NCERT solutions for class 8 maths chapter 14 factorisation Ex-14.2

1. Factorize the following expressions:

(i) $a^2+8a+16$

(ii) $p^2-10p+25$

(iii) $25m^2+30m+9$

(iv) $49y^2+84yz+36z^2$

(v) $4x^2-8x+4$

(vi) $121b^2-88bc+16c^2$

(vii) $(l+m)^2-4lm$

[Hint: Expand $(l+m)^2$ first]

(viii) $a^4+2a^2b^2+b^4$

Ans. (i) $a^2+8a+16=a^2+(4+4)a+4\times4$

Using identity

$x^2+(a+b)x+ab=(x+a)(x+b)$,

Here $x=a, a=4$ and $b=4$

$a^2+8a+16=(a+4)(a+4)=(a+4)^2$

(ii) $p^2-10p+25=p^2+(-5-5)p+(-5)(-5)$

Using identity

$x^2+(a+b)x+ab=(x+a)(x+b)$,

Here $x=p, a=-5$ and $b=-5$

$p^2-10p+25=(p-5)(p-5)=(p-5)^2$

(iii) $25m^2+30m+9=(5m)^2+2\times5m\times3+(3)^2$

Using identity $a^2+2ab+b^2=(a+b)^2$, here $a=5m, b=3$

$25m^2+30m+9=(5m+3)^2$

(iv) $49y^2+84yz+36z^2$

$=(7y)^2+2\times7y\times6z+(6z)^2$

Using identity $a^2+2ab+b^2=(a+b)^2$, here $a=7y, b=6z$

$49y^2+84yz+36z^2=(7y+6z)^2$

(v) $4x^2-8x+4=(2x)^2-2\times2x\times2+(2)^2$

Using identity $a^2-2ab+b^2=(a-b)^2$, here $a=2x, b=2$

$4x^2-8x+4=(2x-2)^2$

$=(2)^2(x-1)^2=4(x-1)^2$

(vi) $121b^2-88bc+16c^2$

$=(11b)^2-2\times11b\times4c+(4c)^2$

Using identity $a^2-2ab+b^2=(a-b)^2$, here $a=11b, b=4c$

$121b^2 - 88bc + 16c^2 = (11b - 4c)^2$

(vii) $(l+m)^2 - 4lm$

$= l^2 + 2 \times l \times m + m^2 - 4lm$

$\left[\because \quad (a+b)^2 = a^2 + 2ab + b^2\right]$

$= l^2 + 2lm + m^2 - 4lm$

$= l^2 - 2lm + m^2$

$= (l-m)^2 \left[\because \quad (a-b)^2 = a^2 - 2ab + b^2\right]$

(viii)

$a^4 + 2a^2b^2 + b^4 = \left(a^2\right)^2 + 2 \times a^2 \times b^2 + \left(b^2\right)^2$

$= \left(a^2 + b^2\right)^2 \left[\because \quad (a+b)^2 = a^2 + 2ab + b^2\right]$

Q2. Factorize:

(i) $4p^2-9q^2$

(ii) $63a^2-112b^2$

(iii) $49x^2-36$

(iv) $16x^5-144x^2$

(v) $(l+m)^2-(l-m)^2$

(vi) $9x^2y^2-16$

(vii) $(x^2-2xy+y^2)-z^2$

(viii) $25a^2-4b^2+28bc-49c^2$

Ans. (i) $4p^2-9q^2=(2p)^2-(3q)^2$

$=(2p-3q)(2p+3q)$

$[\because\ a^2-b^2=(a-b)(a+b)]$

(ii) $63a^2-112b^2=7(9a^2-16b^2)$

$=7[(3a)^2-(4b)^2]$

$=7(3a-4b)(3a+4b)$

$[\because\ a^2-b^2=(a-b)(a+b)]$

(iii) $49x^2-36=(7x)^2-(6)^2$

(iii) $49x^2-36=(7x)^2-(6)^2$

$=(7x-6)(7x+6)\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(iv) $16x^5-144x^3=16x^3\left(x^2-9\right)$

$=16x^3\left[(x)^2-(3)^2\right]$

$=16x^3(x-3)(x+3)$

$\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(v) $(l+m)^2-(l-m)^2$

$=\left[(l+m)+(l-m)\right]\left[(l+m)-(l-m)\right]$

$\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

$=(l+m+l-m)(l+m-l+m)$

$=(2m)(2l)=4lm$

(vi) $9x^2y^2-16=(3xy)^2-(4)^2$

$=(3xy-4)(3xy+4)$

$\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(vii) $\left(x^2-2xy+y^2\right)-z^2=(x-y)^2-z^2$

$\left[\because\quad (a-b)^2=a^2-2ab+b^2\right]$

$=(x-y-z)(x-y+z)$

$\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(viii) $25a^2-4b^2+28bc-49c^2$

$=25a^2-\left(4b^2-28bc+49c^2\right)$

$=25a^2-\left[(2b)^2-2\times 2b\times 7c+(7c)^2\right]$

$=25a^2-(2b-7c)^2$

$\left[\because\ \ (a-b)^2=a^2-2ab+b^2\right]$

$=(5a)^2-(2b-7c)^2$

$=\left[5a-(2b-7c)\right]\left[5a+(2b-7c)\right]$

$\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

$=(5a-2b+7c)(5a+2b-7c)$

Q3. Factorize the expressions:

(i) ax^2+bx

(ii) $7p^2+21q^2$

(iii) $2x^3+2xy^2+2xz^2$

(iv) $am^2+bm^2+bn^2+an^2$

(v) $(lm+l)+m+1$

(vi) $y(y+z)+9(y+z)$

(vii) $5y^2-20y-8z+2yz$

(viii) $10ab+4a+5b+2$

(ix) $6xy-4y+6-9x$

Ans. (i) $ax^2+bx=x(ax+b)$

(ii) $7p^2+21q^2=7\left(p^2+3q^2\right)$

(iii) $2x^3+2xy^2+2xz^2=2x\left(x^2+y^2+z^2\right)$

(iv) $am^2+bm^2+bn^2+an^2$

$=m^2(a+b)+n^2(a+b)$

$=(a+b)\left(m^2+n^2\right)$

(v) $(lm+l)+m+1=l(m+1)+1(m+1)$

$=(m+1)(l+1)$

(vi) $y(y+z)+9(y+z)=(y+z)(y+9)$

(vii) $5y^2-20y-8z+2yz$

$=5y^2-20y+2yz-8z$

$=5y(y-4)+2z(y-4)$

$=(y-4)(5y+2z)$

(viii) $10ab+4a+5b+2$

$=2a(5b+2)+1(5b+2)$

$= (5b+2)(2a+1)$

(ix) $6xy-4y+6-9x$

$= 6xy-9x-4y+6$

$= 3x(2y-3)-2(2y-3)$

$= (2y-3)(3x-2)$

Q4. Factorize:

(i) a^4-b^4 **(ii)** p^4-81

(iii) $x^4-(y+z)^4$ **(iv)** $x^4-(x-z)^4$

(v) $a^4-2a^2b^2+b^4$

Ans. (i) $a^4-b^4=(a^2)^2-(b^2)^2$

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

$[\because\ a^2-b^2-(a-b)(a+b)]$

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

$[\because\ a^2-b^2-(a-b)(a+b)]$

(ii) $p^4-81=(p^2)^2-(9)^2$

$= (p^2-9)(p^2+9)\ [\because\ a^2-b^2-(a-b)(a+b)]$

$= (p^2-3^2)(p^2+9)$

$= (p-3)(p+3)(p^2+9)$

$\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

(iii) $x^4-(y+z)^4=\left(x^2\right)^2-\left[(y+z)^2\right]^2$

$=\left[x^2-(y+z)^2\right]\left[x^2+(y+z)^2\right]$

$\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=\left[x-(y+z)\right]\left[x+(y+z)\right]\left[x^2+(y+z)^2\right]$

$\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=(x-y+z)(x+y+z)\left[x^2+(y+z)^2\right]$

(iv) $x^4-(x-z)^4=\left(x^2\right)^2-\left[(x-z)^2\right]^2$

$=\left[x^2-(x-z)^2\right]\left[x^2+(x-z)^2\right]$

$\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=\left[x-(x-z)\right]\left[x+(x+z)\right]\left[x^2+(x-z)^2\right]$

$\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=(x-x+z)(x+x+z)\left(x^2+x^2-2xz+z^2\right)$

$\left[\because\ (a-b)^2=a^2-2ab+b^2\right]$

$=x(2x+z)\left(2x^2-2xz+z^2\right)$

(v) $a^4-2a^2b^2+b^4=\left(a^2\right)^2-2a^2b^2+\left(b^2\right)^2$

$=\left(a^2-b^2\right)^2\left[\because\ (a-b)^2=a^2-2ab+b^2\right]$

$=\left[(a-b)(a+b)\right]^2\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=(a-b)^2(a+b)^2\left[\because\ (xy)^m=x^m.y^m\right]$

Q5. Factorize the following expressions:

(i) p^2+6p+8 **(ii)** $q^2-10q+21$

(iii) $p^2+6p-16$

Ans. (i) $p^2+6p+8=p^2+(4+2)p+4\times2$

$=p^2+4p+2p+4\times2$

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

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

(ii) $q^2-10q+21=q^2-(7+3)q+7\times3$

$=q^2-7q-3q+7\times3$

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

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

(iii) $p^2+6p-16=p^2+(8-2)p-8\times2$

$=p^2+8p-2p-8\times2$

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

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

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