



Class 9 Maths – Ganita Manjari



Chapter 4: Exploring Algebraic Identities



Exercise Set 4.3 – Solutions

Exercise Set 4.3 has 4 questions.



Q1. Find the following squares

(i) 117^2

$$117 = 100 + 17$$

$$\text{Using } (a + b)^2 = a^2 + 2ab + b^2$$

$$\begin{aligned} 117^2 &= (100 + 17)^2 \\ &= 100^2 + 2(100)(17) + 17^2 \\ &= 10000 + 3400 + 289 \\ &= \mathbf{13689} \end{aligned}$$

✓ Answer: **13689**

(ii) 78^2

$$78 = 80 - 2$$

$$\text{Using } (a - b)^2 = a^2 - 2ab + b^2$$

$$\begin{aligned} 78^2 &= (80 - 2)^2 \\ &= 6400 - 320 + 4 \\ &= \mathbf{6084} \end{aligned}$$

✓ Answer: **6084**

(iii) 198^2

$$198 = 200 - 2$$

$$\begin{aligned} 198^2 &= (200 - 2)^2 \\ &= 40000 - 800 + 4 \\ &= \mathbf{39204} \end{aligned}$$

✓ Answer: **39204**

(iv) 214^2

$$214 = 200 + 14$$

$$\begin{aligned} 214^2 &= (200 + 14)^2 \\ &= 40000 + 5600 + 196 \\ &= \mathbf{45796} \end{aligned}$$

✓ Answer: **45796**

(v) 1104^2

$$1104 = 1100 + 4$$

$$\begin{aligned} 1104^2 &= (1100 + 4)^2 \\ &= 1210000 + 8800 + 16 \\ &= \mathbf{1218816} \end{aligned}$$

✓ Answer: **1218816**

(vi) 1120^2

$$1120 = 1100 + 20$$

$$\begin{aligned} 1120^2 &= (1100 + 20)^2 \\ &= 1210000 + 44000 + 400 \\ &= \mathbf{1254400} \end{aligned}$$

✓ Answer: **1254400**

The textbook asks students to choose whichever of the established identities makes each calculation easier.

Q2. Factor using suitable identities

(i) $16y^2 - 24y + 9$

$$= (4y)^2 - 2(4y)(3) + 3^2$$

$$= (4y - 3)^2$$

✓ Answer: $(4y - 3)^2$

(ii) $9/4 s^2 + 6st + 4t^2$

$$= (3s/2)^2 + 2(3s/2)(2t) + (2t)^2$$

$$= (3s/2 + 2t)^2$$

✓ Answer: $(3s/2 + 2t)^2$

(iii) $m^2/9 + mk/3 + k^2/4 + 3nk + 2mn + 9n^2$

Take:

$$a = m/3$$

$$b = k/2$$

$$c = 3n$$

Using:

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

Therefore:

$$= (m/3 + k/2 + 3n)^2$$

✓ Answer: $(m/3 + k/2 + 3n)^2$

(iv) $p^2/16 - 2 + 16/p^2$

Take:

$$a = p/4$$

$$b = 4/p$$

Then:

$$a^2 = p^2/16$$

$$b^2 = 16/p^2$$

$$2ab = 2$$

Therefore:

$$= a^2 - 2ab + b^2$$

$$= (p/4 - 4/p)^2$$

✓ Answer: $(p/4 - 4/p)^2$

(v) $9a^2 + 4b^2 + c^2 - 12ab + 6ac - 4bc$

Take:

$$a = 3a$$

$$b = -2b$$

$$c = c$$

Using $(a + b + c)^2$:

$$= (3a - 2b + c)^2$$

✓ Answer: $(3a - 2b + c)^2$

These five factorisations are directly supported by the textbook-based solution set.

Q3. Expand using the identity

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

(i) $(p + 3q + 7r)^2$

$$= p^2 + (3q)^2 + (7r)^2$$

- $2(p)(3q) + 2(3q)(7r) + 2(7r)(p)$

$$= p^2 + 9q^2 + 49r^2 + 6pq + 42qr + 14pr$$

✓ Answer: $p^2 + 9q^2 + 49r^2 + 6pq + 42qr + 14pr$

(ii) $(3x - 2y + 4z)^2$

$$= (3x)^2 + (-2y)^2 + (4z)^2$$

- $2(3x)(-2y) + 2(-2y)(4z) + 2(4z)(3x)$

$$= 9x^2 + 4y^2 + 16z^2 - 12xy - 16yz + 24xz$$

✓ Answer: $9x^2 + 4y^2 + 16z^2 - 12xy - 16yz + 24xz$

Q4. Is this an identity?

Given:

$$(a + b - c)^2 + (a - b + c)^2 + (a - b - c)^2$$

$$= 2a^2 + 2b^2 + 2c^2$$

 **Solution:**

Expand the left-hand side.

First:

$$(a + b - c)^2$$

$$= a^2 + b^2 + c^2 + 2ab - 2bc - 2ac$$

Second:

$$(a - b + c)^2$$

$$= a^2 + b^2 + c^2 - 2ab - 2bc + 2ac$$

Third:

$$(a - b - c)^2$$

$$= a^2 + b^2 + c^2 - 2ab + 2bc - 2ac$$

Adding:

$$= 3a^2 + 3b^2 + 3c^2 - 2ab - 2bc - 2ac$$

This is **not equal** to:

$$2a^2 + 2b^2 + 2c^2$$

for all values of a, b and c.

For example, take:

$$a = 1, b = 0, c = 0$$

$$\text{LHS} = 1 + 1 + 1 = 3$$

$$\text{RHS} = 2(1)^2 = 2$$

Since:

$$3 \neq 2$$

✗ Therefore, it is NOT an identity.



QUICK ANSWER KEY

Q1.

(i) **13689**

(ii) **6084**

- (iii) **39204**
- (iv) **45796**
- (v) **1218816**
- (vi) **1254400**

Q2.

- (i) **$(4y - 3)^2$**
- (ii) **$(3s/2 + 2t)^2$**
- (iii) **$(m/3 + k/2 + 3n)^2$**
- (iv) **$(p/4 - 4/p)^2$**
- (v) **$(3a - 2b + c)^2$**

Q3.

- (i) **$p^2 + 9q^2 + 49r^2 + 6pq + 42qr + 14pr$**
- (ii) **$9x^2 + 4y^2 + 16z^2 - 12xy - 16yz + 24xz$**

Q4.

✗ No, it is not an identity.