Exercise 7.9

Factorise each of the following quadratic polynomial by Method of completing square.

1. p^2+6p+8

Sol: p^2+6p+8

$= p^2+6p+9-9+8$ [Adding and subtracting $(\frac{1}{2}$ Coeff of $x)^2 = (\frac{6}{2})^2 = 9$

$= (p^2+6p+9)-1$

$= (p+3)^2-1$

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

$= (p+4)(p+2)$

Q.2 $q^2-10q+21$

Adding and subtracting $(\frac{1}{2}$ Coeff of $x)^2$

ie $(-\frac{10}{2})^2 = (-5)^2 = 25$

$= q^2-10q+21+25-25$

$= (q^2-10q+25)+(21-25)$

$= (q-5)^2+(2)^2$

$= (q-5+2)(q-5-2)$

$= (q-3)(q-7)$

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Q.3 $4y^2+12y+5$

Dividing by 4

$=4\left[\frac{4y^2}{4}+\frac{12y}{4}+\frac{5}{4}\right]$

$=4\left(1.y^2+3y+\frac{5}{4}\right)$

$=$

{ Adding and subtracting $\left(\frac{1}{2}\text{ coeff of } x\right)^2=\left(\frac{3}{2}\right)^2=\frac{9}{4}$

$=4\left[y^2+3y+\frac{9}{4}-\frac{9}{4}+\frac{5}{4}\right]$

$=4\left(y+\frac{3}{2}\right)^2-(1)^2$

$=4\left(y+\frac{3}{2}+1\right)\left(y+\frac{3}{2}-1\right)$

$=4\left(y+\frac{5}{2}\right)\left(y+\frac{1}{2}\right)$

$=4\left(\frac{2y+5}{2}\right)\left(\frac{2y+1}{2}\right)$

$=(2y+5)(2y+1)$

Q.4 $p^2+6p-16$

{ Adding and subtracting $\left(\frac{1}{2}\text{ coeff of } x\right)^2=\left(\frac{6}{2}\right)^2=3^2$

$=p^2+6p+9-9-16$

$=(p+3)^2-25$

$=(p+3)^2-(5)^2$

$=(p+3+5)(p+3-5)=(p+8)(p-2)$

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(5) $x^2+12x+20$

Sol: Adding and subtracting (half of coeff of x)

$= \left(\frac{12}{2}\right)^2 = 6^2$

$= x^2+12x+20+6^2-6^2$

$= x^2+12x+36+(20-36)$

$= (x+6)^2-(4)^2$

$= (x+6+4)(x+6-4)$

$= (x+10)(x+2)$

(6) $a^2-14a-51$

Sol: Adding and subtracting (half of coeff of x)^2

i.e $\left(\frac{-14}{2}\right)^2 = 7^2$

$a^2-14a+(7)^2-(7)^2-51$

$= (a-7)^2-(10)^2$

$= (a-7+10)(a-7-10)$

$= (a+3)(a-17)$

(7) a^2+2a-3

Sol:

$a^2+2a+1-1-3$

$= (a+1)^2-(2)^2$

Adding and subtracting

$(\frac{1}{2}$ coeff of $x)^2 = (\frac{2}{2})^2 = 1$

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$= (a+1+2)(a+1-2)$

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

(8) $4x^2 - 12x + 5$

$= 4\left[x^2 - 3x + \frac{5}{4}\right]$

Adding and subtracting (half of coeff of x)

$= \left(\frac{-3}{2}\right)^2 = \frac{9}{4}$

$= 4\left[x^2 - 3x + \frac{9}{4} - \frac{9}{4} + \frac{5}{4}\right]$

$= 4\left[\left(x - \frac{3}{2}\right)^2 - (1)^2\right]$

$= 4\left[\left(x - \frac{3}{2} + 1\right)\left(x - \frac{3}{2} - 1\right)\right]$

$= 4\left[\frac{(2x-1)}{2}\frac{(2x-5)}{2}\right]$

$= (2x-1)(2x-5)$

(9) $y^2 - 7y + 12$

Sol: Adding and subtracting (half of coeff of x)^2

i.e $\left(\frac{7}{2}\right)^2 = \frac{49}{4}$

$= y^2 - 7y + \frac{49}{4} - \frac{49}{4} + 12$

$= \left(y - \frac{7}{2}\right)^2 - \left(\frac{1}{2}\right)^2$

$= \left(y - \frac{7}{2} + \frac{1}{2}\right)\left(y - \frac{7}{2} - \frac{1}{2}\right) = (y-3)(y-4)$

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(10) $x^2 - 4x - 12$

Adding and subtracting $(\frac{1}{2}$ coeff of $x)^2$

i.e $(\frac{4}{2})^2 = (2)^2 = 4$

$= x^2 - 4x + 4 - 4 - 12$

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

$= (x-2)^2 - (4)^2$

$= (x-2+4)(x-2-4)$

$= (x+2)(x-6)$

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