# Decomposition: Breaking Problems Down

Standard difficulty · 20 questions · 40 marks · Time: 39 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

## Section A — Choose the correct answer — 8 × 1 = 8 marks

1. Breaking a big problem into smaller parts that are easier to solve is:
   **(a)** pattern recognition **(b)** automation
   **(c)** abstraction **(d)** decomposition

2. I am a 3-digit number. The sum of my digits is 13. I am even. My hundreds digit is 3. I am between 285 and 372. My tens digit is 6 less than my units digit. Who am I?
   **(a)** 823 **(b)** 319 **(c)** 328 **(d)** 337

3. Rohan has 10, Priya has 40 and Varun has 30 beads. In turn: Rohan gives 6 beads to Priya; Priya gives 9 beads to Varun; Varun gives 6 beads to Rohan. How many beads does Rohan have at the end?
   **(a)** 10 **(b)** 12 **(c)** 37 **(d)** 33

4. Marks out of 100:
   Name: English, Maths, Art
   Meera: 75, 75, 90
   Tara: 85, 30, 80
   Nikhil: 95, 35, 85
   Rahul: 100, 95, 80
   How many children scored more than 65 in Maths?
   **(a)** 0 **(b)** 2 **(c)** 1 **(d)** 3

5. You have plenty of ₹1, ₹2, ₹5, ₹10 coins. What is the fewest number of coins that make exactly ₹49?
   **(a)** 9 **(b)** 6 **(c)** 7 **(d)** 8

6. Tara is heavier than Rohan. Nikhil is heavier than Isha. Isha is heavier than Tara. Put them in order, heaviest first. Who is fourth?
   **(a)** Isha **(b)** Tara **(c)** Rohan **(d)** Nikhil

7. Tara, Dev, Nikhil each have a different one of: banana, grape, mango. Tara has the banana. Nikhil has the mango. Who has the grape?
   **(a)** Dev **(b)** Tara
   **(c)** Nikhil **(d)** It cannot be worked out

8. How many numbers from 1 to 70 are multiples of 4 but NOT multiples of 3?
   **(a)** 12 **(b)** 13 **(c)** 17 **(d)** 11

## Section B — Short answer — 8 × 2 = 16 marks

9. What is decomposition?

**10.** I am a 3-digit number. The sum of my digits is 13. I am between 755 and 860. I am odd. My tens digit is 5 less than my units digit. Who am I?

**11.** Rohan has 32, Tara has 16 and Priya has 22 beads. In turn: Priya gives half of their beads to Tara; Tara gives 1 bead to Rohan; Tara gives 4 beads to Rohan. How many beads does Rohan have at the end?

**12.** Marks out of 100:
Name: English, Art, Maths
Rohan: 20, 70, 95
Rahul: 40, 55, 95
Asha: 40, 100, 65
Isha: 30, 85, 45
What is Asha's total in the three subjects?

**13.** You have plenty of ₹1, ₹2, ₹5, ₹10 coins. What is the fewest number of coins that make exactly ₹45?

**14.** Meera is older than Isha. Zoya is older than Varun. Varun is older than Meera. Who is the oldest?

**15.** Zoya, Rohan, Asha each have a different one of: chess, cricket, tennis. Rohan does not have the cricket. Zoya does not have the cricket. Rohan does not have the chess. Who has the tennis?

**16.** How many numbers from 1 to 50 are multiples of 3 but NOT multiples of 6?

## Section C — Word problems — 4 × 4 = 16 marks

**17.** Decompose the problem "organise a class library". List four sub-problems and say how each helps.

**18.** (a) Rahul has 48, Isha has 30 and Kabir has 38 beads. In turn: Kabir gives 2 beads to Rahul; Kabir gives half of their beads to Isha; Rahul gives half of their beads to Kabir. How many beads does Kabir have at the end?
(b) You have plenty of ₹1, ₹2, ₹5, ₹10 coins. What is the fewest number of coins that make exactly ₹47?

**19.** (a) I am a 3-digit number. I am between 951 and 992. The sum of my digits is 23. My tens digit is 4 less than my units digit. Who am I?
(b) Tara is older than Isha. Isha is older than Kabir. Meera is older than Tara. Put them in order, oldest first. Who is fourth?

**20.** (a) Priya, Zoya, Isha each have a different one of: guitar, drum, flute. Priya does not have the guitar. Isha has the guitar. Zoya does not have the drum. Who has the flute?
(b) How many numbers from 1 to 70 are multiples of 5 but NOT multiples of 2?

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# Answer key

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| Q | Answer | Working |
|---|---|---|
| 1 | **(d) decomposition** | — |
| 2 | **(c) 328** | check the clues one by one; only this number fits all of them |
| 3 | **(a) 10** | after each step: Rohan, Priya, Varun end with 10, 37, 33 (the total stays 80) |
| 4 | **(b) 2** | Maths: 75, 30, 35, 95 |
| 5 | **(c) 7** | use the biggest coin first: 4 × ₹10 + 1 × ₹5 + 2 × ₹2 |
| 6 | **(c) Rohan** | the order is Nikhil, Isha, Tara, Rohan |
| 7 | **(a) Dev** | only one way fits every clue: Tara – banana, Dev – grape, Nikhil – mango |
| 8 | **(a) 12** | 17 multiples of 4, of which 5 are also multiples of 3 (multiples of 12) |
| 9 | **Breaking a big or complex problem into smaller parts that are easier to understand and solve.** | — |
| 10 | **805** | check the clues one by one; only this number fits all of them |
| 11 | **37** | after each step: Rohan, Tara, Priya end with 37, 22, 11 (the total stays 70) |
| 12 | **205** | 40 + 100 + 65 |
| 13 | **5** | use the biggest coin first: 4 × ₹10 + 1 × ₹5 |
| 14 | **Zoya** | the order is Zoya, Varun, Meera, Isha |
| 15 | **Rohan** | only one way fits every clue: Zoya – chess, Rohan – tennis, Asha – cricket |
| 16 | **8** | 16 multiples of 3, of which 8 are also multiples of 6 (multiples of 6) |
| 17 | **Collect books (to have something to lend); sort them by type (so they are easy to find); make a register of who borrows what (so books come back); set rules for lending (so it is fair). Together they solve the whole problem.** | — |
| 18 | **(a) 43; (b) 6** | (a) after each step: Rahul, Isha, Kabir end with 25, 48, 43 (the total stays 116); (b) use the biggest coin first: 4 × ₹10 + 1 × ₹5 + 1 × ₹2 |
| 19 | **(a) 959; (b) Kabir** | (a) check the clues one by one; only this number fits all of them; (b) the order is Meera, Tara, Isha, Kabir |
| 20 | **(a) Zoya; (b) 7** | (a) only one way fits every clue: Priya – drum, Zoya – flute, Isha – guitar; (b) 14 multiples of 5, of which 7 are also multiples of 2 (multiples of 10) |