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1. Write the following squares of binomials as trinomials:
(i) $(x + 2)^2$
(ii) $(8a + 3b)^2$
(iii) $(2m + 1)^2$
(iv) $(9a + 1/6)^2$
(v) $(x + x^2/2)^2$
(vi) $(x/4 – y/3)^2$
(vii) $(3x – 1/3x)^2$
(viii) $(x/y – y/x)^2$
(ix) $(3a/2 – 5b/4)^2$
(x) $(a^2b – bc^2)^2$
(xi) $(2a/3b + 2b/3a)^2$
(xii) $(x^2 – ay)^2$
Solution:
(i) $(x + 2)^2$
Let us express the given expression in trinomial
$x^2 + 2 (x) (2) + 2^2$
$x^2 + 4x + 4$

(ii) $(8a + 3b)^2$
Let us express the given expression in trinomial
$(8a)^2 + 2 (8a) (3b) + (3b)^2$
$64a^2 + 48ab + 9b^2$

(iii) $(2m + 1)^2$
Let us express the given expression in trinomial
$(2m)^2 + 2 (2m) (1) + 1^2$
$4m^2 + 4m + 1$

(iv) $(9a + 1/6)^2$
Let us express the given expression in trinomial
$(9a)^2 + 2 (9a) (1/6) + (1/6)^2$
$81a^2 + 3a + 1/36$

(v) $(x + x^2/2)^2$
Let us express the given expression in trinomial
$(x)^2 + 2 (x) (x^2/2) + (x^2/2)^2$

$x^2 + x^3 + 1/4x^4$

(vi) $(x/4 – y/3)^2$
Let us express the given expression in trinomial
$(x/4)^2 – 2 (x/4) (y/3) + (y/3)^2$
$1/16x^2 – xy/6 + 1/9y^2$

(vii) $(3x – 1/3x)^2$
Let us express the given expression in trinomial
$(3x)^2 – 2 (3x) (1/3x) + (1/3x)^2$
$9x^2 – 2 + 1/9x^2$

(viii) $(x/y – y/x)^2$
Let us express the given expression in trinomial
$(x/y)^2 – 2 (x/y) (y/x) + (y/x)^2$
$x^2/y^2 - 2 + y^2/x^2$

(ix) $(3a/2 – 5b/4)^2$
Let us express the given expression in trinomial
$(3a/2)^2 – 2 (3a/2) (5b/4) + (5b/4)^2$
$9/4a^2 – 15/4ab + 25/16b^2$

(x) $(a^2b – bc^2)^2$
Let us express the given expression in trinomial
$(a^2b)^2 – 2 (a^2b) (bc^2) + (bc^2)^2$
$a^4b^2 – 2a^2b^2c^2 + b^2c^4$

(xi) $(2a/3b + 2b/3a)^2$
Let us express the given expression in trinomial
$(2a/3b)^2 + 2 (2a/3b) (2b/3a) + (2b/3a)^2$
$4a^2/9b^2 + 8/9 + 4b^2/9a^2$

(xii) $(x^2 – ay)^2$
Let us express the given expression in trinomial
$(x^2)^2 – 2 (x^2) (ay) + (ay)^2$
$x^4 – 2x^2ay + a^2y^2$

2. Find the product of the following binomials:

(i) $(2x + y) (2x + y)$
(ii) $(a + 2b) (a – 2b)$
(iii) $(a^2 + bc) (a^2 – bc)$
(iv) $(4x/5 – 3y/4) (4x/5 + 3y/4)$
(v) $(2x + 3/y) (2x - 3/y)$
(vi) $(2a^3 + b^3) (2a^3 – b^3)$
(vii) $(x^4 + 2/x^2) (x^4 - 2/x^2)$
(viii) $(x^3 + 1/x^3) (x^3 - 1/x^3)$

Solution:

(i) $(2x + y) (2x + y)$
Let us find the product of the given expression
$2x (2x + y) + y (2x + y)$
$4x^2 + 2xy + 2xy + y^2$
$4x^2 + 4xy + y^2$

(ii) $(a + 2b) (a – 2b)$
Let us find the product of the given expression
$a (a – 2b) + 2b (a – 2b)$
$a^2 – 2ab + 2ab – 4b^2$
$a^2 – 4b^2$

(iii) $(a^2 + bc) (a^2 – bc)$
Let us find the product of the given expression
$a^2 (a^2 – bc) + bc (a^2 – bc)$
$a^4 – a^2bc + bca^2 – b^2c^2$
$a^4 – b^2c^2$

(iv) $(4x/5 – 3y/4) (4x/5 + 3y/4)$
Let us find the product of the given expression
$4x/5 (4x/5 + 3y/4) – 3y/4 (4x/5 + 3y/4)$
$16/25x^2 + 12/20yx – 12/20xy – 9y^2/16$
$16/25x^2 – 9/16y^2$

(v) $(2x + 3/y) (2x - 3/y)$
Let us find the product of the given expression
$2x (2x – 3/y) + 3/y (2x – 3/y)$
$4x^2 – 6x/y + 6x/y – 9/y^2$
$4x^2 – 9/y^2$

(vi) $(2a^3 + b^3)(2a^3 – b^3)$
Let us find the product of the given expression
$2a^3 (2a^3 – b^3) + b^3 (2a^3 – b^3)$
$4a^6 – 2a^3b^3 + 2a^3b^3 – b^6$
$4a^6 – b^6$

(vii) $(x^4 + 2/x^2)(x^4 - 2/x^2)$
Let us find the product of the given expression
$x^4 (x^4 – 2/x^2) + 2/x^2 (x^4 - 2/x^2)$
$x^8 – 2x^2 + 2x^2 - 4/x^4$
$(x^8 - 4/x^4)$

(viii) $(x^3 + 1/x^3)(x^3 - 1/x^3)$
Let us find the product of the given expression
$x^3 (x^3 – 1/x^3) + 1/x^3 (x^3 - 1/x^3)$
$x^6 – 1 + 1 - 1/x^6$
$x^6 - 1/x^6$

3. Using the formula for squaring a binomial, evaluate the following:
(i) $(102)^2$
(ii) $(99)^2$
(iii) $(1001)^2$
(iv) $(999)^2$
(v) $(703)^2$
Solution:
(i) $(102)^2$
We can express 102 as 100 + 2
So, $(102)^2 = (100 + 2)^2$
Upon simplification we get,
$(100 + 2)^2 = (100)^2 + 2 (100) (2) + 2^2$
$= 10000 + 400 + 4$
$= 10404$

(ii) $(99)^2$
We can express 99 as 100 - 1
So, $(99)^2 = (100 - 1)^2$
Upon simplification we get,
$(100 - 1)^2 = (100)^2 – 2 (100) (1) + 1^2$
$= 10000 – 200 + 1$

= 9801

(iii) $(1001)^2$
We can express 1001 as 1000 + 1
So, $(1001)^2 = (1000 + 1)^2$
Upon simplification we get,
$(1000 + 1)^2 = (1000)^2 + 2 (1000) (1) + 1^2$
= 1000000 + 2000 + 1
= 1002001

(iv) $(999)^2$
We can express 999 as 1000 - 1
So, $(999)^2 = (1000 - 1)^2$
Upon simplification we get,
$(1000 - 1)^2 = (1000)^2 – 2 (1000) (1) + 1^2$
= 1000000 – 2000 + 1
= 998001

(v) $(703)^2$
We can express 700 as 700 + 3
So, $(703)^2 = (700 + 3)^2$
Upon simplification we get,
$(700 + 3)^2 = (700)^2 + 2 (700) (3) + 3^2$
= 490000 + 4200 + 9
= 494209

4. Simplify the following using the formula: (a - b) (a + b) = $a^2 – b^2$:
(i) $(82)^2 – (18)^2$
(ii) $(467)^2 – (33)^2$
(iii) $(79)^2 – (69)^2$
(iv) 197 × 203
(v) 113 × 87
(vi) 95 × 105
(vii) 1.8 × 2.2
(viii) 9.8 × 10.2
Solution:
(i) $(82)^2 – (18)^2$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,

$(82)^2 – (18)^2 = (82 – 18) (82 + 18)$
$= 64 \times 100$
$= 6400$

(ii) $(467)^2 – (33)^2$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$(467)^2 – (33)^2 = (467 – 33) (467 + 33)$
$= (434) (500)$
$= 217000$

(iii) $(79)^2 – (69)^2$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$(79)^2 – (69)^2 = (79 + 69) (79 – 69)$
$= (148) (10)$
$= 1480$

(iv) 197×203
We can express 203 as 200 + 3 and 197 as 200 - 3
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$197 \times 203 = (200 – 3) (200 + 3)$
$= (200)^2 – (3)^2$
$= 40000 – 9$
$= 39991$

(v) 113×87
We can express 113 as 100 + 13 and 87 as 100 - 13
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$113 \times 87 = (100 - 13) (100 + 13)$
$= (100)^2 – (13)^2$
$= 10000 – 169$
$= 9831$

(vi) 95×105
We can express 95 as 100 - 5 and 105 as 100 + 5
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$

We get,
$95 \times 105 = (100 - 5)(100 + 5)$
$= (100)^2 – (5)^2$
$= 10000 – 25$
$= 9975$

(vii) 1.8×2.2
We can express 1.8 as 2 – 0.2 and 2.2 as 2 + 0.2
Let us simplify the given expression using the formula $(a – b)(a + b) = a^2 – b^2$
We get,
$1.8 \times 2.2 = (2 – 0.2)(2 + 0.2)$
$= (2)^2 – (0.2)^2$
$= 4 – 0.04$
$= 3.96$

(viii) 9.8×10.2
We can express 9.8 as 10 – 0.2 and 10.2 as 10 + 0.2
Let us simplify the given expression using the formula $(a – b)(a + b) = a^2 – b^2$
We get,
$9.8 \times 10.2 = (10 – 0.2)(10 + 0.2)$
$= (10)^2 - (0.2)^2$
$= 100 – 0.04$
$= 99.96$

5. Simplify the following using the identities:
(i) $((58)^2 – (42)^2)/16$
(ii) $178 \times 178 – 22 \times 22$
(iii) $(198 \times 198 – 102 \times 102)/96$
(iv) $1.73 \times 1.73 – 0.27 \times 0.27$
(v) $(8.63 \times 8.63 – 1.37 \times 1.37)/0.726$
Solution:
(i) $((58)^2 – (42)^2)/16$
Let us simplify the given expression using the formula $(a – b)(a + b) = a^2 – b^2$
We get,
$((58)^2 – (42)^2)/16 = ((58-42)(58+42)/16)$
$= ((16)(100)/16)$
$= 100$

(ii) $178 \times 178 – 22 \times 22$

Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$178 \times 178 – 22 \times 22 = (178)^2 – (22)^2$
$= (178-22) (178+22)$
$= 200 \times 156$
$= 31200$

(iii) $(198 \times 198 – 102 \times 102)/96$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$(198 \times 198 – 102 \times 102)/96 = ((198)^2 – (102)^2)/96$
$= ((198-102) (198+102))/96$
$= (96 \times 300)/96$
$= 300$

(iv) $1.73 \times 1.73 – 0.27 \times 0.27$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$1.73 \times 1.73 – 0.27 \times 0.27 = (1.73)^2 – (0.27)^2$
$= (1.73-0.27) (1.73+0.27)$
$= 1.46 \times 2$
$= 2.92$

(v) $(8.63 \times 8.63 – 1.37 \times 1.37)/0.726$
Let us simplify the given expression using the formula $(a – b) (a + b) = a^2 – b^2$
We get,
$(8.63 \times 8.63 – 1.37 \times 1.37)/0.726 = ((8.63)^2 – (1.37)^2)/0.726$
$= ((8.63-1.37) (8.63+1.37))/0.726$
$= (7.26 \times 10)/0.726$
$= 72.6/0.726$
$= 100$

6. Find the value of x, if:
(i) $4x = (52)^2 – (48)^2$
(ii) $14x = (47)^2 – (33)^2$
(iii) $5x = (50)^2 – (40)^2$
Solution:
(i) $4x = (52)^2 – (48)^2$
Let us simplify to find the value of x by using the formula $(a – b) (a + b) = a^2 – b^2$

$4x = (52)^2 – (48)^2$
$4x = (52 – 48) (52 + 48)$
$4x = 4 × 100$
$4x = 400$
$x = 100$

(ii) $14x = (47)^2 – (33)^2$
Let us simplify to find the value of x by using the formula $(a – b) (a + b) = a^2 – b^2$
$14x = (47)^2 – (33)^2$
$14x = (47 – 33) (47 + 33)$
$14x = 14 × 80$
$x = 80$

(iii) $5x = (50)^2 – (40)^2$
Let us simplify to find the value of x by using the formula $(a – b) (a + b) = a^2 – b^2$
$5x = (50)^2 – (40)^2$
$5x = (50 – 40) (50 + 40)$
$5x = 10 × 90$
$5x = 900$
$x = 180$

7. If x + 1/x =20, find the value of x^2 + 1/ x^2.
Solution:
We know that x + 1/x = 20
So when squaring both sides, we get
$(x + 1/x)^2 = (20)^2$
$x^2 + 2 × x × 1/x + (1/x)^2 = 400$
$x^2 + 2 + 1/x^2 = 400$
$x^2 + 1/x^2 = 398$

8. If x – 1/x = 3, find the values of x^2 + 1/ x^2 and x^4 + 1/ x^4.
Solution:
We know that x - 1/x = 3
So when squaring both sides, we get
$(x - 1/x)^2 = (3)^2$
$x^2 - 2 × x × 1/x + (1/x)^2 = 9$
$x^2 - 2 + 1/x^2 = 9$
$x^2 + 1/x^2 = 9+2$
$x^2 + 1/x^2 = 11$

Now again when we square on both sides we get,

$(x^2 + 1/x^2)^2 = (11)^2$

$x^4 + 2 \times x^2 \times 1/x^2 + (1/x^2)^2 = 121$

$x^4 + 2 + 1/x^4 = 121$

$x^4 + 1/x^4 = 121-2$

$x^4 + 1/x^4 = 119$

$\therefore x^2 + 1/x^2 = 11$

$x^4 + 1/x^4 = 119$

9. If $x^2 + 1/x^2 = 18$, find the values of x + 1/ x and x - 1/ x.

Solution:

We know that $x^2 + 1/x^2 = 18$

When adding 2 on both sides, we get

$x^2 + 1/x^2 + 2 = 18 + 2$

$x^2 + 1/x^2 + 2 \times x \times 1/x = 20$

$(x + 1/x)^2 = 20$

$x + 1/x = \sqrt{20}$

When subtracting 2 from both sides, we get

$x^2 + 1/x^2 - 2 \times x \times 1/x = 18 - 2$

$(x - 1/x)^2 = 16$

$x - 1/x = \sqrt{16}$

$x - 1/x = 4$

10. If x + y = 4 and xy = 2, find the value of $x^2 + y^2$

Solution:

We know that x + y = 4 and xy = 2

Upon squaring on both sides of the given expression, we get

$(x + y)^2 = 4^2$

$x^2 + y^2 + 2xy = 16$

$x^2 + y^2 + 2(2) = 16$ (since xy=2)

$x^2 + y^2 + 4 = 16$

$x^2 + y^2 = 16 - 4$

$x^2 + y^2 = 12$

11. If x - y = 7 and xy = 9, find the value of x^2+y^2

Solution:

We know that x - y = 7 and xy = 9

Upon squaring on both sides of the given expression, we get

$(x - y)^2 = 7^2$
$x^2 + y^2 - 2xy = 49$
$x^2 + y^2 - 2 (9) = 49$ (since xy=9)
$x^2 + y^2 - 18 = 49$
$x^2 + y^2 = 49 + 18$
$x^2 + y^2 =67$

12. If $3x + 5y = 11$ and $xy = 2$, find the value of $9x^2 + 25y^2$
Solution:
We know that $3x + 5y = 11$ and $xy = 2$
Upon squaring on both sides of the given expression, we get
$(3x + 5y)^2 = 11^2$
$(3x)^2 + (5y)^2 + 2(3x)(5y) = 121$
$9x^2 + 25y^2 + 2 (15xy) = 121$ (since xy=2)
$9x^2 + 25y^2 + 2(15(2)) = 121$
$9x^2 + 25y^2 + 60 = 121$
$9x^2 + 25y^2 = 121-60$
$9x^2 + 25y^2 = 61$

13. Find the values of the following expressions:
(i) $16x^2 + 24x + 9$ when $x = 7/4$
(ii) $64x^2 + 81y^2 + 144xy$ when $x = 11$ and $y = 4/3$
(iii) $81x^2 + 16y^2 - 72xy$ when $x = 2/3$ and $y = ¾$
Solution:
(i) $16x^2 + 24x + 9$ when $x = 7/4$
Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$
$(4x)^2 + 2 (4x) (3) + 3^2$
$(4x + 3)^2$
Evaluating when $x = 7/4$
$[4 (7/4) + 3]^2$
$(7 + 3)^2$
100

(ii) $64x^2 + 81y^2 + 144xy$ when $x = 11$ and $y = 4/3$
Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$
$(8x)^2 + 2 (8x) (9y) + (9y)^2$ $(8x + 9y)$
Evaluating when $x = 11$ and $y = 4/3$
$[8 (11) + 9 (4/3)]^2$
$(88 + 12)^2$

$(100)^2$
10000

(iii) $81x^2 + 16y^2 - 72xy$ when $x = 2/3$ and $y = ¾$
Let us find the values using the formula $(a + b)^2 = a^2 + b^2 + 2ab$
$(9x)^2 + (4y)^2 – 2 (9x) (4y)$
$(9x – 4y)^2$
Putting $x = 2/3$ and $y = 3/4$
$[9 (2/3) – 4 (3/4)]^2$
$(6 – 3)^2$
3^2
9

14. If $x + 1/x = 9$ find the value of $x^4 + 1/ x^4$.
Solution:
We know that $x + 1/x = 9$
So when squaring both sides, we get
$(x + 1/x)^2 = (9)^2$
$x^2 + 2 × x × 1/x + (1/x)^2 = 81$
$x^2 + 2 + 1/x^2 = 81$
$x^2 + 1/x^2 = 81 – 2$
$x^2 + 1/x^2 = 79$

Now again when we square on both sides we get,
$(x^2 + 1/x^2)^2 = (79)^2$
$x^4 + 2 × x^2 × 1/x^2 + (1/x^2)^2 = 6241$
$x^4 + 2 + 1/x^4 = 6241$
$x^4 + 1/x^4 = 6241- 2$
$x^4 + 1/x^4 = 6239$
$\therefore x^4 - 1/x^4 = 6239$

15. If $x + 1/x = 12$ find the value of $x - 1/x$.
Solution:
We know that $x + 1/x = 12$
So when squaring both sides, we get
$(x + 1/x)^2 = (12)^2$
$x^2 + 2 × x × 1/x + (1/x)^2 = 144$
$x^2 + 2 + 1/x^2 = 144$
$x^2 + 1/x^2 = 144 – 2$

$x^2 + 1/x^2 = 142$

When subtracting 2 from both sides, we get
$x^2 + 1/x^2 - 2 \times x \times 1/x = 142 - 2$
$(x - 1/x)^2 = 140$
$x - 1/x = \sqrt{140}$

16. If 2x + 3y = 14 and 2x - 3y = 2, find value of xy. [Hint: Use $(2x+3y)^2 - (2x-3y)^2 = 24xy$]

Solution:
We know that the given equations are
$2x + 3y = 14$… equation (1)
$2x - 3y = 2$… equation (2)
Now, let us square both the equations and subtract equation (2) from equation (1), we get,
$(2x + 3y)^2 - (2x - 3y)^2 = (14)^2 - (2)^2$
$4x^2 + 9y^2 + 12xy - 4x^2 - 9y^2 + 12xy = 196 - 4$
$24xy = 192$
$xy = 8$
∴ the value of xy is 8.

17. If $x^2 + y^2 = 29$ and xy = 2, find the value of
(i) x + y
(ii) x - y
(iii) $x^4 + y^4$
Solution:
(i) x + y
We know that
$x^2 + y^2 = 29$
$x^2 + y^2 + 2xy - 2xy = 29$
$(x + y)^2 - 2(2) = 29$
$(x + y)^2 = 29 + 4$
$x + y = \pm\sqrt{33}$

(ii) x – y
We know that
$x^2 + y^2 = 29$
$x^2 + y^2 + 2xy - 2xy = 29$
$(x - y)^2 + 2(2) = 29$
$(x - y)^2 + 4 = 29$

$(x - y)^2 = 25$
$(x - y) = \pm 5$

(iii) $x^4 + y^4$
We know that
$x^2 + y^2 = 29$
Squaring both sides, we get
$(x^2 + y^2)^2 = (29)^2$
$x^4 + y^4 + 2x^2y^2 = 841$
$x^4 + y^4 + 2\ (2)^2 = 841$
$x^4 + y^4 = 841 - 8$
$x^4 + y^4 = 833$

18. What must be added each of the following expression to make it a whole square?
(i) $4x^2 - 12x + 7$
(ii) $4x^2 - 20x + 20$
Solution:
(i) $4x^2 - 12x + 7$
$(2x)^2 - 2\ (2x)\ (3) + 3^2 - 3^2 + 7$
$(2x - 3)^2 - 9 + 7$
$(2x - 3)^2 - 2$
∴ 2 must be added to the expression to make it a whole square.

(ii) $4x^2 - 20x + 20$
$(2x)^2 - 2\ (2x)\ (5) + 5^2 - 5^2 + 20$
$(2x - 5)^2 - 25 + 20$
$(2x - 5)^2 - 5$
∴ 5 must be added to the expression to make it a whole square.

19. Simplify:
(i) $(x - y)\ (x + y)\ (x^2 + y^2)\ (x^4 + y^4)$
(ii) $(2x - 1)\ (2x + 1)\ (4x^2 + 1)\ (16x^4 + 1)$
(iii) $(7m - 8n)^2 + (7m + 8n)^2$
(iv) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$
(v) $(m^2 - n^2m)^2 + 2m^3n^2$
Solution:
(i) $(x - y)\ (x + y)\ (x^2 + y^2)\ (x^4 + y^4)$
B7 grouping the values
$(x^2 - y^2)\ (x^2 + y^2)\ (x^4 + y^4)$

$[(x^2)^2 – (y^2)^2] (x^4 + y^4)$
$(x^4 – y^4) (x^4 – y^4)$
$[(x^4)^2 – (y^4)^2]$
$x^8 – y^8$

(ii) $(2x - 1) (2x + 1) (4x^2 + 1) (16x^4 + 1)$
Let us simplify the expression by grouping
$[(2x)^2 – (1)^2] (4x^2 + 1) (16x^4 + 1)$
$(4x^2 – 1) (4x^2 + 1) (16x^4 + 1) 1$
$[(4x^2)^2 – (1)^2] (16x^4 + 1) 1$
$(16x^4 – 1) (16x^4 + 1) 1$
$[(16x^4)^2 – (1)^2] 1$
$256x^8 – 1$

(iii) $(7m – 8n)^2 + (7m + 8n)^2$
Upon expansion
$(7m)^2 + (8n)^2 – 2(7m)(8n) + (7m)^2 + (8n)^2 + 2(7m)(8n)$
$(7m)^2 + (8n)^2 – 112mn + (7m)^2 + (8n)^2 + 112mn$
$49m^2 + 64n^2 + 49m^2 + 64n^2$
By grouping the similar expression we get,
$98m^2 + 64n^2 + 64n^2$
$98m^2 + 128n^2$

(iv) $(2.5p – 1.5q)^2 - (1.5p – 2.5q)^2$
Upon expansion
$(2.5p)^2 + (1.5q)^2 – 2 (2.5p) (1.5q) – (1.5p)^2 – (2.5q)^2 + 2 (1.5p) (2.5q)$
$6.25p^2 + 2.25q^2 – 2.25p^2 – 6.25q^2$
By grouping the similar expression we get,
$4p^2 – 6.25q^2 + 2.25q^2$
$4p^2 – 4q^2$
$4 (p^2 – q^2)$

(v) $(m^2 – n^2m)^2 + 2m^3n^2$
Upon expansion using $(a + b)^2$ formula
$(m^2)^2 – 2 (m^2) (n^2) (m) + (n^2m)^2 + 2m^3n^2$
$m^4 – 2m^3n^2 + (n^2m)^2 + 2m^3n^2$
$m^4+ n^4m^2 – 2m^3n^2 + 2m^3n^2$
$m^4+ m^2n^4$

20. Show that:
(i) $(3x + 7)^2 – 84x = (3x - 7)^2$
(ii) $(9a – 5b)^2 + 180ab = (9a + 5b)^2$
(iii) $(4m/3 – 3n/4)^2 + 2mn = 16m^2/9 + 9n^2/16$
(iv) $(4pq + 3q)^2 – (4pq - 3q)^2 = 48pq^2$
(v) (a - b) (a + b) + (b - c) (b + c) + (c - a) (c + a) = 0
Solution:
(i) $(3x + 7)^2 – 84x = (3x - 7)^2$
Let us consider LHS $(3x + 7)^2 – 84x$
By using the formula $(a + b)^2 = a^2 + b^2 + 2ab$
$(3x)^2 + (7)^2 + 2 (3x) (7) – 84x$
$(3x)^2 + (7)^2 + 42x – 84x$
$(3x)^2 + (7)^2 – 42x$
$(3x)^2 + (7)^2 – 2 (3x) (7)$
$(3x – 7)^2$ = R.H.S
Hence, proved

(ii) $(9a – 5b)^2 + 180ab = (9a + 5b)^2$
Let us consider LHS $(9a – 5b)^2 + 180ab$
By using the formula $(a + b)^2 = a^2 + b^2 + 2ab$
$(9a)^2 + (5b)^2 – 2 (9a) (5b) + 180ab$
$(9a)^2$ 6 $(5b)^2 – 90ab + 180ab$
$(9a)^2 + (5b)^2 + 9ab$
$(9a)^2 + (5b)^2 + 2 (9a) (5b)$
$(9a + 5b)^2$ = R.H.S
Hence, proved

(iii) $(4m/3 – 3n/4)^2 + 2mn = 16m^2/9 + 9n^2/16$
Let us consider LHS $(4m/3 – 3n/4)^2 + 2mn$
$(4m/3)^2 + (3n/4)^2 – 2mn + 2mn$
$(4m/3)^2 + (3n/4)^2$
$16/9m^2 + 9/16n^2$ = R.H.S
Hence, proved

(iv) $(4pq + 3q)^2 – (4pq - 3q)^2 = 48pq^2$
Let us consider LHS $(4pq + 3q)^2 – (4pq - 3q)^2$
$(4pq)^2 + (3q)^2 + 2 (4pq) (3q) – (4pq)^2 – (3q)^2 + 2(4pq)(3q)$
$24pq^2 + 24pq^2$
$48pq^2$ = RHS

Hence, proved

(v) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$
Let us consider LHS $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a)$
By using the identity $(a – b)(a + b) = a^2 – b^2$
We get,
$(a^2 – b^2) + (b^2 – c^2) + (c^2 – a^2)$
$a^2 – b^2 + b^2 – c^2 + c^2 – a^2$
0 = R.H.S
Hence, proved