We Distribute Yet Things Multiply: Thinking Puzzles

Standard difficulty · 20 questions · 40 marks · Time: 37 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. a × (b + c) equals:

(a) a + b × c **(b)** (a × b) × c **(c)** a × b + c **(d)** a × b + a × c

2. Using the distributive law, 40 × 98 = ?

(a) 3,920 **(b)** 4,000 **(c)** 3,960 **(d)** 3,880

3. 104 × 96 = ?

(a) 10,000 **(b)** 9,996 **(c)** 10,016 **(d)** 9,984

4. Painters A, B and C each paint 2 rooms on every day they work. They are booked for 27 days starting on a Monday. A does not work on Saturdays or Sundays; B does not work on every 6th day (day 6, day 12, …); C works every day. How many rooms do they paint in all?

(a) 140 **(b)** 162 **(c)** 94 **(d)** 142

5. A train runs from P to S, stopping at Q and R. 110 passengers board at P. At Q, 35 get off and 25 get on. At R, 30 get off and 30 get on. Everyone left gets off at S. A ticket costs ₹20 from P to Q, ₹25 from Q to R and ₹5 from R to S, for each stretch travelled. How much is collected in fares altogether?

(a) 2,700 **(b)** 5,500 **(c)** 5,200 **(d)** 5,325

6. Find (14 + 4)(9 + 3) − (14 − 4)(9 − 3). Look for a shortcut.

(a) 158 **(b)** 252 **(c)** 276 **(d)** 156

7. 208^2 = ?

(a) 43,272 **(b)** 40,064 **(c)** 43,264 **(d)** 41,664

8. A merchant has $24^2 - 1$ coins. Each of 5 children first gets 2 packs of 6 coins. Then, only if more than half of the original coins are left, each child gets 3 more packs of 6. How many coins are left with the merchant?

(a) 425 **(b)** 545 **(c)** 515 **(d)** 431

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

9. Explain why 25 × 44 = 25 × 40 + 25 × 4.

10. Work out 66 × 9 using the distributive law.

11. Work out 81 × 99 using $(a - b)(a + b) = a^2 - b^2$.

12. A works on a 53-day job that starts on a Monday, and does not work on Saturdays or Sundays. B works every day except every 4th day. (a) On how many days does A work? (b) On how many days does B work?

13. A train runs from P to S, stopping at Q and R. 60 passengers board at P. At Q, 30 get off and 45 get on. At R, 30 get off and 10 get on. Everyone left gets off at S. A ticket costs ₹25 from P to Q, ₹20 from Q to R and ₹20 from R to S, for each stretch travelled. How many passengers travel (a) from Q to R (b) from R to S?

14. Find $(14 + 9)^2 - (14 - 9)^2$ without squaring either bracket.

15. A merchant has (22 + 1)(22 − 1) coins and gives each of 2 children 5 packs of 8 coins. How many coins are left?

16. Find 9 + 18 + 27 + … + 243. (Take out the common factor first.)

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

17. Painters A, B and C each paint 5 rooms on every day they work, on a 54-day job starting on a Monday. A does not work on Saturdays or Sundays; B does not work on every 6th day; C works every day. (a) On how many days does A work? (b) On how many days does B work? (c) How many rooms are painted altogether?

18. A train runs from P to S, stopping at Q and R. 140 passengers board at P. At Q, 45 get off and 55 get on. At R, 45 get off and 60 get on. Everyone left gets off at S. A ticket costs ₹20 from P to Q, ₹20 from Q to R and ₹20 from R to S, for each stretch travelled. (a) How many passengers travel from Q to R? (b) From R to S? (c) How much is collected in fares altogether?

19. A shop sells notebooks at ₹120 each, with ₹6 off each notebook during a sale. Asha buys 18. (a) What would they cost without the sale? (b) How much is saved? (c) How much is paid? Show that 18 × (120 − 6) gives the same answer.

20. A hall has 9 rows of 14 seats. 6 more rows are added and every row gets 5 more seats. (a) How many seats were there? (b) How many are there now? (c) How many seats were added? Use (9 + 6)(14 + 5) = 9 × 14 + 9 × 5 + 6 × 14 + 6 × 5.

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Answer key

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Q	Answer	Working
1	**(d) a × b + a × c**	—
2	**(a) 3,920**	40 × (100 − 2) = 4,000 − 80
3	**(d) 9,984**	$(100 + 4)(100 - 4) = 100^2 - 4^2 = 10{,}000 - 16$
4	**(a) 140**	A 20 days, B 27 − 4 = 23 days, C 27; 2 × (20 + 23 + 27)
5	**(c) 5,200**	110 × 20 + 100 × 25 + 100 × 5
6	**(d) 156**	the expression always equals 2(ad + bc) for (a + b)(c + d) − (a − b)(c − d): 2(14 × 3 + 4 × 9)
7	**(c) 43,264**	$(200 + 8)^2 = 40{,}000 + 2 \times 200 \times 8 + 64$
8	**(a) 425**	$24^2 - 1 = 575$; 575 − 5 × 2 × 6 = 515 > 287.5, so − 5 × 3 × 6 = 425
9	**44 = 40 + 4, and multiplying a sum means multiplying each part and adding (the distributive law).**	—
10	**594**	66 × (10 − 1) = 660 − 66
11	**8,019**	$90^2 - 9^2 = 8{,}100 - 81$
12	**(a) 39; (b) 40**	A: count the working days week by week; B: 53 − 13
13	**(a) 75; (b) 55**	60 − … at each station: subtract those who get off, add those who get on
14	**504**	$(a + b)^2 - (a - b)^2 = 4ab = 4 \times 14 \times 9$
15	**403**	$(22 + 1)(22 - 1) = 22^2 - 1 = 483$; 483 − 2 × 5 × 8
16	**3,402**	9 × (1 + 2 + … + 27) = 9 × 378
17	**(a) 40; (b) 45; (c) 695**	5 × (40 + 45 + 54) = 695
18	**(a) 150; (b) 165; (c) ₹9,100**	140 × 20 + 150 × 20 + 165 × 20
19	**(a) ₹2,160; (b) ₹108; (c) ₹2,052**	18 × 120 − 18 × 6 = 18 × 114
20	**(a) 126; (b) 285; (c) 159**	126 + 45 + 84 + 30