Chapter 6: Operations on Algebraic Expressions
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Exercise 6A

Question 1.

Solution:

$8ab$

$-5ab$

$3ab$

$\underline{-ab}$

$5ab$

Question 2.

Solution:

$7x$

$-3x$

$5x$

$-x$

$\underline{-2x}$

$6x$

Question 3.

Solution:

$3a-4b+4c$

$2a+3b-8c$

$\underline{a-6b+c}$

$6a-7b-3c$

Question 4.

Solution:

$5x-8y+2z$

$-2x-4y+3z$

$-x+6y-z$

$\underline{3x-3y-2z}$

$5x-9y+2z$

Question 5.

Solution:

$$6ax - 2by + 3cz$$
$$-11ax + 6by - cz$$
$$\underline{-2ax - 3by + 10cz}$$
$$-7ax + by + 12cz$$

Question 6.

Solution:

$$2x^3 - 9x^2 + 0x + 8$$
$$0x^3 + 3x^2 - 6x - 5$$
$$7x^3 + 0x^2 - 10x + 1$$
$$\underline{-4x^3 - 5x^2 + 2x + 3}$$
$$5x^3 - 11x^2 - 14x + 7$$

Question 7.

Solution:

$$6p + 4q - r + 3$$
$$-5p + 0q + 2r - 6$$
$$-7p + 11q + 2r - 1$$
$$\underline{0p + 2q - 3r + 4}$$
$$-6p + 17q + 0r + 0$$
$$= -6p + 17q$$

Question 8.

Solution:

$$4x^2 + 4y^2 - 7xy - 3$$
$$x^2 + 6y^2 - 8xy + 0$$
$$\underline{2x^2 - 5y^2 - 2xy + 6}$$
$$7x^2 + 5y^2 - 17xy + 3$$

Subtract:

Question 9.

Solution:

$$\begin{array}{r} -5a^2b \\ \underline{-3a^2b} \\ -8a^2b \end{array}$$

Question 10.

Solution:

$$\begin{array}{r} 6pq \\ \underline{-(-8pq)} \\ 14pq \end{array}$$

Question 11.

Solution:

$$\begin{array}{r} -8abc \\ \underline{-(-2abc)} \\ -6abc \end{array}$$

Question 12.

Solution:

$$\begin{array}{r} -11p \\ \underline{-(-16p)} \\ 5p \end{array}$$

Question 13.

Solution:

$$\begin{array}{r} 3a-4b-c+6 \\ \underline{-(2a-5b+2c-9)} \\ a+b-3c+15 \end{array}$$

Question 14.

Solution:

$$\begin{array}{r} p-2q-5r-8 \\ \underline{-(-6p+q+3r+8)} \\ 7p-3q-8r-16 \end{array}$$

Question 15.

Solution:

$$3x^3 - x^2 + 2x - 4$$
$$\underline{-(x^3 + 3x^2 - 5x + 4)}$$
$$2x^3 - 4x^2 + 7x - 8$$

Question 16.

Solution:

$$4y^4 - 2y^3 - 6y^2 - y + 5$$
$$\underline{-(5y^4 - 3y^3 + 2y^2 + y - 1)}$$
$$-y^4 + y3 - 8y^2 - 2y + 6$$

Question 17.

Solution:

$$3p^2 - 4q^2 - 5r^2 - 6$$
$$\underline{-(4p^2 + 5q^2 - 6r^2 + 7)}$$
$$-p^2 - 9q^2 + r^2 - 13$$

Question 18.

Solution:

$$(3a^2 - 6ab - 3b^2 - 1) - x = (4a^2 - 7ab - 4b^2 + 1)$$
$$(3a^2 - 6ab - 3b^2 - 1) - (4a^2 - 7ab - 4b^2 + 1) = x$$

$$3a^2 - 6ab - 3b^2 - 1$$
$$\underline{-(4a^2 - 7ab - 4b^2 + 1)}$$
$$-a^2 + ab + b^2 - 2$$
$$\therefore x = (-a^2 + ab + b^2 - 2)$$

Question 19.

Solution: Perimeter of rectangle = (2l + 2b)

$Perimeter = 2\left(5x^2 - 3y^2\right) + 2(x^2 + 2xy)$

$= (10x^2 - 6y^2) + (2x^2 + 4xy)$

$10x^2 - 6y^2$

$\underline{2x^2 + 0y2 + 4xy}$

$12x^2 - 6y^2 + 4xy$

$\therefore perimeter = 12x^2 - 6y^2 + 4xy$

Question 20.

Solution:

$Perimeter = (a + b + c)$

$(6p^2 - 4p + 9) = (p^2 - 2p + 1) + (3p^2 - 5p + 3) + c$

$6p^2 - 4p + 9 - p^2 + 2p - 1 - 3p^2 + 5p - 3 = c$

$(6p^2 - p^2 - 3p^2) + (-4p + 2p + 5p) + (9 - 1 - 3) = c$

$2p^2 + 3p + 5 = c$

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Exercise 6B

Question 1.

Solution:

$(5x + 7) \times (3x + 4)$

$= 5x(3x + 4) + 7(3x + 4)$

$= 15x^2 + 20x + 21x + 28$

$= 15x^2 + 41x + 28$

Question 2.

Solution:

$(4x + 9) \times (x - 6)$

$= 4x(x - 6) + 9(x - 6)$

$= 4x^2 - 24x + 9x - 6$

$= 4x^2 - 15x - 6$

Question 3.

Solution:

$(2x+5)\times(4x-3)$

$=2x(4x-3)+5(4x-3)$

$=8x^2-6x+20x-15$

$=8x^2+14x-15$

Question 4.

Solution:

$(3y-8)\times(5y-1)$

$=3y(5y-1)-8(5y-1)$

$=15y^2-3y-40y+8$

$=15y^2-43y+8$

Question 5.

Solution:

$(7x+2y)\times(x+4y)$

$=7x(x+4y)+2y(x+4y)$

$=7x^2+28xy+2xy+8y^2$

$=7x^2+30xy+8y^2$

Question 6.

Solution:

$(9x+5y)\times(4x+3y)$

$=9x(4x+3y)+5y(4x+3y)$

$=36x^2+27xy+20xy+15y^2$

$=36x^2+47xy+15y^2$

Question 7.

Solution:

$$(3m-4n)\times(2m-3n)$$
$$=3m(2m-3n)-4n(2m-3n)$$
$$=6m^2-9mn-8mn+12n^2$$
$$=6m^2-17mn+12n^2$$

Question 8.

Solution:

$$(x^2-a^2)\times(x-a)$$
$$=x^2(x-a)-a^2(x-a)$$
$$=x^3-ax^2-a^2x+a^3$$

Question 9.

Solution:

$$(x^2-y^2)\times(x+2y)$$
$$=x^2(x+2y)-y^2(x+2y)$$
$$=x^3+2x^2y-xy^2-2y^3$$

Question 10.

Solution:

$$(3p^2+q^2)\times(2p^2-3q^2)$$
$$=3p^2(2p^2-3q^2)+q^2(2p^2-3q^2)$$
$$=6p^4-9p^2q^2+2p^2q^2-3q^4$$
$$=6p^4-7p^2q^2-3q^4$$

Question 11.

Solution:

$$(2x^2-5y^2)\times(x^2+3y^2)$$
$$=2x^2(x^2+3y^2)-5y^2(x^2+3y^2)$$
$$=2x^4+6x^2y^2-5x^2y^2-15y^4$$
$$=2x^4+x^2y^2-15y^4$$

Question 12.

Solution:

$$(x^3 - y^3) \times (x^2 + y^2)$$
$$= x^3(x^2 + y^2) - y^3(x^2 + y^2)$$
$$= x^5 + x^3y^2 - x^2y^3 - y^5$$

Question 13.

Solution:

$$(x^4 + y^4) \times (x^2 - y^2)$$
$$= x^4(x^2 - y^2) + y^4(x^2 - y^2)$$
$$= x^6 - x^4y^2 + x^2y^4 - y^6$$

Question 14.

Solution:

$$\left(x^4 + \frac{1}{x^4}\right) \times \left(x + \frac{1}{x}\right)$$
$$= x^4\left(x + \frac{1}{x}\right) + \frac{1}{x^4}\left(x + \frac{1}{x}\right)$$
$$= x^5 + x^3 + \frac{1}{x^3} + \frac{1}{x^5}$$

Question 15.

Solution:

$$(x^2 - 3x + 7) \times (2x + 3)$$
$$= 2x(x^2 - 3x + 7) + 3(x^2 - 3x + 7)$$
$$= 2x^3 - 6x^2 + 14x + 3x^2 - 9x + 21$$
$$= 2x^3 - 3x^2 + 5x + 21$$

Question 16.

Solution:

$$(3x^2+5x-9)\times(3x-5)$$
$$=3x(3x^2+5x-9)-5(3x-5)$$
$$=9x^3+15x^2-27x-15x+25$$
$$=9x^3+15x^2-42x+25$$

Question 17.

Solution:

$$(x^2-xy+y^2)\times(x+y)$$
$$=x(x^2-xy+y^2)+y(x^2-xy+y^2)$$
$$=x^3-x^2y+xy^2+x^2y-xy^2+y^3$$
$$=x^3+y^3$$

Question 18.

Solution:

$$(x^2+xy+y^2)\times(x-y)$$
$$=x(x^2+xy+y^2)-y(x^2+xy+y^2)$$
$$=x^3+x^2y+xy^2-x^2y-xy^2-y^3$$
$$=x^3-y^3$$

Question 19.

Solution:

$$(3-2x^2+5)\times(4x-1)$$
$$=4x(3-2x^2+5)-1(3-2x^2+5)$$
$$=12x-8x^3+20x-3+2x^2-5$$
$$=-8x^3+2x^2+32x-8$$

Question 20.

Solution:

$$(9x^2 - x + 15) \times (x^2 - 3)$$
$$= x^2(9x^2 - x + 15) - 3(9x^2 - x + 15)$$
$$= 9x^4 - x^3 + 15x^2 - 27x^2 + 3x - 45$$
$$= 9x^4 - x^3 - 12x^2 + 3x - 45$$

Question 21.

Solution:

$$(x^2 - 5x + 8) \times (x^2 + 2)$$
$$= x^2(x^2 - 5x + 8) + 2(x^2 - 5x + 8)$$
$$= x^4 - 5x^3 + 8x^2 + 2x^2 - 10x + 16$$
$$= x^4 - 5x^3 + 10x^2 - 10x + 16$$

Question 22.

Solution:

$$(x^3 - 5x^2 + 3 + 1) \times (x^2 - 3)$$
$$= x^2(x^3 - 5x^2 + 3 + 1) - 3(x^3 - 5x^2 + 3 + 1)$$
$$= x^5 - 5x^4 + 3x^2 + x^2 - 3x^3 + 15x^2 - 9 - 3$$
$$= x^5 - 5x^4 - 3x^3 + 17x^2 - 12$$

Question 23.

Solution:

$$(3x + 2y - 4) \times (x - y + 2)$$
$$= 3x(x - y + 2) + 2y(x - y + 2) - 4(x - y + 2)$$
$$= 3x^2 - 3xy + 6x + 2xy - 2xy + 4y - 4x + 4y - 8$$
$$= 3x^2 - 3xy + 2x + 8y - 8$$

Question 24.

Solution:

$$(x^2-5x+8)\times(x^2+2x-3)$$
$$=x^2(x^2+2x-3)-5x(x^2+2x-3)+8(x^2+2x-3)$$
$$=x^4+2x^3-3x^2-5x^3-10x^2+15x+8x^2+16x-24$$
$$=x^4-3x^3-5x^2+31x-24$$

Question 25. $(2x^2+3x-7)\times(3x^2-5x+4)$

Solution:

$$(2x^2+3x-7)\times(3x^2-5x+4)$$
$$=2x^2(3x^2-5x+4)+3x(3x^2-5x+4)-7(3x^2-5x+4)$$
$$=6x^4-10x^3+8x^2+9x^3-15x^2+12x-21x^2+35x-28$$
$$=6x^4-x^3-28x^2+47x-28$$

Question 26. $(9x^2-x+15)\times(x^2-x-1)$

Solution:

$$(9x^2-x+15)\times(x^2-x-1)$$
$$=9x^2(x^2-x-1)-x(x^2-x-1)+15(x^2-x-1)$$
$$=9x^4-9x^3-9x^2-x^3+x^2+x+15x^2-15x-15$$
$$=9x^4-10x^3+7x^2-14x-15$$

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Exercise 6C
Question 1.

(i)

Solution:

$$\frac{24x^2y^3}{3xy}$$
$$=\frac{24}{3}x^{(2-1)}y^{(3-1)}$$
$$=8xy^2$$

(ii)

Solution:

$$\frac{36xyz^2}{-9xz}$$

$$= \frac{36}{9} x^{(1-1)} y^{(1-0)} z^{(2-1)}$$

$$= 4yz$$

(iii)

Solution:

$$\frac{-72x^2y^2z}{-12xyz}$$

$$= \frac{-72}{-12} x^{(2-1)} y^{(2-1)} z^{(1-1)}$$

$$= 6xy$$

(iv)

Solution:

$$\frac{-56mnp^2}{7mnp}$$

$$= \frac{-56}{7} m^{(1-1)} n^{(1-1)} p^{(2-1)}$$

$$= 8p$$

Question 2.

(i)

Solution:

$$= \frac{5m^2 - 30m^2 + 45}{5m}$$

$$= \frac{5m^2}{5m} - \frac{30m^2}{5m} + \frac{45}{5m}$$

$$= m - 6m + \frac{9}{m}$$

(ii)

Solution:

$$= \frac{8x^2y^2 - 6xy^2 + 10x^2y^3}{2xy}$$

$$= \frac{8x^2y^2}{2xy} - \frac{6xy^2}{2xy} + \frac{10x^2y^3}{2xy}$$

$$= 4xy - 3y + 5xy^2$$

(iii)

Solution:

$$= \frac{9x^2y - 6xy + 12xy^2}{-3xy^2}$$

$$= \frac{9x^2y}{-3xy^2} - \frac{6xy}{-3xy^2} + \frac{12xy^2}{-3xy^2}$$

$$= \frac{9x}{-y} - \frac{2}{-y} - 4$$

$$= \frac{-9x - 2}{y} - 4$$

(iv)

Solution:

$$= \frac{12x^4 + 8x^3 - 6x^2}{-2x^2}$$

$$= \frac{12x^4}{-2x^2} + \frac{8x^3}{-2x^2} - \frac{6x^2}{-2x^2}$$

$$= -6x^2 - 4x + 3$$

Question 3.

Solution:

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

$\underline{-x^2 - 2x}$

$-2x + 4$

$\underline{-2x + 4}$

0

Therefore, $Q = (x-2), R = 0$

Question 4.

Solution:

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

$\underline{-x^2+4}$

0

Therefore, $Q = (x-2), R = 0$

Question 5.

Solution:

$x+7)x^2 12x+35(x+5$

$\underline{-x^2+7x}$

$5x+35$

$\underline{-5x+35}$

0

Therefore, $Q = (x+5), R = 0$

Question 6.

Solution:

$3x+2)15x^2+x-6(5x-3$

$\underline{-15x^2+10x}$

$-9x-6$

$\underline{-9x-6}$

0

Therefore, $Q = (5x-3), R = 0$

Question 7.

Solution:

$7x-9)14x^2-53x+45(2x-5$

$\underline{-14x^2-18x}$

$-35x+45$

$\underline{-35x+45}$

0

Therefore, $Q = (2x - 5), R = 0$

Question 8.

Solution:

$2x - 5)6x^2 - 31x + 47(3x - 8$

$\underline{-6x^2 - 15x}$

$-16x + 47$

$\underline{-16x + 40}$

7

Therefore, $Q = (3x - 8), R = 7$

Question 9.

Solution:

$2x + 3)2x^3 + x^2 - 5x - 2(x^2 - x - 1$

$\underline{-2x^3 + 3x^2}$

$-2x^2 - 5x$

$\underline{-2x - 3x}$

$-2x - 2$

$\underline{-2x - 3}$

1

Therefore, $Q = (x^2 - x - 1), R = 1$

Question 10.

Solution:

$x + 1)x^3 + 1(x^2 - x + 1$

$-x^2 + 1$

$\underline{-x^2 - x}$

$x + 1$

$\underline{-x + 1}$

0

Therefore, $Q = (x^2 - x + 1), R = 0$

Question 11.

Solution:

$x^2+x+1)x^4-2x^3+2x^2+x+4(x^2-3x+4$

$\underline{-x^4+x^3+x^2}$

$-3x^3+x^2+x$

$\underline{-3x^3-3x^2-3x}$

$4x^2+4x+4$

$\underline{-4x^2+4x+4}$

0

Therefore, $Q=(x^2-3x+4), R=0$

Question 12.

Solution:

$x^2-5x+6)x^3-6x^2+11x-6(x-1$

$\underline{-x^3-5x^2+6x}$

$-x^2+5x-6$

$\underline{-x^2+5x-6}$

0

Therefore, $Q=(x-1), R=0$

Question 13.

Solution:

$x^2-3x+4)5x^3-12x^2+12x+13(5x+3$

$\underline{-5x^3-15x2+20x}$

$3x^2-8x+13$

$\underline{-3x^2-9x+12}$

$x+1$

Therefore, $Q=(5x+3), R=(x+1)$

Question 14.

Solution:

$2x^2-3x+5)2x^3-5x^2+8x-5(x-1$

$\underline{-2x^3-3x^2+5x}$

$-2x^2+3x-5$

$\underline{-2x^2+3x-5}$

0

Therefore, $Q=(x-1), R=0$

Question 15.

Solution:

$2x^2+x-1)8x^4+10x^3-5x^2-4x+1(4x^2+3x-2$

$\underline{-8x^4+4x^3-4x^2}$

$6x^3-x^2-4x$

$\underline{-6x^3+3x^2-3x}$

$-4x^2-x+1$

$\underline{-4x^2-2x+2}$

$x-1$

Therefore, $Q=(4x^2+3x-2), R=(x-1)$

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Exercise 6D

Question 1.

(i)

Solution:

$(x+6)(x+6)$

$=x(x+6)+6(x+6)$

$=x^2+6x+6x+36$

$=x^2+12x+36$

(ii)

Solution:

$(4x+5y)(4x+5y)$

$=4x(4x+5y)+5y(4x+5y)$

$=16x^2+20xy+20xy+25y^2$

$=16x^2+40xy+25y^2$

(iii)

Solution:

$$(7a+9b)(7a+9b)$$
$$=7a(7a+9b)+9b(7a+9b)$$
$$=47a^2+63ab+63ab+81b^2$$
$$=47a^2+126ab+81b^2$$

(iv)

Solution:

$$\left(\frac{2}{3}x+\frac{4}{5}y\right)\left(\frac{2}{3}x+\frac{4}{5}y\right)$$
$$=\frac{2}{3}x\left(\frac{2}{3}x+\frac{4}{5}y\right)+\frac{4}{5}y\left(\frac{2}{3}x+\frac{4}{5}y\right)$$
$$=\frac{4}{9}x^2+\frac{8}{15}xy+\frac{8}{15}xy+\frac{16}{25}y^2$$
$$=\frac{4}{9}x^2+\frac{16}{15}xy+\frac{16}{25}y^2$$

(v)

Solution:

$$(x^2+7)(x^2+7)$$
$$=x^2(x^2+7)+7(x^2+7)$$
$$=x^4+7x^2+7x^2+49$$
$$=x^4+14x^2+49$$

(vi)

Solution:

$$\left(\frac{5}{6}a^2+2\right)\left(\frac{5}{6}a^2+2\right)$$
$$=\frac{5}{6}a^2\left(\frac{5}{6}a^2+2\right)+2\left(\frac{5}{6}a^2+2\right)$$
$$=\frac{25}{36}a^4+\frac{5}{3}a^2+\frac{5}{3}a^2+4$$
$$=\frac{25}{36}a^4+\frac{10}{3}a^2+4$$

Question 2.

(i)

Solution:

$$(x-4)(x-4)$$
$$=x(x-4)-4(x-4)$$
$$=x^2-4x-4x+16$$
$$=x^2-8x+16$$

(ii)

Solution:

$$(2x-3y)(2x-3y)$$
$$=2x(2x-3y)-3y(2x-3y)$$
$$=4x^2-6xy-6xy+9y^2$$
$$=4x^2-12xy+9y^2$$

(iii)

Solution:

$$\left(\frac{3}{4}x-\frac{5}{6}y\right)\left(\frac{3}{4}x-\frac{5}{6}y\right)$$
$$=\frac{3}{4}x\left(\frac{3}{4}x-\frac{5}{6}y\right)-\frac{5}{6}y\left(\frac{3}{4}x-\frac{5}{6}y\right)$$
$$=\frac{9}{16}x^2-\frac{15}{24}xy-\frac{15}{24}xy+\frac{25}{36}y^2$$
$$=\frac{9}{16}x^2-\frac{30}{24}xy+\frac{25}{36}y^2$$

(iv)

Solution:

$$\left(x-\frac{3}{x}\right)\left(x-\frac{3}{x}\right)$$
$$=x\left(x-\frac{3}{x}\right)-\frac{3}{x}\left(x-\frac{3}{x}\right)$$
$$=x^2-3-3+\frac{9}{x^2}$$
$$=x^2-6+\frac{9}{x^2}$$

(v)

Solution:

$$\left(\frac{1}{3}x^2-9\right)\left(\frac{1}{3}x^2-9\right)$$

$$=\frac{1}{3}x^2\left(\frac{1}{3}x^2-9\right)-9\left(\frac{1}{3}x^2-9\right)$$

$$=\frac{1}{9}x^4-3x^2-3x^2+81$$

$$=\frac{1}{9}x^4-6x^2+81$$

(vi)

Solution:

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

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

$$=\frac{1}{4}y^4-\frac{1}{6}y^3-\frac{1}{6}y^3+\frac{1}{9}y^2$$

$$=\frac{1}{4}y^4-\frac{1}{3}y^3+\frac{1}{9}y^2$$

Question 3.

(i)

Solution:

$$(8a+3b)^2$$

$$=(8a)^2+2\times 8a\times 3b+(3b)^2$$

$$=64a^2+48ab+9b^2$$

(ii)

Solution:

$$(7x+2y)^2$$

$$=(7x)^2+2\times 7x\times 2y+(2y)^2$$

$$=49x^2+28xy+4y^2$$

(iii)

Solution:

$$(5x+11)^2$$
$$=(5x)^2+2\times 5x\times 11+(11)^2$$
$$=25x^2+110x+121$$

(iv)

Solution:

$$\left(\frac{a}{2}+\frac{2}{a}\right)^2$$
$$=\left(\frac{a}{2}\right)^2+2\times\frac{a}{2}\times\frac{2}{a}+\left(\frac{2}{a}\right)^2$$
$$=\frac{a^2}{4}+2+\frac{4}{a^2}$$

(v)

Solution:

$$\left(\frac{3x}{4}+\frac{2y}{9}\right)^2$$
$$=\left(\frac{3x}{4}\right)^2+2\times\frac{3x}{4}\times\frac{2y}{9}+\left(\frac{2y}{9}\right)^2$$
$$=\frac{9x^2}{16}+\frac{xy}{3}+\frac{4y^2}{81}$$

(vi)

Solution:

$$(9x-10)^2$$
$$=(9x)^2-2\times 9x\times 10+(10)^2$$
$$=81x^2-180x+100$$

(vii)

Solution:

$$(x^2y-yz^2)^2$$
$$=(x^2y)^2-2\times x^2y\times yz^2+(yz^2)^2$$
$$=x^4y^2-2x^2y^2z^2+y^2z^4$$

(viii)

Solution:

$$\left(\frac{x}{y}-\frac{y}{x}\right)^2$$

$$=\left(\frac{x}{y}\right)^2-2\times\frac{x}{y}\times\frac{y}{x}+\left(\frac{y}{x}\right)^2$$

$$=\frac{x^2}{y^2}-2+\frac{y^2}{x^2}$$

(ix)

Solution:

$$\left(3m-\frac{4}{5}n\right)^2$$

$$=(3m)^2-2\times3m\times\frac{4}{5}n+\left(\frac{4}{5}n\right)^2$$

$$=9m^2-\frac{24}{5}mn+\frac{16}{25}n^2$$

Question 4.

(i)

Solution:

$$(x+3)(x-3)$$

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

$$=x^2-3x+3x-9$$

$$=x^2-9$$

(ii)

Solution:

$$(2x+5)(2x-5)$$

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

$$=4x^2-10x+10x-25$$

$$=4x^2-25$$

(iii)

Solution:

$$(8+x)(8-x)$$
$$=8(8-x)+x(8-x)$$
$$=64-8x+8x-x^2$$
$$=-x^2+64$$

(iv)

Solution:

$$(7x+11y)(7x-11y)$$
$$=7x(7x-11y)+11y(7x-11y)$$
$$=49x^2-77xy+77xy-121y^2$$
$$=49x^2-121y^2$$

(v)

Solution:

$$\left(5x^2+\frac{3}{4}y^2\right)\left(5x^2-\frac{3}{4}y^2\right)$$
$$=5x2\left(5x^2-\frac{3}{4}y^2\right)+\frac{3}{4}y^2\left(5x^2-\frac{3}{4}y^2\right)$$
$$=25x^4-\frac{15}{4}x^2y^2+\frac{15}{4}x^2y^2-\frac{9}{16}y^4$$
$$=25x^4-\frac{9}{16}y^4$$

(vi)

Solution:

$$\left(\frac{4x}{5}-\frac{5y}{3}\right)\left(\frac{4x}{5}+\frac{5y}{3}\right)$$
$$=\frac{4x}{5}\left(\frac{4x}{5}+\frac{5y}{3}\right)-\frac{5y}{3}\left(\frac{4x}{5}+\frac{5y}{3}\right)$$
$$=\frac{16x^2}{25}+\frac{20xy}{15}-\frac{20xy}{15}-\frac{25y^2}{9}$$
$$=\frac{16x^2}{25}-\frac{25y^2}{9}$$

(vii)

Solution:

$$\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$$

$$=x\left(x-\frac{1}{x}\right)+\frac{1}{x}\left(x-\frac{1}{x}\right)$$

$$=x^2-1+1-\frac{1}{x^2}$$

$$=x^2-\frac{1}{x^2}$$

(viii)

Solution:

$$\left(\frac{1}{x}+\frac{1}{y}\right)\left(\frac{1}{x}-\frac{1}{y}\right)$$

$$=\frac{1}{x}\left(\frac{1}{x}-\frac{1}{y}\right)+\frac{1}{y}\left(\frac{1}{x}-\frac{1}{y}\right)$$

$$=\frac{1}{x^2}-\frac{1}{xy}+\frac{1}{xy}-\frac{1}{y^2}$$

$$=\frac{1}{x^2}-\frac{1}{y^2}$$

(ix)

Solution:

$$\left(2a+\frac{3}{b}\right)\left(2a-\frac{3}{b}\right)$$

$$=2a\left(2a-\frac{3}{b}\right)+\frac{3}{b}\left(2a-\frac{3}{b}\right)$$

$$=4a^2-\frac{6a}{b}+\frac{6a}{b}-\frac{9}{b^2}$$

$$=4a^2-\frac{9}{b^2}$$

Question 5.

Solution:

(i)

$(54)^2$

$= (50+4)^2$

$= (50)^2 + 2\times 50\times 4 + (4)^2$

$= 2500 + 400 + 16$

$= 2916$

(ii)

$(82)^2$

$= (80+2)^2$

$= (80)^2 + 2\times 80\times 2 + (2)^2$

$= 6400 + 320 + 4$

$= 6724$

(iii)

$(103)^2$

$= (100+3)^2$

$= (100)^2 + 2\times 100\times 3 + (3)^2$

$= 10000 + 600 + 9$

$= 10609$

(iv)

$(704)^2$

$= (700+4)^2$

$= (700)^2 + 2\times 700\times 4 + (4)^2$

$= 490000 + 5600 + 16$

$= 495616$

Question 6.

Solution:

(i)

$(69)^2$

$= (70-1)^2$

$= (70)^2 - 2\times 70\times 1 + (1)^2$

$= 4900 - 140 + 1$

$= 5041$

(ii)

$(78)^2$

$= (80-2)^2$

$= (80)^2 - 2\times 80\times 2 + (2)^2$

$= 6400 - 320 + 4$

$= 6724$

(iii)

$(197)^2$

$= (200-3)^2$

$= (200)^2 - 2\times 200\times 3 + (3)^2$

$= 40000 - 1200 + 9$

$= 41209$

(iv)

$(999)^2$

$= (1000-1)^2$

$= (1000)^2 - 2\times 1000\times 1 + (1)^2$

$= 1000000 - 2000 + 1$

$= 1002001$

Question 7.

Solution:

(i)

$(82)2 - (18)2$

$= (82+18)(82-18)$

$= 100\times 64$

$= 6400$

(ii) $(128)^2$-$(72)^2$

$(128)2 - (72)2$

$= (128+72)(128-72)$

$= 200\times 56$

$= 11200$

(iii) 39991

(iv)

$$\frac{198\times198-102\times102}{96}$$

$$=\frac{(198)2-(102)2}{96}$$

$$=\frac{(198+102)(198-102)}{96}$$

$$=\frac{300\times96}{96}$$

$$=300$$

(v) 224.91

(vi)

$$(8.63)2-(1.37)2$$

$$=(8.63+1.37)(8.63-1.37)$$

$$=10\times7.26$$

$$=72.6$$

Question 8.

Solution:

$$(9x^2+24x+16)$$

$$=9\times(12)2+24\times12+16$$

$$=1296+288+16$$

$$=1600$$

Question 9.

Solution:

$$(64x^2+81y^2+144xy)$$

$$=64(11)2+81\left(\frac{4}{3}\right)2+144\times11\times\frac{4}{3}$$

$$=7744+144+2112$$

$$=10000$$

Question 10.

Solution:

$(36x^2 + 25y^2 - 60xy)$

$= 36\left(\frac{2}{3}\right)^2 + 25\left(\frac{1}{5}\right)^2 - 60 \times \frac{2}{3} \times \frac{1}{5}$

$= 16 + 1 - 8$

$= 9$

Question 11.

Solution:

(i)

$\left(x + \frac{1}{x}\right) = 4$

$\left(x + \frac{1}{x}\right)^2 = (4)^2$

$x^2 + 2 \times x \times \frac{1}{x} + \left(\frac{1}{x}\right)^2 = 16$

$x^2 + \frac{1}{x^2} = 16 - 2 = 14$

(ii)

$\left(x^2 + \frac{1}{x^2}\right)^2 = (14)^2$

$x^4 + 2 \times x^2 \times \frac{1}{x^2} + \frac{1}{x^4} = 196$

$x^4 + \frac{1}{x^4} = 196 - 2 = 194$

Question 12.

Solution:

(i)

$$\left(x-\frac{1}{x}\right)=5$$

$$\left(x-\frac{1}{x}\right)^2=(5)^2$$

$$x^2-2\times x\times\frac{1}{x}+\frac{1}{x^2}=25$$

$$x^2+\frac{1}{x^2}=25-2=23$$

(ii)

$$\left(x^2+\frac{1}{x^2}\right)^2=(23)^2$$

$$x^4+2\times x^2\times\frac{1}{x^2}+\frac{1}{x^4}=529$$

$$x^4+\frac{1}{x^4}=529-2=527$$

Question 13.

Solution:

(i)

$$(x+1)\left[(x-1)(x^2+1)\right]$$

$$=(x+1)\left[x^3+x-x^2-1\right]$$

$$=x^4+x^2-x^3-x+x^3+x-x^2-1$$

$$=x^4-1$$

(ii)

$$(x-3)\left[(x+3)(x^2+9)\right]$$

$$=(x-3)\left[x^3+9x+3x^2+27\right]$$

$$=x^4+9x^2+3x^3+27^x-3x^3-27x-9x^2-81$$

$$=x^4-81$$

(iii)

$$(3x-2y)\left[(3x+2y)(9x^2+4y^2)\right]$$
$$=(3x-2y)\left[27x^3+12xy^2+18x^2y+8y^3\right]$$
$$=81x^4+36x^2y^2+54x^3y+24xy^3-54x^3y-24xy^3-36x^2y^2-16y^4$$
$$=81x^4-16y^4$$

(iv)

$$(2p+3)\left[(2p-3)(4p^2+9)\right]$$
$$=(2p+3)\left[8p^3+18p-12p^2-27\right]$$
$$=16p^4+36p^2-24p^3-54p+24p^3+54p-36p^2-81$$
$$=16p^4-81$$

Question 14.

Solution:

$$x+y=12$$
$$(x+y)^2=(12)^2$$
$$x^2+2xy+y^2=144$$
$$x^2+2\times14+y^2=144$$
$$x^2+y^2+28=144$$
$$x^2+y^2=116$$

Question 15.

Solution:

$$x-y=7$$
$$(x-y)^2=(7)^2$$
$$x^2-2xy+y^2=49$$
$$x^2+y^2-2\times9=49$$
$$x^2+y^2-18=49$$
$$x^2+y^2=31$$

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Exercise 6E

Question 1.

Solution: (c) $(-6a+17b)$

Question 2.

Solution: (d) $(3p^2+5q-9r^3+7)$

Question 3.

Solution: (d) $x^2+2x-15$

Question 4. $(2x+3)(3x+1)=?$

(a) $(6x^2+8x-3)$ (b) $(6x^2+7x-3)$

(c) $(6x^2-7x-3)$ (d) $(6x^2-7x+3)$

Solution: (b) $(6x^2+7x-3)$

Question 5.

Solution: (c) $(x^2+8x+16)$

Question 6.

Solution: (d) $(x2-12x+36)$

Question 7.

Solution: (b) $(4x^2-25)$

Question 8.

Solution: (c) $-4ab^2$

Question 9.

Solution: (b) $(2x+1)$

Question 10.

Solution: (a) $(x-2)$

Question 11.

Solution: (c) (a^4-1)

Question 12.

Solution: (a) $\left(\frac{1}{x^2}-\frac{1}{y^2}\right)$

Question 13.

Solution: (c) 23

Question 14.

Solution: (b) 38

Question 15.

Solution: (c) 6400

Question 16.

Solution: (a) 39991

Question 17.

Solution: (b) 116

Question 18.

Solution: (a) 67

Question 19.

Solution: (c) 625