EXERCISE 7.7

Factorize each of the following algebraic expressions:

1. $x^2 + 12x – 45$

Solution:

We have,

$x^2 + 12x – 45$

To factorize the given expression we have to find two numbers p and q such that p+q = 12 and pq = -45

So we can replace 12x by 15x – 3x

-45 by 15 × 3

$x^2 + 12x – 45 = x^2 + 15x – 3x – 45$

$= x (x + 15) – 3 (x + 15)$

$= (x – 3) (x + 15)$

2. $40 + 3x – x^2$

Solution:

We have,

$40 + 3x – x^2$

$-(x^2 – 3x – 40)$

By considering, p+q = -3 and pq = -40

So we can replace -3x by 5x – 8x

-40 by 5 × -8

$-(x^2 – 3x – 40) = x^2 + 5x – 8x – 40$

$= -x (x + 5) – 8 (x + 5)$

$= -(x - 8) (x + 5)$

$= (-x + 8) (x + 5)$

3. $a^2 + 3a – 88$

Solution:

We have,

$a^2 + 3a – 88$

By considering, p+q = 3 and pq = -88

So we can replace 3a by 11a – 8a

-40 by -11 × 8

$a^2 + 3a – 88 = a^2 + 11a – 8a – 88$

$= a (a + 11) – 8 (a + 11)$

$= (a – 8) (a + 11)$

4. $a^2 – 14a – 51$

Solution:

We have,

$a^2 – 14a – 51$

By considering, p+q = -14 and pq = -51

So we can replace -14a by 3a – 17a

-51 by -17 × 3

$a^2 – 14a – 51 = a^2 + 3a – 17a – 51$

$= a (a + 3) – 17 (a + 3)$

$= (a – 17) (a + 3)$

5. $x^2 + 14x + 45$

Solution:

We have,

$x^2 + 14x + 45$

By considering, p+q = 14 and pq = 45

So we can replace 14x by 5x + 9x

45 by 5 × 9

$x^2 + 14x + 45 = x^2 + 5x + 9x + 45$

$= x (x + 5) – 9 (x + 5)$

$= (x + 9) (x + 5)$

6. $x^2 – 22x + 120$

Solution:

We have,

$x^2 – 22x + 120$

By considering, p+q = -22 and pq = 120

So we can replace -22x by -12x -10x

120 by -12 × -10

$x^2 - 22x + 120 = x^2 - 12x – 10x + 120$

$= x (x - 12) – 10 (x - 12)$

$= (x – 10) (x - 12)$

7. $x^2 – 11x – 42$

Solution:

We have,

$x^2 – 11x – 42$

By considering, p+q = -11 and pq = -42

So we can replace -11x by 3x -14x

-42 by 3 × -14

$x^2 - 11x - 42 = x^2 + 3x - 14x - 42$

$= x(x + 3) - 14(x + 3)$

$= (x - 14)(x + 3)$

8. $a^2 + 2a - 3$

Solution:

We have,

$a^2 + 2a - 3$

By considering, p+q = 2 and pq = -3

So we can replace 2a by 3a -a

-3 by 3 × -1

$a^2 + 2a - 3 = a^2 + 3a - a - 3$

$= a(a + 3) - 1(a + 3)$

$= (a - 1)(a + 3)$

9. $a^2 + 14a + 48$

Solution:

We have,

$a^2 + 14a + 48$

By considering, p+q = 14 and pq = 48

So we can replace 14a by 8a + 6a

48 by 8 × 6

$a^2 + 14a + 48 = a^2 + 8a + 6a + 48$

$= a(a + 8) + 6(a + 8)$

$= (a + 6)(a + 8)$

10. $x^2 - 4x - 21$

Solution:

We have,

$x^2 - 4x - 21$

By considering, p+q = -4 and pq = -21

So we can replace -4x by 3x – 7x

-21 by 3 × -7

$x^2 + 4x - 21 = x^2 + 3x - 7x - 21$

$= x(x + 3) - 7(x + 3)$

$= (x - 7)(x + 3)$

11. $y^2 + 5y - 36$

Solution:
We have,
$y^2 + 5y – 36$
By considering, p+q = 5 and pq = -36
So we can replace 5y by 9y – 4y
-36 by 9 × -4
$y^2 + 5y – 36 = y^2 + 9y – 4y – 36$
$= y (y + 9) – 4 (y + 9)$
$= (y – 4) (y + 9)$

12. $(a^2 - 5a)^2 - 36$
Solution:
We have,
$(a^2 - 5a)^2 – 36$
$(a^2 - 5a)^2 - 6^2$
By using the formula $(a^2 – b^2) = (a+b) (a-b)$
$(a^2 – 5a)^2 – 6^2 = (a^2 – 5a + 6) (a^2 – 5a – 6)$
So now we shall factorize the expression $(a^2 – 5a + 6)$
By considering, p+q = -5 and pq = 6
So we can replace -5a by a -6a
6 by 1 × -6
$a^2 -5a – 6 = a^2 + a – 6a – 6$
$= a (a + 1) -6(a + 1)$
$= (a – 6) (a + 1)$

So now we shall factorize the expression $(a^2 – 5a + 6)$
By considering, p+q = -5 and pq = -6
So we can replace -5a by -2a -3a
6 by -2 × -3
$a^2 -5a + 6 = a^2 – 2a – 3a + 6$
$= a (a – 2) -3 (a - 2)$
$= (a – 3) (a – 2)$

$\therefore (a^2 - 5a)^2 – 36 = (a^2 – 5a + 6) (a^2 – 5a – 6)$
$= (a + 1) (a – 6) (a – 2) (a – 3)$

13. (a + 7) (a – 10) + 16
Solution:
We have,

$(a + 7) (a – 10) + 16$
$a^2 – 10a + 7a – 70 + 16$
$a^2 – 3a – 54$
By considering, $p+q = -3$ and $pq = -54$
So we can replace $-3a$ by $6a – 9a$
-54 by 6×-9
$a^2 – 3a – 54 = a^2 + 6a – 9a – 54$
$= a (a + 6) -9 (a + 6)$
$= (a - 9) (a + 6)$