Decomposition: Clues, Ratios and Schedules

Standard difficulty · 20 questions · 40 marks · Time: 40 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. Multiples of 3 or 5 (or both) from 1 to 30 number:

(a) 10 **(b)** 15 **(c)** 16 **(d)** 14

2. I am a 3-digit number. The sum of my digits is 13. I am odd. My hundreds digit is 7. All my digits are different. I am a multiple of 5. Who am I?

(a) 517 **(b)** 706 **(c)** 715 **(d)** 724

3. Five jobs: A takes 3 min; B takes 6 min and starts only after A is done; C takes 3 min and starts only after A is done; D takes 9 min and starts only after A and B are done; E takes 2 min and starts only after C and D are done. Jobs can run at the same time when their rules allow. What is the shortest time, in minutes, to finish all five?

(a) 23 min **(b)** 20 min **(c)** 21 min **(d)** 9 min

4. A class of 60 has boys and girls in the ratio 2 : 1. 20% of the girls are in the science club. How many girls are in the science club?

(a) 20 **(b)** 4 **(c)** 12 **(d)** 8

5. How many numbers from 1 to 120 are multiples of 7 OR of 6 (or both)?

(a) 34 **(b)** 37 **(c)** 36 **(d)** 35

6. Arjun, Dev, Zoya, Rohan each have a different one of: violin, guitar, drum, flute. Arjun does not have the violin. Dev does not have the drum. Rohan has the violin. Arjun does not have the drum. Dev does not have the flute. Who has the drum?

(a) Arjun **(b)** Dev **(c)** Rohan **(d)** Zoya

7. Tara is faster than Rahul. Dev is not faster than Rahul. Isha is faster than Nikhil. Dev is faster than Isha. Put them in order, fastest first. Who is fourth?

(a) Rahul **(b)** Isha **(c)** Tara **(d)** Dev

8. Varun has 22, Priya has 66 and Arjun has 74 beads. In turn: Priya gives half of their beads to Arjun; Priya gives 5 beads to Arjun; Priya gives half of their beads to Arjun; Varun gives half of their beads to Priya. How many beads does Priya have at the end?

(a) 66 **(b)** 11 **(c)** 126 **(d)** 25

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

9. How many numbers from 1 to 60 are multiples of 4 or 6? Show the working.

10. I am a 4-digit number. I am a multiple of 5. My thousands digit is 9. The sum of my digits is 28. I am between 9,897 and 9,965. Who am I?

11. Five jobs: A takes 2 min; B takes 6 min and starts only after A is done; C takes 7 min and starts only after A is done; D takes 4 min and starts only after C and A are done; E takes 2 min and starts only after C is done. Jobs can run at the same time when their rules allow. What is the shortest time, in minutes, to finish all five?

12. A class of 200 has boys and girls in the ratio 2 : 3. 50% of the girls are in the art club. How many girls are in the art club?

13. How many numbers from 1 to 190 are multiples of 5 OR of 3 (or both)?

14. Sana, Kabir, Zoya, Asha each have a different one of: rabbit, cat, parrot, dog. Zoya does not have the parrot. Zoya has the cat. Kabir does not have the parrot. Asha does not have the dog. Sana does not have the parrot. Kabir does not have the dog. Who has the rabbit?

15. Rahul is older than Arjun. Arjun is older than Dev. Rahul is not older than Zoya. Dev is older than Sana. Put them in order, oldest first. Who is second?

16. Asha has 66, Tara has 34 and Isha has 70 marbles. In turn: Isha gives half of their marbles to Asha; Isha gives 3 marbles to Asha; Asha gives Isha as many marbles as Isha already has; Tara gives 7 marbles to Isha. How many marbles does Asha have at the end?

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

17. Plan a sports day by decomposition: list four sub-problems, one dependency between them and how you would check the plan works.

18. (a) Five jobs: A takes 8 min; B takes 6 min and starts only after A is done; C takes 4 min and starts only after A is done; D takes 7 min and starts only after B and C are done; E takes 4 min and starts only after C and B are done. Jobs can run at the same time when their rules allow. What is the shortest time, in minutes, to finish all five?
(b) A class of 150 has boys and girls in the ratio 3 : 2. 80% of the girls are in the art club. How many girls are in the art club?

19. (a) Rohan, Isha, Sana, Priya each have a different one of: dog, cat, parrot, rabbit. Isha does not have the cat. Sana has the rabbit. Rohan does not have the dog. Priya does not have the parrot. Priya does not have the cat. Who has the parrot?
(b) Rohan is faster than Sana. Arjun is faster than Priya. Rahul is not faster than Priya. Rahul is faster than Rohan. Who is the fastest?

20. (a) I am a 4-digit number. My thousands digit is 5. My first digit is 5 times my last digit. I am a multiple of 3. I am a multiple of 9. I am between 5,180 and 5,216. Who am I?
(b) How many numbers from 1 to 210 are multiples of 2 OR of 6 (or both)?

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Answer key

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Q	Answer	Working
1	**(d) 14**	—
2	**(c) 715**	check the clues one by one; only this number fits all of them
3	**(b) 20 min**	finish times: A 3, B 9, C 6, D 18, E 20
4	**(b) 4**	girls = 1/3 of 60 = 20; 20% of 20 = 4
5	**(d) 35**	17 + 20 − 2 (multiples of 42 counted twice)
6	**(d) Zoya**	only one way fits every clue: Arjun – flute, Dev – guitar, Zoya – drum, Rohan – violin
7	**(b) Isha**	the order is Tara, Rahul, Dev, Isha, Nikhil
8	**(d) 25**	after each step: Varun, Priya, Arjun end with 11, 25, 126 (the total stays 162)
9	**15 + 10 − 5 = 20 (multiples of 12 are counted twice).**	—
10	**9,955**	check the clues one by one; only this number fits all of them
11	**13 min**	finish times: A 2, B 8, C 9, D 13, E 11
12	**60**	girls = 3/5 of 200 = 120; 50% of 120 = 60
13	**89**	38 + 63 − 12 (multiples of 15 counted twice)
14	**Kabir**	only one way fits every clue: Sana – dog, Kabir – rabbit, Zoya – cat, Asha – parrot
15	**Rahul**	the order is Zoya, Rahul, Arjun, Dev, Sana
16	**72**	after each step: Asha, Tara, Isha end with 72, 27, 71 (the total stays 170)
17	**Sub-problems: events list, timetable, equipment, volunteers. Dependency: the timetable can only be made after the events are chosen. Check: walk through the day's timetable to see that every event has equipment and helpers.**	—
18	**(a) 21 min; (b) 48**	(a) finish times: A 8, B 14, C 12, D 21, E 18; (b) girls = 2/5 of 150 = 60; 80% of 60 = 48
19	**(a) Isha; (b) Arjun**	(a) only one way fits every clue: Rohan – cat, Isha – parrot, Sana – rabbit, Priya – dog; (b) the order is Arjun, Priya, Rahul, Rohan, Sana
20	**(a) 5,211; (b) 105**	(a) check the clues one by one; only this number fits all of them; (b) 105 + 35 − 35 (multiples of 6 counted twice)

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