CLASS VIII – MATHEMATICS

Chapter Test: Algebra Play – Step-by-Step Solutions & Marking Scheme

(Ganita Prakash, Grade 8, Part II – 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	**(A)**	$(3n + 12)/3 - n = n + 4 - n =$ **4**.
2	**(C)**	4M + 5, then × 25 gives 100M + 125; adding D gives 100M + 125 + D = 654, so 100M + D = 529. D is at most 31 (two digits), so D = 29 and M = 5: **29 May**.
3	**(D)**	Top = a + 2b + c = 2 + 2 × 5 + 3 = **15**. (Check: 7 and 8 in the middle row, 7 + 8 = 15.)
4	**(B)**	Row 3: a + b, b + c, c + d. Row 2: a + 2b + c, b + 2c + d. Top: **a + 3b + 3c + d**.
5	**(C)**	Square = 21 ÷ 3 = 7. Circle = 13 − 7 = **6**.
6	**(A)**	Use the largest digit 7 as the multiplier and arrange the other two digits in decreasing order: 42 × 7 = **294**.
7	**(B)**	(10a + b) − (10b + a) = 9a − 9b = 9(a − b): divisible by **9**.
8	**(C)**	abc + bca + cab = 111(a + b + c) = 37 × 3(a + b + c): always divisible by **37**.
9	**(B)**	Top = 5 + 2b + 8 = 29, so 2b = 16 and b = **8**. (Check: middle row 13, 16; 13 + 16 = 29.)
10	**(D)**	If the smallest number is a, the grid is a, a + 1, a + 7, a + 8 with sum 4a + 16 = 76. So 4a = 60 and a = **15** (the numbers are 15, 16, 22, 23).

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

Q11. Shape grid (Fig. 3)

(i) Row 1: 3 squares = 24, so square = 24 ÷ 3 = **8**. [1]

(ii) Row 2: 2 circles + square = 22, so 2 circles = 22 − 8 = 14 and circle = **7**. [1]

Q12.

(A) n → 5n → 5n + 10 → (5n + 10)/5 = n + 2. [1]

Subtracting n: n + 2 − n = **2**, whatever n is. [1]

(B) ab = 10a + b and ba = 10b + a. [1]

(10a + b) − (10b + a) = 9a − 9b = 9(a − b), which is divisible by 9. [1]

Q13. Largest product

Largest digit 8 is the multiplier; the other digits in decreasing order give 64. Arrangement: **64 × 8**. [1]

Product = **512**. (Other arrangements: 84 × 6 = 504, 86 × 4 = 344, 46 × 8 = 368, ..., all smaller.) [1]

Section C – Short Answer Questions (3 marks each)

Q14. 'Think of a Number' trick (Fig. 4)

(i) Step 1: n. Step 2: 4n. Step 3: 4n + 10. Step 4: (4n + 10)/2 = 2n + 5. Step 5: 2n + 5 − 2n = 5. [1]

(ii) The final result is **5**. It does not depend on n, because the n terms cancel. [1]

(iii) Let Step 3 add k: (4n + k)/2 − 2n = k/2. For the result 8, k/2 = 8, so k = **16** ("Add 16"). [1]

Q15.

(A) Top = a + 2b + c = 7 + 2 × 12 + 5 [1] = 7 + 24 + 5 = **36**. [1]

Verification: middle row 7 + 12 = 19 and 12 + 5 = 17; top 19 + 17 = 36. [1]

(B) Top = a + 3b + 3c + d = 2 + 3 × 5 + 3 × 3 + 6 [1] = 2 + 15 + 9 + 6 = **32**. [1]

Verification: row 3: 7, 8, 9; row 2: 15, 17; top 15 + 17 = 32. [1]

Q16.

(A) Let the top-left number be a: the grid is a, a + 1, a + 7, a + 8. Sum = 4a + 16. [1]

4a + 16 = 108, so 4a = 92 and a = 23. [1]

The numbers are **23, 24, 30, 31**. [1]

(B) Let the dates be a, a + 7, a + 14. Sum = 3a + 21. [1]

3a + 21 = 57, so 3a = 36 and a = 12. [1]

The dates are **12, 19, 26**. [1]

Q17.

(A) The largest digit 9 should be the multiplier, so the candidates are 62 × 9 and 92 × 6 (the largest multiplicand for each multiplier). [1]

62 × 9 = (6 × 10 × 9) + (2 × 9) = 540 + 18 = 558; 92 × 6 = (9 × 10 × 6) + (2 × 6) = 540 + 12 = 552. [1]

The first terms are equal and 2 × 9 > 2 × 6, so the largest product is **62 × 9 = 558**. [1]

(B) Let the start be x. After a bridge: 2x − 4. After 3 bridges: 2(2(2x − 4) − 4) − 4. [1]

= 8x − 16 − 8 − 4 = 8x − 28 = 12. [1]

8x = 40, so x = **5 items**. (Check: 5 → 6 → 8 → 12.) [1]

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

Q18.

(A) (i) Row 3 left = 2 + b = 11, so b = **9**. [1]

(ii) Row 3: 11, 9 + c, c + 7. Row 2: 11 + 9 + c = 20 + c and 9 + c + c + 7 = 16 + 2c. Top = (20 + c) + (16 + 2c) = **36 + 3c**. [1]

(iii) 36 + 3c = 63, so 3c = 27 and c = **9**. [1]

(iv) Bottom: 2, 9, 9, 7. Row 3: 11, 18, 16. Row 2: 29, 34. Top: 63. [1]

(B) (i) Dates: a, a + 1, a + 2, a + 7, a + 8, a + 9, a + 14, a + 15, a + 16. [1] Sum = 9a + 72. [1]

(ii) 9a + 72 = 135, so 9a = 63 and a = 7. [1]

The dates are **7, 8, 9, 14, 15, 16, 21, 22, 23**. [1]

Q19.

(A) (i) d + g = 40 and 2d + 4g = 112. [1]

(ii) d = 40 − g: 2(40 − g) + 4g = 112, so 80 + 2g = 112, g = 16. [1]

d = 40 − 16 = 24. **24 ducks and 16 goats**. [1]

(iii) Heads: 24 + 16 = 40. Legs: 2 × 24 + 4 × 16 = 48 + 64 = 112. Both are correct. [1]

(B) (i) Let the son's age be s; father's age 4s. 4s + 8 = 2.5(s + 8). [1]

(ii) 4s + 8 = 2.5s + 20, so 1.5s = 12 and s = 8. Father = 4 × 8 = 32. **Son 8 years, father 32 years**. [2]

(iii) After 8 years: son 16, father 40; 2.5 × 16 = 40. Correct. [1]

Q20. Case Study: Tea stall

(i) Total cost = **₹(800 + 6n)**. [1]

(ii) Let the price be p. 200p − (800 + 6 × 200) = 400, so 200p = 2400 and p = **₹12**. [1]

(iii) 14n − (800 + 6n) = 1200, so 8n = 2000 and n = **250 cups**. [1]

(iv) 14n = 800 + 6n, so 8n = 800 and n = **100 cups**. [1]

Note for teachers: Award full marks for any correct alternative method (for example, solving Q19(A) by assuming all animals are ducks). Units must be stated in the final answers.