of wins.

3 wins: WWW

2 wins: WWL, WLW, LWW

1 win: WLL, LWL, LLW

0 wins: LLL

There are $2 \times 2 \times 2 = 8$ possible results.

Answer: WWW, WWL, WLW, LWW, WLL, LWL, LLW, LLL

Tip: Each result must have 3 letters, one for each game. WWL, WLW and LWW are different results, so list all three.

Marks: 2 marks for all 8 and no repeats. 1 mark for at least 5 correct.

3 (2 marks)

Nia has to visit three shops: a bakery (B), a chemist (C) and a newsagent (N). She will visit each shop once.

Use the table to list all the different orders in which Nia could visit the three shops.

Fix the first shop, then swap the other two.

1st shop	2nd shop	3rd shop
B	C	N
B	N	C
C	B	N
C	N	B
N	B	C
N	C	B

Answer: 6 orders: BCN, BNC, CBN, CNB, NBC, NCB

Tip: Work in a fixed pattern: two orders start with B, two with C and two with N.

Marks: 2 marks for all 6 and no repeats. 1 mark for at least 4 correct.

4 (2 marks)

Tariq has three cards.

0 5 9

He puts all three cards down in a row to make a 3-digit number.

A 3-digit number cannot start with 0

How many different 3-digit numbers can Tariq make?

The first digit cannot be 0, so it must be 5 or 9.

Starting with 5: 509, 590

Starting with 9: 905, 950

That is 4 numbers.

Answer: 4

Tip: 059 and 095 are not 3-digit numbers, so do not count them. The answer is not 6.

Marks: 1 mark for a systematic list with at least 2 correct numbers. 1 mark for 4.

5 (2 marks)

Zoe rolls a red dice and a blue dice.
Both dice are ordinary six-sided dice.
She adds the two scores to get a total.

List all the ways Zoe could get a total of 8

Go through the red dice scores in order.

Red 1 would need blue 7, which is not possible.

Red 2, blue 6

Red 3, blue 5

Red 4, blue 4

Red 5, blue 3

Red 6, blue 2

That is 5 ways.

Answer: (Red, Blue): (2, 6), (3, 5), (4, 4), (5, 3), (6, 2)

Tip: The dice are different colours, so red 2 with blue 6 is a different way from red 6 with blue 2. List both.

Marks: 2 marks for all 5 and no extras. 1 mark for at least 3 correct.

6 (2 marks)

A target has three rings.

The rings score 1 point, 3 points and 5 points.

Hana throws 2 darts. Both darts hit the target.

Both darts can land in the same ring.

Write down all the possible total scores Hana can get.

Both darts can land in the same ring.

Same ring: $1 + 1 = 2$, $3 + 3 = 6$, $5 + 5 = 10$

Different rings: $1 + 3 = 4$, $1 + 5 = 6$, $3 + 5 = 8$

6 comes up twice, so only write it once.

Answer: 2, 4, 6, 8, 10

Tip: Remember that both darts can land in the same ring, e.g. $1 + 1 = 2$ and $5 + 5 = 10$.

Marks: 2 marks for all 5 totals and no extras. 1 mark for at least 4 correct totals.

7 (2 marks)

Jo has four coins: 10p, 20p, 50p and £1

She picks two of the coins.

Write down all the possible total amounts she can pick.

Pair each coin with each coin after it in the list.

With 10p: $10 + 20 = 30\text{p}$, $10 + 50 = 60\text{p}$, $10\text{p} + £1 = £1.10$

With 20p: $20 + 50 = 70\text{p}$, $20\text{p} + £1 = £1.20$

With 50p: $50\text{p} + £1 = £1.50$

Answer: 30p, 60p, £1.10, 70p, £1.20, £1.50

Marks: 2 marks for all 6 and no extras. 1 mark for at least 4 correct.

8 (3 marks)

Tom has three cards.

1

4

6

He puts two of the cards down to make a 2-digit number.

- (a) Write down all the 2-digit numbers Tom can make.

Take each card in turn as the first digit.

First card 1: 14, 16

First card 4: 41, 46

First card 6: 61, 64

Answer: 14, 16, 41, 46, 61, 64

Marks: 2 marks for all 6 and no extras. 1 mark for at least 4 correct.

- (b) How many of these numbers are multiples of 4?

Check each number:

$$16 = 4 \times 4 \quad \checkmark$$

$$64 = 4 \times 16 \quad \checkmark$$

14, 41, 46 and 61 are not in the 4 times table.

Answer: 2

9 (2 marks)

Maria has 4 T-shirts and 3 pairs of shorts.

An outfit is one T-shirt and one pair of shorts.

Show that Maria can make 12 different outfits.

Call the T-shirts A, B, C, D and the shorts 1, 2, 3.

List the outfits systematically:

A1, A2, A3

B1, B2, B3

C1, C2, C3

D1, D2, D3

Each of the 4 T-shirts goes with each of the 3 pairs of shorts.

$$4 \times 3 = 12 \text{ outfits}$$

Answer: 12 outfits (4 lots of 3)

Marks: 1 mark for a systematic list of at least 6 correct outfits, or 4×3 . 1 mark for showing all 12.

10 (3 marks)

Pens cost 30p each.

Pencils cost 20p each.

Kim buys at least one pen and at least one pencil.

She spends exactly £1.50

Find all the possible numbers of pens and pencils that Kim could buy.

$$£1.50 = 150\text{p}$$

Try each number of pens (30p each). See if the money left is a multiple of 20p.

1 pen: 30p, leaving 120p = 6 pencils ✓

2 pens: 60p, leaving 90p (not a multiple of 20)

3 pens: 90p, leaving 60p = 3 pencils ✓

4 pens: 120p, leaving 30p (not a multiple of 20)

5 pens: 150p, leaving 0p (she must buy at least one pencil)

So Kim could buy 1 pen and 6 pencils, or 3 pens and 3 pencils.

Answer: 1 pen and 6 pencils; 3 pens and 3 pencils

Tip: Work in pence so you do not mix pounds and pence. Try every possible number of pens so you do not miss an answer.

Marks: 1 mark for a systematic method, e.g. listing the cost of 1, 2, 3, ... pens. 1 mark for one correct combination. 1 mark for both combinations and no others.
