CLASS VIII – MATHEMATICS

Chapter Test: We Distribute, Yet Things Multiply – Step-by-Step Solutions & Marking Scheme

(Ganita Prakash, Grade 8, Part I – Chapter 6)

M. M.: 40 | Marks for each step are shown in square brackets.

Section A – Multiple Choice Questions (1 mark each)

Q.	Ans.	Solution
1	**(B)**	(36 + 1) × 45 = 36 × 45 + 1 × 45, so the product increases by **45** (the other number).
2	**(C)**	$(x + 3)(x + 5) = x^2 + 5x + 3x + 15 = \mathbf{x^2 + 8x + 15}$.
3	**(D)**	$(2a - 3)^2 = (2a)^2 - 2(2a)(3) + 3^2 = \mathbf{4a^2 - 12a + 9}$.
4	**(A)**	$103 \times 97 = (100 + 3)(100 - 3) = 100^2 - 3^2 = 10000 - 9 = \mathbf{9991}$.
5	**(B)**	$52^2 = (50 + 2)^2 = 2500 + 200 + 4 = \mathbf{2704}$.
6	**(C)**	$a^2 + b^2 = (a + b)^2 - 2ab = 49 - 24 = \mathbf{25}$.
7	**(A)**	One-line rule: ones digit 1; then 2 + 1 = 3; 3 + 2 = 5; 4 + 3 = 7; first digit 4. So 4321 × 11 = **47531**.
8	**(B)**	$(x^2 + 2xy + y^2) - (x^2 - 2xy + y^2) = \mathbf{4xy}$.
9	**(A)**	The bottom row is one row below the centre, so p becomes p + 1; the left column is one column to the left, so q becomes q − 1. The shaded cell is **(p + 1)(q − 1)**.
10	**(C)**	Step 1 has 1 row of 4, Step 2 has 2 rows of 5, Step 3 has 3 rows of 6. So Step k has k rows of (k + 3) dots: k(k + 3) = $\mathbf{k^2 + 3k}$.

Section B – Very Short Answer Questions (2 marks each)

Q11. Square of side (x + 4) (Fig. 3)

(i) P is x by x: area $\mathbf{x^2}$. Q is 4 by x: area **4x**. R is x by 4: area **4x**. S is 4 by 4: area **16**. [1]

(ii) The whole square has area $(x + 4)^2 = x^2 + 4x + 4x + 16 = \mathbf{x^2 + 8x + 16}$. [1]

Q12.

(A) $(3a + 2b)(a - 4b) = 3a \times a + 3a \times (-4b) + 2b \times a + 2b \times (-4b)$ [1]

$= 3a^2 - 12ab + 2ab - 8b^2 = \mathbf{3a^2 - 10ab - 8b^2}$. [1]

(B) $(2x/3) \times 9x = 6x^2$; $(2x/3) \times (-6y) = -4xy$; $(2x/3) \times 3 = 2x$. [1]

Result: $\mathbf{6x^2 - 4xy + 2x}$. [1]

Q13. 998^2

$998 = 1000 - 2$, so $998^2 = (1000 - 2)^2 = 1000^2 - 2(1000)(2) + 2^2$ (identity $(a - b)^2$). [1]

$= 1{,}000{,}000 - 4{,}000 + 4 = \mathbf{996{,}004}$. [1]

Section C – Short Answer Questions (3 marks each)

Q14. Lawn and path (Fig. 4)

(i) The path adds 2 m on each side, so the outer square has side x + 2 + 2 = x + 4. Area = $\mathbf{(x + 4)^2\ m^2}$. [1]

(ii) Area of path = $(x + 4)^2 - x^2 = x^2 + 8x + 16 - x^2 = \mathbf{8x + 16\ m^2}$. [1]

(iii) For x = 10: 8(10) + 16 = $\mathbf{96\ m^2}$. (Check: $14^2 - 10^2 = 196 - 100 = 96$.) [1]

Q15.

(A) (i) $87 \times 93 = (90 - 3)(90 + 3) = 90^2 - 3^2 = 8100 - 9 = \mathbf{8091}$. [1½]

(ii) $71^2 = (70 + 1)^2 = 4900 + 2(70)(1) + 1 = 4900 + 140 + 1 = \mathbf{5041}$. [1½]

(B) (i) 7264 × 11: units digit 4; 6 + 4 = 10, write 0 carry 1; 2 + 6 + 1 = 9; 7 + 2 = 9; first digit 7. So **79,904**. (Check: 72640 + 7264 = 79904.) [1½]

(ii) 5230 × 101 = 5230 × 100 + 5230 = 523000 + 5230 = **528,230**. (One-line rule: digits 5 2 3 0 give 5, 2, (3 + 5), (0 + 2), 3, 0.) [1½]

Q16.

(A) $a^2 + b^2 = (a + b)^2 - 2ab = 81 - 28 = \mathbf{53}$. [1½]

$(a - b)^2 = a^2 + b^2 - 2ab = 53 - 28 = \mathbf{25}$. (Also $= (a + b)^2 - 4ab = 81 - 56 = 25$.) [1½]

(B) $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$. [1]

Subtracting: $(a + b)^2 - (a - b)^2 = 4ab$. [1]

For $22^2 - 12^2$: $a + b = 22$ and $a - b = 12$ give $a = 17$, $b = 5$. So the value is $4 \times 17 \times 5 = \mathbf{340}$. (Check: 484 − 144 = 340.) [1]

Q17.

(A) (i) The middle term $2 \times 3x \times 2 = 12x$ was left out. Correct: $(3x + 2)^2 = (3x)^2 + 2(3x)(2) + 2^2 = \mathbf{9x^2 + 12x + 4}$. [1½]

(ii) Only $4a \times a$ and $(-3) \times 2$ were multiplied; the cross terms were left out. Correct: $(4a - 3)(a + 2) = 4a^2 + 8a - 3a - 6 = \mathbf{4a^2 + 5a - 6}$. [1½]

(B) For k = 10: $10 \times 13 = \mathbf{130}$ dots. [1]

$(k + 1)(k + 2) - 2 = k^2 + 2k + k + 2 - 2 = k^2 + 3k$. [1]

And $k(k + 3) = k^2 + 3k$. Both sides are equal, so the identity is true. [1]

Section D – Long Answer / Case-based Questions (4 marks each)

Q18.

(A) (i) Area of L-shaped region = area of big square − area of small square = $\mathbf{x^2 - y^2}$. [1]

(ii) Lower rectangle: length x, height (x − y), area = x(x − y). Upper-left rectangle: width (x − y), height y, area = y(x − y). [1]

Sum = x(x − y) + y(x − y) = (x + y)(x − y) (taking (x − y) as a common factor). So $x^2 - y^2 = (x + y)(x - y)$. [1]

(iii) For x = 14, y = 6: $14^2 - 6^2 = 196 - 36 = \mathbf{160\ m^2}$. (Also (20)(8) = 160.) [1]

(B) (i) Area = $(2x + 5)(x + 3) = 2x^2 + 6x + 5x + 15$ [1]

$= \mathbf{2x^2 + 11x + 15\ m^2}$. [1]

(ii) For x = 5: 2(25) + 55 + 15 = 50 + 55 + 15 = $\mathbf{120\ m^2}$. [1]

(iii) New length 2x + 8 and new breadth x + 2: new area = $(2x + 8)(x + 2) = 2x^2 + 4x + 8x + 16 = 2x^2 + 12x + 16$. Increase = $(2x^2 + 12x + 16) - (2x^2 + 11x + 15) = \mathbf{(x + 1)\ m^2}$. [1]

Q19.

(A) (i) $(a + b)^2 + (a - b)^2 = (a^2 + 2ab + b^2) + (a^2 - 2ab + b^2)$. [1]

The 2ab terms cancel, giving $2a^2 + 2b^2 = 2(a^2 + b^2)$. Hence the identity. [1]

(ii) $2(7^2 + 4^2) = (7 + 4)^2 + (7 - 4)^2 = \mathbf{11^2 + 3^2}$. (Check: 2 × 65 = 130 = 121 + 9.) [1]

(iii) a = −3, b = 5: LHS = 2(9 + 25) = 68. RHS = $(2)^2 + (-8)^2 = 4 + 64 = 68$. LHS = RHS, so it holds for integers that are negative too. [1]

(B) (i) Products: $a(a + 8) = a^2 + 8a$ and $(a + 1)(a + 7) = a^2 + 8a + 7$. [1]

Difference = $(a^2 + 8a + 7) - (a^2 + 8a) = \mathbf{7}$. [1]

(ii) The a^2 and 8a terms cancel in the subtraction, so only the constant 7 remains; the difference is the same for every a. [1]

(iii) a = 20: 20 × 28 = 560 and 21 × 27 = 567; 567 − 560 = 7 ✓. [1]

Q20. Case Study: ista-gunana

(i) $56 \times 99 = 56 \times (100 - 1) = 5600 - 56 = \mathbf{5544}$. [1]

(ii) 3142 × 101: digits d c b a = 3 1 4 2. The product has digits d, c, (b + d), (a + c), b, a = 3, 1, (4 + 3) = 7, (2 + 1) = 3, 4, 2. So **317,342**. (Check: 314200 + 3142 = 317342.) [1]

(iii) $197^2 = (200 - 3)^2 = 40000 - 2(200)(3) + 9 = 40000 - 1200 + 9 = \mathbf{38,809}$. [1]

(iv) $48 \times 52 = (50 - 2)(50 + 2) = 50^2 - 2^2 = 2500 - 4 = \mathbf{2496}$. [1]

Note for teachers: Award full marks for any correct alternative method. In Q15 and Q20 any correct method (identity, distributive property or the one-line rule) that reaches the right product earns the marks. In Q17(A) the mistake must be named as well as corrected.