GANITA PRAKASH • GRADE 7

Chapter 4 — Expressions Using Letter-Numbers

Handwriting-Style Exam Notes
Book pages 81–95

All visible examples + in-text questions + Figure it Out + Mind the Mistake + Formula Detective

Strict book coverage: These notes follow the sequence and ideas of the Ganita Prakash textbook. The wording is shortened into notebook-style revision points, while the examples and exercises are solved step-by-step.

Golden Rule:
A letter-number represents a number. Replace it by its given value when evaluating, and combine only like terms when simplifying.

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4.1 The Notion of Letter-Numbers

Example 1. Shabnam is 3 years older than Aftab. Aftab is now 18 years old. Find Shabnam's age.

✦ Understand: "3 years older" means add 3.

✓ **Answer: Shabnam = 18 + 3 = 21 years.**

Expression: s = a + 3 (s = Shabnam's age, a = Aftab's age)

If a = 23, then s = 23 + 3 = 26 years.

Key idea: Letters such as a and s are letter-numbers. An expression containing letter-numbers is an algebraic expression.

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Example 1 (continued). Given Shabnam's age s, write an expression for Aftab's age a. Then find a when s = 20.

✦ Understand: Aftab is 3 years younger, so subtract 3.

✓ **Answer: a = s − 3; when s = 20, a = 20 − 3 = 17 years.**

Example 2. Each L-shape uses 2 matchsticks. How many sticks are needed for 5, 7 and 45 Ls?

✦ Understand: Number of sticks = 2 × number of Ls. If n is the number of Ls, expression = 2n.

✓ **Answer: 5×2 = 10; 7×2 = 14; 45×2 = 90.**

Exam point: "times" → multiplication. "more than" → addition. "less than/younger than" → subtraction.

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Example 3. A coconut costs ₹35 and 1 kg jaggery costs ₹60. Find the total cost for 10 coconuts and 5 kg jaggery.

✓ **Answer: 10×35 + 5×60 = 350 + 300 = ₹650.**

Example 3 (continued). Find the cost for 8 coconuts and 9 kg jaggery.

✓ **Answer: 8×35 + 9×60 = 280 + 540 = ₹820.**

General expression: If c = number of coconuts and j = kg of jaggery:
Total = c×35 + j×60 = 35c + 60j.

Use the expression. Find the cost of 7 coconuts and 4 kg jaggery.

✓ **Answer: 35(7) + 60(4) = 245 + 240 = ₹485.**

Example 4. The perimeter of a square is 4 times its side. If q is the side length, write the expression. Then find the perimeter when q = 7 cm.

✦ Understand: A square has 4 equal sides.

✓ **Answer: Expression = 4q. For q = 7, P = 4×7 = 28 cm.**

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Figure it Out — Questions 1–5

Q1(a). Perimeter of an equilateral triangle with side a.

✓ **Answer: a+a+a = 3a.**

Q1(b). Perimeter of a regular pentagon with side a.

✓ **Answer: 5a.**

Q1(c). Perimeter of a regular hexagon with side a.

✓ **Answer: 6a.**

Q2. A 20 m pipe is joined to another pipe of length k m.

✓ **Answer: 20+k metres.**

Q3. Krithika's notes

₹100 notes	₹20 notes	₹5 notes	Expression / total
3	5	6	3×100 + 5×20 + 6×5 = ₹430
6	4	3	6×100 + 4×20 + 3×5 = ₹695
8	4	z	8×100 + 4×20 + 5z = ₹880 + 5z
x	y	z	100x + 20y + 5z

Q4. Flour mill takes 10 seconds to start and 8 seconds per kg. Which expression gives time for y kg?

✦ Understand: Fixed time is 10; variable time is 8×y.

✓ **Answer: 10 + 8y → option (d).**

Q5. Write expressions: (a) 5 more than a number (b) 4 less than a number (c) 2 less than 13 times a number (d) 13 less than 2 times a number.

✓ **Answer: (a) n+5 (b) n−4 (c) 13n−2 (d) 2n−13**

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Figure it Out — Q6–7 + Revisiting Arithmetic Expressions

Q6(a). Describe a situation for 8x+3y.

✓ **Answer: Example: x notebooks at ₹8 each and y pencils at ₹3 each. Total = 8x+3y.**

Q6(b). Describe a situation for 15j−2k.

✓ **Answer: Example: ₹15 earned for each of j items, less ₹2 for each of k returned/discounted items.**

Q7. In a 2×3 calendar block, the bottom-middle date is w. Write expressions for the other five cells.

✦ Understand: Left/right changes by 1; one week up changes by 7.

✓ **Answer: Top row: w−8, w−7, w−6; bottom row: w−1, w, w+1.**

4.2 Revisiting Arithmetic Expressions

Remember: Swapping and grouping terms does not change the value. With brackets, evaluate the bracket or remove it carefully. A minus sign outside a bracket changes the signs inside.

1. 23−10×2

✦ Understand: 10×2=20.

✓ **Answer: 3**

2. 83+28−13+32

✦ Understand: (83−13)+(28+32)=70+60.

✓ **Answer: 130**

3. 34−14+20

✦ Understand: (34−14)+20=20+20.

✓ **Answer: 40**

4. 42+15−(8−7)

✦ Understand: Bracket = 1; 57−1=56.

✓ **Answer: 56**

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5. $68-(18+13)$

✦ Understand: $18+13=31$; $68-31=37$.

✓ **Answer: 37**

6. $7\times4+9\times6$

✦ Understand: $28+54=82$.

✓ **Answer: 82**

7. $20+8\times(16-6)$

✦ Understand: Bracket first: 10; $8\times10=80$; $20+80=100$.

✓ **Answer: 100**

4.3 Omission of the Multiplication Symbol

Sequence: 4, 8, 12, 16, 20, ... These are multiples of 4. The nth term is $4\times n$, written simply as $4n$.

Evaluate. Find $7k$ when $k=4$.

✓ **Answer: $7k=7\times4=28$.**

Evaluate. Find $5m+3$ when $m=2$.

✓ **Answer: $5(2)+3=13$.**

Important notation: $4\times n=4n$, $7\times k=7k$. The number is written before the letter.

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Mind the Mistake, Mend the Mistake — Substitution

1. a=−4; 10−a=6 → Wrong. Correct: 10−(−4)=14.
2. d=6; 3d=36 → Wrong. Correct: 3×6=18.
3. s=7; 3s−2=15 → Wrong. Correct: 3×7−2=19.
4. r=8; 2r+1=29 → Wrong. Correct: 2×8+1=17.
5. j=5; 2j=10 → Correct. Correct: 2×5=10.
6. m=−6; 3(m+1)=19 → Wrong. Correct: 3(−6+1)=−15.
7. f=3,g=1; 2f−2g=2 → Wrong. Correct: 6−2=4.
8. t=4,b=3; 2t+b=24 → Wrong. Correct: 8+3=11.
9. h=5,n=6; h−(3−n)=4 → Wrong. Correct: 5−(−3)=8.

Exam tip: When a letter is replaced by a negative number, keep the brackets: 10−(−4)=14.

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4.4 Simplification of Algebraic Expressions

Rectangle perimeter: p=l+b+l+b=l+l+b+b=2l+2b.

Example check: if l=3 and b=4, both forms give 14, so they are equivalent.

Example 5. Pencils sold over 3 days: 5, 3, 10. Price each=c. Simplify pencil earnings.

✦ Understand: Only like terms with c are combined.

✓ **Answer: 5c+3c+10c=(5+3+10)c=18c.**

For erasers: 4d+6d+1d=11d. Total earnings = 18c+11d.

Example 5 (value). If c=₹50, find pencil earnings.

✓ **Answer: 18×50=₹900.**

Check equivalence. Take c=5. Compare 5c+3c+10c with 18c.

✓ **Answer: Both=90. Hence equivalent.**

Like terms: 5c,c,10c have the same letter-number. Unlike terms: 18c and 11d have different letter-numbers and cannot be combined.

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Example 6. A rectangle of height v is split into widths 4 and 3. Find the area of the bigger rectangle.

✦ Understand: Distributive property: $4v+3v=(4+3)v$.

✓ **Answer: $v(4+3)=7v$; also $4v+3v=7v$.**

Example 6 (second rectangle). Height=n, total length=12, right part=4. Find area of left rectangle AEFD.

✓ **Answer: $n(12-4)=8n$; also $12n-4n=8n$.**

Key rule: Like terms can be added/subtracted. Example: $12n-4n=8n$. Unlike terms cannot be combined: $18c+11d$ stays as it is.

Example 7. Chair costs ₹40 and table ₹75 initially. Refunds are ₹6 per chair and ₹10 per table. For x chairs and y tables, write and simplify net payment.

✦ Understand: A minus before a bracket changes the signs inside.

✓ **Answer: $(40x+75y)-(6x+10y)=40x-6x+75y-10y=34x+65y$.**

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Example 7 — simplifying by grouping like terms

Net payment = 34x+65y rupees. Equivalent form: (40x+75y)+(−6x−10y).

Example 8. Charu’s three quiz scores are 7p−3q, 8p−4q, and 6p−2q. If p=4 and q=1, find first-round score.

✓ **Answer: 7(4)−3(1)=28−3=25.**

Example 8. Find second and third round scores for p=4,q=1.

✓ **Answer: Second: 8(4)−4(1)=28. Third: 6(4)−2(1)=22.**

No penalty? What is q if there is no penalty?

✓ **Answer: q=0.**

Charu’s total: (7p−3q)+(8p−4q)+(6p−2q)=21p−9q.

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Example 8 (continued). Give possible three-round scores for Krishita that total $23p-7q$.

✓ **Answer: One valid set: $(8p-4q),(9p-2q),(6p-q)$. $\text{Sum}=(8+9+6)p-(4+2+1)q=23p-7q$.**

Who scored more? Compare Krishita's $23p-7q$ with Charu's $21p-9q$.

✓ **Answer: Krishita scored more for positive p and q.**

Difference. Simplify $(23p-7q)-(21p-9q)$.

✓ **Answer: $23p-7q-21p+9q=2p+2q=2(p+q)$.**

Example 9. Simplify $4(x+y)-y$.

✦ Understand: Use distributive property first.

✓ **Answer: $4x+4y-y=4x+3y$.**

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Example 10. Are 5u and 5+u equal?

✓ **Answer: No. 5u means 5×u; 5+u means 5 more than u.**

u	5u	5+u
11	55	16
2	10	7
8	40	13
5	25	10

Conclusion: The values differ, so 5u and 5+u are not equal.

Math Talk. Are 10y−3 and 10(y−3) equal?

✓ **Answer: No. 10y−3 means (10×y)−3; 10(y−3) means 10×(y−3).**

y	10y−3	10(y−3)
2	17	−10
0	−3	−30
10	97	70
7	67	40

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Example 11. Find the sum of the numbers in the picture containing eight 3s, two r’s and two s’s.

✓ **Answer: All methods simplify to 24+2r+2s.**

Method 1: (4×3)+(r+s)+(r+s)+(4×3)=24+2r+2s.

Method 2: (8×3)+(r+r)+(s+s)=24+2r+2s.

Method 3: 2(4×3+r+s)=24+2r+2s.

Lesson: Different grouping/order can give different-looking expressions with the same value.

Figure it Out — Q1: Add each picture in different ways and simplify.

Picture 1: Column/row addition → 5y+x−4.

Picture 2: Total = 1 (row-wise and column-wise).

Picture 3: Two kinds of rows/columns simplify to 10k−10g and 20k; different addition paths agree.

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Figure it Out — Q2

a1. p+p+p+p = 4p
a2. p+p+p+q = 3p+q
a3. p+q+p−q = 2p
b1. p−q+p−q = 2p−2q
b2. p+q−p+q = 2q
c1. p+q−(p+q) = 0
c2. p−q−p−q = −2q
d1. 2d−d−d−d = −d
d2. 2d−d−d−c = −c
e1. 2d−d−(d−c) = c
e2. 2d−(d−d)−c = 2d−c
f. 2d−d−c−c = d−2c

Mind the Mistake, Mend the Mistake — the table continues on the next book page.

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Mind the Mistake, Mend the Mistake

1. 3a+2b → Given: 5. Wrong: unlike terms. Correct 3a+2b.
2. 3b−2b−b → Given: 0. Correct. (3−2−1)b=0.
3. 6(p+2) → Given: 6p+8. Wrong. Correct 6p+12.
4. (4x+3y)−(3x+4y) → Given: x+y. Wrong. Correct x−y.
5. 5−(2−6z) → Given: 3−6z. Wrong. Correct 3+6z.
6. 2+(x+3) → Given: 2x−6. Wrong. Correct x+5.
7. 2y+(3y−6) → Given: −y+6. Wrong. Correct 5y−6.
8. 7p−p+5q−2q → Given: 7p+3q. Wrong. Correct 6p+3q.
9. 5(2w+3x+4w) → Given: 10w+15x+20w. Not fully simplified. Correct 30w+15x.
10. 3j+6k+9h+12 → Given: 3(j+2k+3h+4). Equivalent forms; expanded form is simplest here: 3j+6k+9h+12.
11. 4+(2r+3s+5) → Given: −20−8r−12s. Wrong. Correct 2r+3s+9.

Relationship: After simplification, the number of terms generally matches the number of different letter-numbers, plus 1 if there is a separate constant term.

4.5 Pick Patterns and Reveal Relationships — Formula Detective

Formula Detective. Find the rule of the number machine.

✓ **Answer: Rule: two times the first number minus the second number. Formula = 2a−b.**

Inputs (a,b)	Calculation	Output
(5,2)	2×5−2	8
(8,1)	2×8−1	15
(9,11)	2×9−11	7
(10,10)	2×10−10	10
(6,4)	2×6−4	8

Exam point: Find one rule that works for every input pair, then verify it with all examples.

End of requested range: Book Page 95. Questions beginning on page 96 are intentionally not included.