# NCERT SOLUTIONS

## CLASS - 8TH

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Class : 8th
Subject : Maths
Chapter Name : Factorisation
Chapter : 14

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Exercise - 14.1

Q1 Find the common factors of the given terms.
(i) 12x, 36
(ii) 2y, 22xy
(iii) $14pq, 28p^2q^2$
(iv) $2x, 3x^2, 4$
(v) $6abc, 24ab^2, 12a^2b$
(vi) $16x^3, -4x^2, 32x$
(vii) $10pq, 20qr, 30rp$
(viii) $3x^2y^3, 10x^3y^2, 6x^2y^2z$

Answer. (i) $12x = 2 \times 2 \times 3 \times x$
$36 = 2 \times 2 \times 3 \times 3$
The common factors are 2,2,3
And $2 \times 2 \times 3 = 12$

(ii) $2y = 2 \times y$
$22xy = 2 \times 11 \times x \times y$
The common Factors are 2,y
And $2 \times y = 2y$

(iii) $14pq = 2 \times 7 \times p \times q$
$28p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$
The common factors are $2, 7, p, q$
And $2 \times 7 \times p \times q = 14pq$

(iv) $2x = 2 \times x$
$3x^2 = 3 \times x \times x$
$4 = 2 \times 2$
The common factor is 1

(v) $6abc = 2 \times 3 \times a \times b \times c$
$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$
$12a^2b = 2 \times 2 \times 3 \times a \times a \times b$
The common factors are $2, 3, a, b$
And $2 \times 3 \times a \times b = 6ab$

(vi) $3x^2y^3 = 3 \times x \times x \times y \times y \times y$
$-4x^2 = -1 \times 2 \times 2 \times x \times x$
$32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$

The common factors are $2, 2, x$
And $2 \times 5 = 10$

(vii) $10pq = 2 \times 5 \times p \times q$
$20qr = 2 \times 2 \times 5 \times q \times r$
$30rp = 2 \times 3 \times 5 \times r \times p$
The common factors are $2, 5$
And 2*5=10

(viii) $3x^2y^3 = 3 \times x \times x \times y \times y \times y$
$10x^3y^2 = 2 \times 5 \times x \times x \times x \times y \times y$
$6x^2y^2z = 2 \times 3 \times x \times x \times y \times y \times z$
The common factors are $x, x, y, y$
And $x \times x \times y \times y = x^2y^2$

Page : 220 , Block name : Exercise 14.1

Q2 Factorise the following expressions.

(i) $7x - 42$
(ii) 6p – 12q
(iii) $7a^2 + 14a$
(iv) $-16z + 20z^3$
(v) $20/^2m + 30\text{alm}$
(vi) $5x^2y - 15xy^2$
(vii) $10a^2 - 15b^2 + 20c^2$
(viii) $-4a^2 + 4ab - 4ca$
(ix) $x^2yz + xy^2z + xyz^2$
(x) $ax^2y + bxy^2 + cxyz$

Answer. (i) $7x = 7 \times x$
$42 = 2 \times 3 \times 7$
The common factor is 7
$\therefore 7x - 42 = (7 \times x) - (2 \times 3 \times 7) = 7(x - 6)$

(ii) $6p = 2 \times 3 \times p$
The common factors are 2 and 3.
$12q = 2 \times 2 \times 3 \times q$
$\therefore 6p - 12q = (2 \times 3 \times p) - (2 \times 2 \times 3 \times q)$
$= 2 \times 3[p - (2 \times q)]$
$= 6(p - 2q)$

(iii) $14a = 2 \times 7 \times a$

$\therefore 7a^2 + 14a = (7 \times a \times a) + (2 \times 7 \times a)$
$= 7 \times a[a + 2] = 7a(a + 2)$

(iv) $16z = 2 \times 2 \times 2 \times 2 \times z$
$20z^3 = 2 \times 2 \times 5 \times z \times z \times z$
The common factors $2, 2,$ and $z$

$\therefore -16z+20z^3=-(2\times2\times2\times2\times z)+(2\times2\times5\times z\times z\times z)$
$=(2\times2\times z)[-(2\times2)+(5\times z\times z)]$
$=4z\left(-4+5z^2\right)$

(v) $20/^2m=2\times2\times5\times/\times l\times m$
$30a/m=2\times3\times5\times a\times l\times m$
The common factors are 2,5,l and m
$\therefore 20/^2m+30a/m=(2\times2\times5\times I\times l\times m)+(2\times3\times5\times a\times/\times m)$
$=(2\times5\times I\times m)[(2\times l)+(3\times a)]$
$=10\,\mathrm{lm}(2l+3a)$

(vi) $5x^2y=5\times x\times x\times y$
$15xy^2=3\times5\times x\times y\times y$
$=5\times x\times y[x-(3\times y)]$
$=5xy(x-3y)$
$=5xy(x-3y)$

(vii) $10a^2=2\times5\times a\times a$
$15b^2=3\times5\times b\times b$
$20c^2=2\times2\times5\times c\times c$
The common factor is 5.
$10a^2-15b^2+20c^2=(2\times5\times a\times a)-(3\times5\times b\times b)+(2\times2\times5\times c\times c)$
$=5[(2\times\mathrm{a}\times\mathrm{a})-(3\times b\times b)+(2\times2\times c\times c)]$
$=5\left(2a^2-3b^2+4c^2\right)$

(viii) $4a^2=2\times2\times a\times a$
$4ab=2\times2\times a\times b$
$4ca=2\times2\times c\times a$
The common factors are 2,2 and a
$\therefore -4a^2+4ab-4ca=-(2\times2\times a\times a)+(2\times2\times a\times b)-(2\times2\times c\times a)$
$=2\times2\times a[-(a)+b-c]$
$=4a(-a+b-c)$

(ix) $x^2yz=x\times x\times y\times z$
$xy^2z=x\times y\times y\times z$
$xyz^2=x\times y\times z\times z$
The common factors are $x, y,$ and $z$
$\therefore x^2yz+xy^2z+xyz^2=(x\times x\times y\times z)+(x\times y\times y\times z)+(x\times y\times z\times z)$
$=x\times y\times z[x+y+z]$
$=xyz(x+y+z)$

(x) $ax^2y=a\times x\times x\times y$
$bxy^2=b\times x\times y\times y$
$cxyz=c\times x\times y\times z$
The common factors are x and y
$ax^2y+bxy^2+cxyz=(a\times x\times x\times y)+(b\times x\times y\times y)+(c\times x\times y\times z)$
$=(x\times y)[(a\times x)+(b\times y)+(c\times z)]$
$=xy(ax+by+cz)$

Page : 220 , Block name : Exercise 14.1

Q3 Factorise
(i) $x^2 + xy + 8x + 8y$
(ii) $15xy - 6x + 5y - 2$
(iii) $ax + bx - ay - by$
(iv) $15pq + 15 + 9q + 25p$
(v) $z - 7 + 7xy - xyz$

Answer. (i) $x^2 + xy + 8x + 8y = x \times x + x \times y + 8 \times x + 8 \times y$
$= x(x + y) + 8(x + y)$
$= (x + y)(x + 8)$

(ii) $15xy - 6x + 5y - 2 = 3 \times 5 \times x \times y - 3 \times 2 \times x + 5 \times y - 2$
$= 3x(5y - 2) + 1(5y - 2)$
$= (5y - 2)(3x + 1)$

(iii) $ax + bx - ay - by = a \times x + b \times x - a \times y - b \times y$
$= x(a + b) - y(a + b)$
$= (a + b)(x - y)$

(iv) $15pq + 15 + 9q + 25p = 15pq + 9q + 25p + 15$
$= 3 \times 5 \times p \times q + 3 \times 3 \times q + 5 \times 5 \times p + 3 \times 5$
$= 3q(5p + 3) + 5(5p + 3)$

(v) $z - 7 + 7xy - xyz = z - x \times y \times z - 7 + 7 \times x \times y$
$= z(1 - xy) - 7(1 - xy)$
$= (1 - xy)(z - 7)$

Page : 220 , Block name : Exercise 14.1

Exercise - 14.2

Q1 Factorise the following expressions
(i) $a^2 + 8a + 16$
(ii)$p^x - 10p + 25$
(iii) $25m^2 + 30m + 9$
(iv) $49y^4 + 84yz + 36z^2$
(v) $4x^2 - 8x + 4$
(vi) $121b^2 - 88bc + 16c^2$
(vii) $(l + m)^2 - 4Im$
(viii) $a^4 + 2a^2b^2 + b^4$

Answer. (i) $a^2 + 8a + 16 = (a)^2 + 2 \times a \times 4 + (4)^2$
$= (a + 4)^2 \left[(x + y)^2 = x^2 + 2xy + y^2\right]$

(ii) $p^2 - 10p + 25 = (p)^2 - 2 \times p \times 5 + (5)^2$
$= (p - 5)^2 \left[(a - b)^2 = a^2 - 2ab + b^2\right]$

(iii) $25m^2 + 30m + 9 = (5m)^2 + 2 \times 5m \times 3 + (3)^2$
$= (5m + 3)^2 \left[(a + b)^2 = a^2 + 2ab + b^2\right]$

(iv) $49y^2 + 84yz + 36z^2 = (7y)^2 + 2 \times (7y) \times (6z) + (6z)^2$
$= (7y + 6z)^2 \left[(a + b)^2 = a^2 + 2ab + b^2\right]$

(v) $4x^2 - 8x + 4 = (2x)^2 - 2(2x)(2) + (2)^2$
$= (2x - 2)^2 \left[(a - b)^2 = a^2 - 2ab + b^2\right]$
$= [(2)(x - 1)]^2 = 4(x - 1)^2$

(vi) $121b^2 - 88bc + 16c^2 = (11b)^2 - 2(11b)(4c) + (4c)^2$
$= (11b - 4c)^2 \left[(a - b)^2 = a^2 - 2ab + b^2\right]$

(v) $4x^2 - 8x + 4 = (2x)^2 - 2(2x)(2) + (2)^2$
$= (2x - 2)^2 \left[(a - b)^2 = a^2 - 2ab + b^2\right]$
$= [(2)(x - 1)]^2 = 4(x - 1)^2$

(vi) $121b^2 - 88bc + 16c^2 = (11b)^2 - 2(11b)(4c) + (4c)^2$
$= (11b - 4c)^2 \left[(a - b)^2 = a^2 - 2ab + b^2\right]$

(vii) $(I + m)^2 - 4lm = f^2 + 2lm + m^2 - 4lm$
$= f^2 - 2lm + m^2$

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

(viii) $a^4 + 2a^2b^2 + b^4 = \left(a^2\right)^2 + 2\left(a^2\right)\left(b^2\right) + \left(b^2\right)^2$
$= \left(a^2 + b^2\right)^2 \left[(a + b)^2 = a^2 + 2ab + b^2\right]$

Page : 223 , Block name : Exercise 14.2

Q2 Factorise
(i) $4p^2 = 9q^2$
(ii) $63a^2 - 112b^2$
(iii) $49x^2 - 36$
(iv) $16x^3 - 144x$
(v) $(l + m)^2 - (l - m)^t$
(vi) $9x^2y^2 - 16$
(vii) $\left(x^2 - 2xy + y^2\right) - z^3$
(viii) $a^4 + 2a^2b^2 + b^4$

Answer. (i) $4p^2 - 9q^2 = (2p)^2 - (3q)^2$
$= (2p + 3q)(2p - 3q) \left[a^2 - b^2 = (a - b)(a + b)\right]$

(ii) $63a^2 - 112b^2 = 7\left(9a^2 - 16b^2\right)$
$= 7\left[(3a)^2 - (4b)^2\right]$
$= 7(3a + 4b)(3a - 4b) \left[a^2 - b^2 = (a - b)(a + b)\right]$

(iii) $49x^2 - 36 = (7x)^2 - (6)^2$
$= (7x-6)(7x+6)\left[a^2 - b^2 = (a-b)(a+b)\right]$

(iv) $16x^5 - 144x^3 = 16x^3\left(x^2 - 9\right)$
$= 16x^3\left[(x)^2 - (3)^2\right]$
$= 16x^3(x-3)(x+3)\left[a^2 - b^2 = (a-b)(a+b)\right]$

(v) $(I+m)^2 - (I-m)^2 = [(I+m) - (I-m)][(l+m) + (I-m)]$
$\left[\text{ Using identity } a^2 - b^2 = (a-b)(a+b)\right]$
$= (l+m-I+m)(/+m+I-m)$
$= 2m \times 2l$
$= 4ml$
$= 4lm$

(vi) $9x^2y^2 - 16 = (3xy)^2 - (4)^2$
$= (3xy-4)(3xy+4)\left[a^2 - b^2 = (a-b)(a+b)\right]$

(vii) $\left(x^2 - 2xy + y^2\right) - z^2 = (x-y)^2 - (z)^2\left[(a-b)^2 = a^2 - 2ab + b^2\right]$
$= (x-y-z)(x-y+z)\left[a^2 - b^2 = (a-b)(a+b)\right]$

(viii) $25a^2 - 4b^2 + 28bc - 49c^2 = 25a^2 - \left(4b^2 - 28bc + 49c^2\right)$
$(5a)^2 - \left[(2b)^2 - 2 \times 2b \times 7c + (7c)^2\right]$
$= (5a)^2 - \left[(2b-7c)^2\right]\backslash$
$\left[\text{ Using identity } (a-b)^2 = a^2 - 2ab + b^2\right]$
$= [5a + (2b-7c)][5a - (2b-7c)]$
$\left[\text{ Using identity } a^2 - b^2 = (a-b)(a+b)\right]$
$= (5a + 2b - 7c)(5a - 2b + 7c)$

Page : 223 , Block name : Exercise 14.2

Q3 Factorise The Expressions.
(i) $ax^2 + bx$
(ii $7p^2 + 21q^2$
(iii) $2x^2 + 2xy^2 + 2xz^4$
(iv) $am^2 + bm^2 + bv^2 + an^2$
(v) $(lm + l) + m + 1$
(vi) $y(y+z) + 9(y+z)$
(vii) $5y^2 - 20y - 8z + 2yz$
(viii) $10ab + 4a + 5b + 2$
(ix) $6xy - 4y + 6 - 9x$

Answer. (i) $ax^2 + bx = a \times x \times x + b \times x = x(ax+b)$

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

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

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

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

(v) $(Im+l)+m+1=Im+m+l+1$
$=m(l+1)+1(I+1)$
$=(I+1)(m+1)$

(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) $10ab+4a+5b+2=10ab+5b+4a+2$
$=5b(2a+1)+2(2a+1)$
$=(2a+1)(5b+2)$

(ix) $6xy-4y+6-9x=6xy-9x-4y+6$
$3x(2y-3)-2(2y-3)$
$(2y-3)(3x-2)$

Page : 223 , Block name : Exercise 14.2

Q4 Factorise

(i) $a^4-b^4$
(ii) $p^4-81$
(iii) $x^4-(y+z)^4$
(iv)$x^4-(x-z)^4$
(v) $a^4-2a^2b^2+b^4$

Answer. (i) $a^4-b^4=\left(a^2\right)^2-\left(b^2\right)^2$
$=\left(a^2-b^2\right)\left(a^2+b^2\right)$
$=(a-b)(a+b)\left(a^2+b^2\right)$

(ii) $p^4-81=\left(p^2\right)^2-(9)^2$
$=\left(p^2-9\right)\left(p^2+9\right)$
$=\left[(p)^2-(3)^2\right]\left(p^2+9\right)$
$=(p-3)(p+3)\left(p^2+9\right)$

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

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

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

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

Page : 224 , Block name : Exercise 14.2

Q5 Factorise the following expressions

(i) $p^2+6p+8$
(ii) $q^2-10q+21$
(iii) $p^2+6p-16$

Answer. (i) $p^2+6p+8$
It can be observed that $8=4\times 2$ and $4+2=6$
$\therefore p^2+6p+8=p^2+2p+4p+8$
$=p(p+2)+4(p+2)$
$=(p+2)(p+4)$

(ii) $q^2-10q+21$
It can be observed that $21=(-7)\times(-3)$ and $(-7)+(-3)=-10$
$\therefore q^2-10q+21=q^2-7q-3q+21$
$=q(q-7)-3(q-7)$
$=(q-7)(q-3)$

(iii) $p^2+6p-16$
It can be observed that $16=(-2)\times 8$ and $8+(-2)=6$
$p^2+6p-16=p^2+8p-2p-16$
$=p(p+8)-2(p+8)$
$=(p+8)(p-2)$

Page : 224 , Block name : Exercise 14.2

Exercise - 14.3

Q1 Carry out the following divisions

(i) $28x^4\div 56x$
(ii) $-36y^3\div 9y^2$
(iii) $66pq^2r^3\div 11qr^2$
(iv) $34x^3y^3z^5\div 51xy^2z^3$
(v) $12a^3b^8\div\left(-6x^6b^4\right)$

Answer. (i) $28x^4=2\times 2\times 7\times x\times x\times x\times x$

$56x = 2 \times 2 \times 2 \times 7 \times x$
$28x^4 \div 56x = \frac{2\times2\times7\times x\times x\times x\times x}{2\times2\times2\times7\times x} = \frac{x^3}{2} = \frac{1}{2}x^3$

(ii) $36y^3 = 2 \times 2 \times 3 \times 3 \times y \times y \times y$
$9y^2 = 3 \times 3 \times y \times y$
$-36y^3 \div 9y^2 = \frac{-2\times2\times3\times3\times y\times y\times y}{3\times3\times y\times y} = -4y$

(iii) $66pq^2r^3 = 2 \times 3 \times 11 \times p \times q \times q \times r \times r \times r$
$11qr^2 = 11 \times q \times r \times r$
$66pq^2r^3 \div 11qr^2 = \frac{2\times3\times11\times p\times q\times q\times r\times r\times r}{11\times q\times r\times r} = 6pqr$

(iv) $34x^3y^3z^3 = 2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z$
$51xy^2z^3 = 3 \times 17 \times x \times y \times y \times z \times z \times z$
$34x^3y^3z^3 \div 51xy^2z^3 = \frac{2\times17\times x\times x\times x\times y\times y\times y\times z\times z\times z}{3\times17\times x\times y\times z\times z\times z}$
$= \frac{2}{3}x^2y$

(v) $12a^8b^8 = 2 \times 2 \times 3 \times a^8 \times b^8$
$6a^6b^4 = 2 \times 3 \times a^6 \times b^4$

$12a^8b^8 \div \left(-6a^6b^4\right) = \frac{2\times2\times3\times a^8\times b^8}{-2\times3\times a^6\times b^4} = -2a^2b^4$

Page : 227 , Block name : Exercise 14.3

Q2 Divide the given polynomial by the given monomial.

(i) $\left(5x^2 - 6x\right) \div 3x$
(ii) $\left(3y^8 - 4y^6 + 5y^4\right) \div y^4$
(iii) $8\left(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3\right) \div 4x^2y^2z^2$
(iv) $\left(x^3 + 2x^2 + 3x\right) \div 2x$
(v) $\left(p^3q^5 - p^6q^5\right) \div p^3q^3$

Answer. (i) $5x^2 - 6x = x(5x - 6)$
$\left(5x^2 - 6x\right) \div 3x = \frac{x(5x-6)}{3x} = \frac{1}{3}(5x - 6)$

(ii) $3y^8 - 4y^6 + 5y^4 = y^4\left(3y^4 - 4y^2 + 5\right)$
$\left(3y^8 - 4y^6 + 5y^4\right) \div y^4 = \frac{y^4\left(3y^4-4y^2+5\right)}{y^4} = 3y^4 - 4y^2 + 5$

(iii) $8\left(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3\right) = 8x^2y^2z^2(x + y + z)$
$8\left(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3\right) \div 4x^2y^2z^2 = \frac{8x^2y^2z^2(x+y+z)}{4x^2y^2z^2} = 2(x + y + z)$

(iv) $x^3 + 2x^2 + 3x = x\left(x^2 + 2x + 3\right)$
$\left(x^3 + 2x^2 + 3x\right) \div 2x = \frac{x\left(x^2+2x+3\right)}{2x} = \frac{1}{2}\left(x^2 + 2x + 3\right)$

(v) $p^3q^6 - p^6q^3 = p^3q^3\left(q^3 - p^3\right)$
$\left(p^3q^6 - p^6q^3\right) \div p^3q^3 = \frac{p^3q^3\left(q^3-p^3\right)}{p^3q^3} = q^3 - p^3$

Page : 227 , Block name : Exercise 14.3

Q3 Work out the following divisions.

(i) $(10x-25) \div 5$
(ii) $(10x-25) \div (2x-5)$
(iii) $10y(6y+21) \div 5(2y+7)$
(iv) $9x^2y^2(3z-24) \div 27xy(z-8)$
(v) $96abc(3a-12)(5b-30) \div 144(a-4)(b-6)$

Answer. (i) $(10x-25) \div 5 = \frac{2\times5\times x-5\times5}{5} = \frac{5(2x-5)}{5} = 2x-5$

(ii) $(10x-25) \div (2x-5) = \frac{2\times5\times x-5\times5}{(2x-5)} = \frac{5(2x-5)}{2x-5} = 5$

(iii) $10y(6y+21) \div 5(2y+7) = \frac{2\times5\times y[2\times3\times y+3\times7]}{5(2y+7)}$
$= \frac{2\times5\times y\times3(2y+7)}{5(2y+7)} = 6y$

(iv) $9x^2y^2(3z-24) \div 27xy(z-8) = \frac{9x^2y^2[3\times z-2\times2\times2\times3]}{27xy(z-8)}$
$= \frac{xy\times3(z-8)}{3(z-8)} = xy$

(v) $96abc(3a-12)(5b-30) \div 144(a-4)(b-6)$
$= \frac{96abc(3\times a-3\times4)(5\times b-2\times3\times5)}{144(a-4)(b-6)}$
$= \frac{2abc\times3(a-4)\times5(b-6)}{3(a-4)(b-6)} = 10abc$

Page : 227 , Block name : Exercise 14.3

Q4 Divide as directed

(i) $5(2x+1)(3x+5) \div (2x+1)$
(ii) $26xy(x+5)(y-4) \div 13x(y-4)$
(iii) $52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p)$
(iv) $20(y+4)\left(y^2+5y+3\right) \div 5(y+4)$
(v) $x(x+1)(x+2)(x+3) \div (x+1)$

Answer. (i) $5(2x+1)(3x+5) \div (2x+1) = \frac{5(2x+1)(3x+1)}{(2x+1)} = 5(3x+1)$

(ii) $26xy(x+5)(y-4) \div 13x(y-4) = \frac{2\times13\times xy(x+5)(y-4)}{13x(y-4)} = 2y(x+5)$

(iii) $52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p)$
$= \frac{2\times2\times13\times p\times q\times r\times(p+q)\times(q+r)\times(r+p)}{2\times2\times2\times13\times p\times q\times(q+r)\times(r+p)}$
$= \frac{1}{2}r(p+q)$

(iv) $20(y+4)\left(y^2+5y+3\right) = 2\times2\times5\times(y+4)\left(y^2+5y+3\right)$

$20(y+4)\left(y^2+5y+3\right) \div 5(y+4) = \frac{2\times2\times5\times(y+4)\times\left(y^2+5y+3\right)}{5\times(y+4)}$
$= 4\left(y^2+5y+3\right)$

(v) $x(x+1)(x+2)(x+3) \div (x+1) = \frac{x(x+1)(x+2)(x+3)}{x(x+1)}$
$= (x+2)(x+3)$

Page : 227 , Block name : Exercise 14.3

Q5 Factorise the expressions and divide them as directed

(i) $\left(y^2+7y+10\right) \div (y+5)$
(ii) $\left(m^2-14m-32\right) \div (m+2)$
(iii) $\left(5p^2-25p+20\right) \div (p-1)$
(iv) $4yz\left(z^2+6z-16\right) \div 2y(z+8)$
(v) $5pq\left(p^2-q^2\right) \div 2p(p+q)$
(vi) $12xy\left(9x^2-16y^2\right) \div 4xy(3x+4y)$
(vii) $39y^3\left(50y^2-98\right) \div 26y^2(5y+7)$

Answer. (i) $\left(y^2+7y+10\right) = y^2+2y+5y+10$
$= y(y+2)+5(y+2)$
$= (y+2)(y+5)$
$\left(y^2+7y+10\right) \div (y+5) = \frac{(y+5)(y+2)}{(y+5)} = y+2$

(ii) $m^2-14m-32 = m^2+2m-16m-32$
$= m(m+2)-16(m+2)$
$= (m+2)(m-16)$
$\left(m^2-14m-32\right) \div (m+2) = \frac{(m+2)(m-16)}{(m+2)} = m-16$

(iii) $5p^2-25p+20 = 5\left(p^2-5p+4\right)$
$= 5\left[p^2-p-4p+4\right]$
$= 5[p(p-1)-4(p-1)]$
$5(p-1)(p-4)$
$\left(5p^2-25p+20\right) \div (p-1) = \frac{5(p-1)(p-4)}{(p-1)} = 5(p-4)$

(iv) $4yz\left(z^2+6z-16\right) = 4yz\left[z^2-2z+8z-16\right]$
$= 4yz[z(z-2)+8(z-2)]$
$= 4yz(z-2)(z+8)$
$4yz\left(z^2+6z-16\right) \div 2y(z+8) = \frac{4yz(z-2)(z+8)}{2y(z+8)} = 2z(z-2)$

(v) $5pq\left(p^2-q^2\right) = 5pq(p-q)(p+q)$
$5pq\left(p^2-q^2\right) \div 2p(p+q) = \frac{5pq(p-q)(p+q)}{2p(p+q)} = \frac{5}{2}q(p-q)$

(vi) $12xy\left(9x^2-16y^2\right) = 12xy\left[(3x)^2-(4y)^2\right] = 12xy(3x-4y)(3x+4y)$

$$12xy\left(9x^2-16y^2\right) \div 4xy(3x+4y) = \frac{2\times 2\times 3\times x\times y\times (3x-4y)\times (3x+4y)}{2\times 2\times x\times y\times (3x+4y)}$$
$$= 3(3x-4y)$$
$= 3(3x-4y)$

(vii) $39y^3\left(50y^2-98\right) = 3\times 13\times y\times y\times y\times 2\left[\left(25y^2-49\right)\right]$
$= 3\times 13\times 2\times y\times y\times y\times \left[(5y)^2-(7)^2\right]$
$= 3\times 13\times 2\times y\times y\times y(5y-7)(5y+7)$
$26y^2(5y+7) = 2\times 13\times y\times y\times (5y+7)$
$39y^3\left(50y^2-98\right) \div 26y^2(5y+7)$

Page : 227 , Block name : Exercise 14.3

Exercise - 14.4

Q1 Find and correct the errors in the following mathematical statements.
$4(x-5) = 4x-5$

Answer. L.H.S $= 4(x-5) \neq$ R.H.S
The correct statement is 4x - 20.

Page : 228 , Block name : Exercise 14.4

Q2 Find and correct the errors in the following mathematical statements.
$x(3x+2) = 3x^2+2$

Answer. L.H.S $= x(3x+2) \neq$ R.H.S
The correct statement is $3x^2+2x$

Page : 228 , Block name : Exercise 14.4

Q3 Find and correct the errors in the following mathematical statements.
$2x+3y = 5xy$

Answer. L.H.S $= 2x+3y \neq$ R.H.S
The correct statement is $2x+3y = 2x+3y$

Page : 228 , Block name : Exercise 14.4

Q4 Find and correct the errors in the following mathematical statements.
$x+2x+3x = 5x$

Answer. L.H.S $= x+2x+3x = 1x+2x+3x = x(1+2+3) = 6x \neq$ R.H.S
The correct statement is $x+2x+3x = 6x$

Page : 228 , Block name : Exercise 14.4

Q5 Find and correct the errors in the following mathematical statements.
$5y+2y+y-7y = 0$

Answer. L.H.S $= 5y + 2y + y - 7y = 8y - 7y = y \neq$ R.H.S
The correct statement is $5y + 2y + y - 7y = y$

Page : 228 , Block name : Exercise 14.4

Q6 Find and correct the errors in the following mathematical statements.
$3x + 2x = 5x^2$

Answer. L.H.S $= 3x + 2x = 5x \neq$ R.H.S
The correct statement is $3x + 2x = 5x$

Page : 228 , Block name : Exercise 14.4

Q7 Find and correct the errors in the following mathematical statements.
$(2x)^2 + 4(2x) + 7 = 2x^2 + 8x + 7$

Answer. L.H.S $= (2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7 \neq$ R.H.S
The correct statement is $(2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7$

Page : 228 , Block name : Exercise 14.4

Q8 Find and correct the errors in the following mathematical statements.
$(2x)^2 + 4(2x) + 7 = 2x^2 + 8x + 7$

Answer. L.H.S $= (2x)^2 + 5x = 4x^2 + 5x \neq$ R.H.S
The correct statement is $(2x)^2 + 5x = 4x^2 + 5x$

Page : 228 , Block name : Exercise 14.4

Q9 Find and correct the errors in the following mathematical statements. $(3x + 2)^2 = 3x^2 + 6x + 4$

Answer. L.H.S $= (3x + 2)^2 = (3x)^2 + 2(3x)(2) + (2)^2 \left[(a + b)^2 = a^2 + 2ab + b^2\right] = 9x^2 + 12x + 4$
R.H.S
The correct statement is $(3x + 2)^2 = 9x^2 + 12x + 4$

Page : 228 , Block name : Exercise 14.4

Q10 Find and correct the errors in the following mathematical statements. Substituting x=-3

(a) $x^2 + 5x + 4$ gives $(-3)^2 + 5(-3) + 4 = 9 + 2 + 4 = 15$
(b) $x^2 - 5x + 4$ gives $(-3)^2 - 5(-3) + 4 = 9 - 15 + 4 = -2$
(c) $x^2 + 5x$ gives $(-3)^2 + 5(-3) = -9 - 15 = -24$

Answer. (a) For $x = -3$
$x^2 + 5x + 4 = (-3)^2 + 5(-3) + 4 = 9 - 15 + 4 = 13 - 15 = -2$

(b) For $x = -3$
$x^2 - 5x + 4 = (-3)^2 - 5(-3) + 4 = 9 + 15 + 4 = 28$

(c) For $x = -3$
$x^2 + 5x = (-3)^2 + 5(-3) = 9 - 15 = -6$

Page : 229 , Block name : Exercise 14.4

Q11 Find and correct the errors in the following mathematical statements.
$(y-3)^2 = y^2 - 9$

Answer. L.H.S $= (y-3)^2 = (y)^2 - 2(y)(3) + (3)^2 \left[(a-b)^2 = a^2 - 2ab + b^2\right]$
$= y^2 - 6y + 9 \neq R.H.S$

Page : 229 , Block name : Exercise 14.4

Q12 Find and correct the error in the statement $(z+5)^2 = z^2 + 25$

Answer. L.H.S. $= (z+5)^2 = (z)^2 + 2(z)(5) + (5)^2 \left[(a+b)^2 = a^2 + 2ab + b^2\right]$
$= z^2 + 10z + 25 \neq$ R.H.S
The correct statement is $(z+5)^2 = z^2 + 10z + 25$

Page : 229 , Block name : Exercise 14.4

Q13 Find and correct the error in the statement
$(2a+3b)(a-b) = 2a^2 - 3b^2$

Answer. L.H.S.
$= (2a+3b)(a-b) = 2a \times a + 3b \times a - 2a \times b - 3b \times b = 2a^2 + 3ab - 2ab - 3b^2 = 2a^2 + ab - 3b^2 \neq$ R.H.S
The correct statement is $(2a+3b)(a-b) = 2a^2 + ab - 3b^2$

Page : 229 , Block name : Exercise 14.4

Q14 Find and correct the error in the statement
$(a+4)(a+2) = a^2 + 8$

Answer. L.H.S $= (a-4)(a-2) = (a)^2 + [(-4) + (-2)](a) + (-4)(-2) = a^2 + 6a + 8 \neq R.H.S$
The correct statement is $(a+4)(a+2) = a^2 + 6a + 8$

Page : 229 , Block name : Exercise 14.4

Q15 Find and correct the error in the statement $(a-4)(a-2) = a^2 - 8$

Answer. L.H.S. $= (a-4)(a-2) = (a)^2 + [(-4) + (-2)](a) + (-4)(-2) = a^2 - 6a + 8 \neq R.H.S$
The correct statement is $(a-4)(a-2) = a^2 - 6a + 8$

Page : 229 , Block name : Exercise 14.4

Q16 Find and correct the error in the statement
$\frac{3x^2}{3x^2} = 0$

Answer. $\frac{3x^2}{3x^2} = 1$ Not equal to 0.

Page : 229 , Block name : Exercise 14.4

Q17 Find and correct the error in the statement
$\frac{3x^2+1}{3x^2} - 1 + 1 = 2$

Answer. $\frac{3x^2+1}{3x^2} = \frac{3x^2}{3x^2} + \frac{1}{3x^2} = 1 + \frac{1}{3x^2}$
And not equal to 2.

Page : 229 , Block name : Exercise 14.4

Q18 Find and correct the error in the statement
$\frac{3x}{3x+2} = \frac{1}{2}$

Answer. $\frac{3x}{3x+2} = \frac{3x}{3x+2}$
And is not equal to $\frac{1}{2}$

Page : 229 , Block name : Exercise 14.4

Q19 Find and correct the error in the statement
$\frac{3}{4x+3} = \frac{1}{4x}$

Answer. $\frac{3}{4x+3} = \frac{3}{4x+3}$
And is not equal to $\frac{1}{4x}$.

Page : 229 , Block name : Exercise 14.4

Q20 Find and correct the error in the statement
$\frac{4x+5}{4x} = 5$

Answer. $\frac{4x+5}{4x} = \frac{4x}{4x} + \frac{5}{4x} = 1 + \frac{5}{4x}$ and not equal to 5

Page : 229 , Block name : Exercise 14.4

Q21 Find and correct the error in the statement
$\frac{7x+5}{5} - 7x$

Answer. $\frac{7x+5}{5} = \frac{7x}{5} + \frac{5}{5} = \frac{7x}{5} + 1$ and not equal to $7x$

Page : 229 , Block name : Exercise 14.4