

$$\begin{aligned}
 \text{c)} \quad & 5a^3 + b^2 \\
 & = 5(-1)^3 + (7)^2 \\
 & = 5(-1) + 49 \\
 & = -5 + 49 \\
 & = 44
 \end{aligned}$$

$$\begin{aligned}
 \text{d)} \quad & -5a + 8b - 4ab \\
 & = -5(-1) + 8(7) - 4(-1)(7) \\
 & = 5 + 56 + 28 \\
 & = 89
 \end{aligned}$$

$$\begin{aligned}
 \text{e)} \quad & 10ab^2 - 15a + 3b \\
 & = 10(-1)(7)^2 - 15(-1) + 3(7) \\
 & = -10(49) + 15 + 21 \\
 & = -490 + 36 \\
 & = -454
 \end{aligned}$$

$$\begin{aligned}
 \text{f)} \quad & (ab)^c \\
 & = (-1 \times 7)^0 \\
 & = 1
 \end{aligned}$$

$$\begin{aligned}
 4. \quad \text{a)} \quad & 15ab + 25bc \\
 & = 5b(3a + 5c)
 \end{aligned}$$

$$\begin{aligned}
 \text{b)} \quad & -18mn^2p - 36m^2n + 90mnp \\
 & = -9mn(2np + 4m - 10p)
 \end{aligned}$$

$$\begin{aligned}
 \text{c)} \quad & 42x^2y^2z - 14xyz^2 + 77x^3yz \\
 & = 7xyz(6xy - 2z + 11x^2)
 \end{aligned}$$

$$\begin{aligned}
 \text{d)} \quad & 3a(4b - 5) + 4b(4b - 5) \\
 & = (4b - 5)(3a + 4b)
 \end{aligned}$$

$$\begin{aligned}
 \text{e)} \quad & -9a + 3b - 6ab \\
 & = -3(3a - b + 2ab)
 \end{aligned}$$

$$\begin{aligned}
 \text{f)} \quad & 36xy - 45x^2y + 63xy^2 \\
 & = 9xy(4 - 5x + 7y)
 \end{aligned}$$

$$\begin{aligned}
 \text{g)} \quad & 8a(3b - c) + 7c(c - 3b) \\
 & = 8a(3b - c) - 7c(3b - c) \\
 & = (3b - c)(8a - 7c)
 \end{aligned}$$

$$\begin{aligned}
 \text{h)} \quad & 12p^2q - 60pq^2 + 96p^2q^2 \\
 & = 12pq(p - 5q + 8pq)
 \end{aligned}$$

$$\begin{aligned}
 \text{i)} \quad & -70c^3b^2 + (7a^2c^3b)^2 - 35a^2b^2c^2 \\
 & = -70c^3b^2 + 49a^4c^6b^2 - 35a^2b^2c^2 \\
 & = -7c^2b^2(10c - 7a^4c^4 + 5a^2)
 \end{aligned}$$

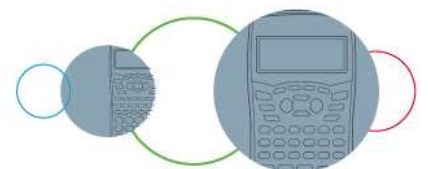
$$\begin{aligned}
 \text{j)} \quad & 17a(b + 3c) - 34a^2(2b - 3c) \\
 & = 17a[(b + 3c) - 2a(2b - 3c)] \\
 & = 17a(b + 3c - 4ab + 6ac)
 \end{aligned}$$

$$\begin{aligned}
 5. \quad \text{a)} \quad & 9a^2 - 81b^2 \\
 & = 9(a^2 - 9b^2) \\
 & = 9(a - 3b)(a + 3b)
 \end{aligned}$$

$$\begin{aligned}
 \text{b)} \quad & 64 - 81c^2 \\
 & = (8 - 9c)(8 + 9c)
 \end{aligned}$$

$$\begin{aligned}
 \text{c)} \quad & 49c^2d^2 - 16 \\
 & = (7cd - 4)(7cd + 4)
 \end{aligned}$$

$$\begin{aligned}
 \text{d)} \quad & 16a^8 - 1 \\
 & = (4a^4 - 1)(4a^4 + 1) \\
 & = (2a^2 - 1)(2a^2 + 1)(4a^4 + 1)
 \end{aligned}$$



$$\begin{aligned} \text{e)} \quad & 27x^4 - 48x^2y^2 \\ & = 3x^2(9x^2 - 16y^2) \\ & = 3x^2(3x - 4y)(3x + 4y) \end{aligned}$$

$$\begin{aligned} \text{f)} \quad & 25x^8 - 121y^8 \\ & = (5x^4 - 11y^4)(5x^4 + 11y^4) \end{aligned}$$

$$\begin{aligned} \text{g)} \quad & 16x^2 + 25y^2 \\ & \text{cant factorize} \end{aligned}$$

$$\begin{aligned} \text{h)} \quad & 288x^8 - 64y^{16} \\ & = 32(9x^8 - 2y^{16}) \end{aligned}$$

$$\begin{aligned} \text{i)} \quad & (3a + b)^2 - c^2 \\ & = [(3a + b) - c][(3a + b) + c] \end{aligned}$$

$$\begin{aligned} \text{j)} \quad & 169a^2 - 100b^4 \\ & = (13a - 10b^2)(13a + 10b^2) \end{aligned}$$

6. Factorize the following trinomials:

$$\begin{aligned} \text{a)} \quad & x^2 + 17x + 72 \\ & = (x + 8)(x + 9) \end{aligned}$$

$$\begin{aligned} \text{b)} \quad & x^2 + 14x + 40 \\ & = (x + 4)(x + 10) \end{aligned}$$

$$\begin{aligned} \text{c)} \quad & x^2 + 9x + 20 \\ & = (x + 4)(x + 5) \end{aligned}$$

$$\begin{aligned} \text{d)} \quad & x^2 + 16x + 64 \\ & = (x + 8)(x + 8) \quad \text{or} \quad (x + 8)^2 \end{aligned}$$

$$\begin{aligned} \text{e)} \quad & a^2 + 11a + 28 \\ & = (a + 4)(a + 7) \end{aligned}$$

$$\begin{aligned} \text{f)} \quad & 3b^2 + 42b + 135 \\ & = 3(b^2 + 14b + 45) \\ & = 3(b + 5)(b + 9) \end{aligned}$$

$$\begin{aligned} \text{g)} \quad & y^2 + 6y + 5 \\ & = (y + 1)(y + 5) \end{aligned}$$

$$\begin{aligned} \text{h)} \quad & z^2 + 14z + 49 \\ & = (z + 7)(z + 7) \quad \text{or} \quad (z + 7)^2 \end{aligned}$$

$$\begin{aligned} \text{i)} \quad & 7x^2 + 28x + 21 \\ & = 7(x^2 + 4x + 3) \\ & = 7(x + 1)(x + 3) \end{aligned}$$

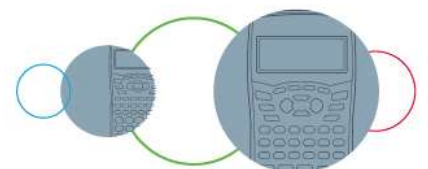
$$\begin{aligned} \text{j)} \quad & x^2 + 10x + 21 \\ & = (x + 3)(x + 7) \end{aligned}$$

$$\begin{aligned} \text{k)} \quad & a^3 + 13a^2 + 40a \\ & = a(a^2 + 13a + 40) \\ & = a(a + 5)(a + 8) \end{aligned}$$

$$\begin{aligned} \text{l)} \quad & 2b^2 + 20b + 18 \\ & = 2(b^2 + 10b + 9) \\ & = 2(b + 1)(b + 9) \end{aligned}$$

$$\begin{aligned} \text{m)} \quad & 11y^2 + 110y + 275 \\ & = 11(y^2 + 10y + 25) \\ & = 11(y + 5)(y + 5) \quad \text{or} \quad 11(y + 5)^2 \end{aligned}$$

$$\begin{aligned} \text{n)} \quad & z^2 + 11z + 30 \\ & = (z + 5)(z + 6) \end{aligned}$$



$$\begin{aligned} \text{o)} \quad & x^2 + 13x + 42 \\ & = (x + 6)(x + 7) \end{aligned}$$

$$\begin{aligned} \text{q)} \quad & a^2 + 14a + 48 \\ & = (a + 6)(a + 8) \end{aligned}$$

$$\begin{aligned} \text{s)} \quad & 10m^3n + 140m^2n + 450mn \\ & = 10mn(m^2 + 14m + 45) \\ & = 10mn(m + 5)(m + 9) \end{aligned}$$

$$\begin{aligned} 7. \quad \text{a)} \quad & 7abc - 56ac + 49bc^2 \\ & = 7c(ab - 8a + 7bc) \end{aligned}$$

$$\begin{aligned} \text{c)} \quad & 100x^4 - 81y^2 \\ & = (10x^2 - 9y)(10x^2 + 9y) \end{aligned}$$

$$\begin{aligned} \text{e)} \quad & x^2 + 23x + 132 \\ & = (x + 11)(x + 12) \end{aligned}$$

$$\begin{aligned} \text{g)} \quad & 81x^4 - 16y^4 \\ & = (9x^2 - 4y^2)(9x^2 + 4y^2) \\ & = (3x - 2y)(3x + 2y)(9x^2 + 4y^2) \end{aligned}$$

$$\begin{aligned} \text{i)} \quad & 192a^2c^2 - 363b^2c^2 \\ & = 3c^2(64a^2 - 121b^2) \\ & = 3c^2(8a - 11b)(8a + 11b) \end{aligned}$$

$$\begin{aligned} \text{k)} \quad & 42m^2n^2 - 84m^3n + 21m^4n^5 \\ & = 21m^2n(2n - 4m + m^2n^4) \end{aligned}$$

$$\begin{aligned} \text{m)} \quad & 49c^4 - d^4 \\ & = (7c^2 - d^2)(7c^2 + d^2) \end{aligned}$$

$$\begin{aligned} \text{p)} \quad & 4x^2 + 52x + 48 \\ & = 4(x^2 + 13x + 12) \\ & = 4(x + 1)(x + 12) \end{aligned}$$

$$\begin{aligned} \text{r)} \quad & 9d^2 + 99d + 162 \\ & = 9(d^2 + 11d + 18) \\ & = 9(d + 2)(d + 9) \end{aligned}$$

$$\begin{aligned} \text{t)} \quad & x^2 + 10x + 24 \\ & = (x + 4)(x + 6) \end{aligned}$$

$$\begin{aligned} \text{b)} \quad & x^2 + 12x + 35 \\ & = (x + 5)(x + 7) \end{aligned}$$

$$\begin{aligned} \text{d)} \quad & x^2 + \frac{5}{6}x + \frac{1}{6} \\ & = \left(x + \frac{1}{2}\right)\left(x + \frac{1}{3}\right) \end{aligned}$$

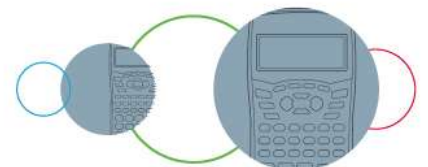
$$\begin{aligned} \text{f)} \quad & 108x^2y^2 - 192a^2 \\ & = 12(9x^2y^2 - 16a^2) \\ & = 12(3xy - 4a)(3xy + 4a) \end{aligned}$$

$$\begin{aligned} \text{h)} \quad & 4x^2 + 80x + 384 \\ & = 4(x^2 + 20x + 96) \\ & = 4(x + 8)(x + 12) \end{aligned}$$

$$\begin{aligned} \text{j)} \quad & 60m^3 + 12n^3 - 48mnp \\ & = 12(5m^3 + n^3 - 4mnp) \end{aligned}$$

$$\begin{aligned} \text{l)} \quad & x^2 + 18x + 72 \\ & = (x + 6)(x + 12) \end{aligned}$$

$$\begin{aligned} \text{n)} \quad & 400 - 144x^4 \\ & = 16(25 - 9x^4) \\ & = 16(5 - 3x^2)(5 + 3x^2) \end{aligned}$$



$$\begin{aligned} \text{o)} \quad & 36xyz + 19abc - 12bdf \\ & = 1(36xyz + 19abc - 12bdf) \end{aligned}$$

$$\begin{aligned} \text{q)} \quad & 108x^3y + 75xy \\ & = 3xy(36x^2 + 25) \end{aligned}$$

$$\begin{aligned} \text{s)} \quad & x^2 + 24x + 144 \\ & = (x + 12)(x + 12) \text{ or } (x + 12)^2 \end{aligned}$$

$$\begin{aligned} \text{p)} \quad & 5x^3 + 85x^2 + 350x \\ & = 5x(x^2 + 17x + 70) \\ & = 5x(x + 7)(x + 10) \end{aligned}$$

$$\begin{aligned} \text{r)} \quad & 3ax^2 + 66ax + 360a \\ & = 3a(x^2 + 22x + 120) \\ & = 3a(x + 10)(x + 12) \end{aligned}$$

$$\begin{aligned} \text{t)} \quad & x^2 + \frac{9}{20}x + \frac{1}{20} \\ & = \left(x + \frac{1}{4}\right)\left(x + \frac{1}{5}\right) \end{aligned}$$

$$\begin{aligned} 8. \quad \text{a)} \quad & \frac{x^2-16}{x^2+6x+8} \\ & = \frac{(x-4)(x+4)}{(x+2)(x+4)} \\ & = \frac{x-4}{x+2} \end{aligned}$$

$$\begin{aligned} \text{b)} \quad & \frac{x^2+9x+14}{x^2+11x+28} \\ & = \frac{(x+2)(x+7)}{(x+4)(x+7)} \\ & = \frac{x+2}{x+4} \end{aligned}$$

$$\begin{aligned} \text{c)} \quad & \frac{x^2-1}{x^2+9x+8} \times \frac{x^2+12x+32}{x^2-64} \\ & = \frac{(x-1)(x+1)}{(x+1)(x+8)} \times \frac{(x+4)(x+8)}{(x-8)(x+8)} \\ & = \frac{(x-1)}{(x+8)} \times \frac{(x+4)}{(x-8)} \\ & = \frac{(x-1)(x+4)}{(x+8)(x-8)} \end{aligned}$$

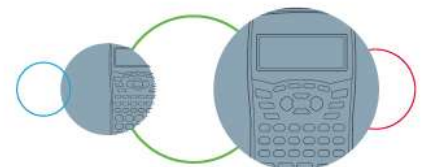
$$\begin{aligned} \text{d)} \quad & \frac{a^2+8a+15}{3a^2+9a} \div \frac{a^2-25}{6a^2+42a} \\ & = \frac{(a+3)(a+5)}{3a(a+3)} \div \frac{(a-5)(a+5)}{6a(a+7)} \\ & = \frac{(a+5)}{3a} \times \frac{6a(a+7)}{(a-5)(a+5)} \\ & = \frac{6a(a+7)}{3a(a-5)} \end{aligned}$$

$$\begin{aligned} \text{e)} \quad & \frac{x^2+3x+2}{8x+8} \times \frac{9x+27}{x^2-9} \\ & = \frac{(x+1)(x+2)}{8(x+1)} \times \frac{9(x+3)}{(x-3)(x+3)} \\ & = \frac{(x+2)}{8} \times \frac{9}{(x-3)} \\ & = \frac{9(x+2)}{8(x-3)} \end{aligned}$$

$$\begin{aligned} \text{f)} \quad & \frac{3x+24}{x^2-16} \times \frac{x^2-36}{x^2+14x+48} \\ & = \frac{3(x+8)}{(x-4)(x+4)} \times \frac{(x-6)(x+6)}{(x+6)(x+8)} \\ & = \frac{3}{(x-4)(x+4)} \times \frac{(x-6)}{1} \\ & = \frac{3(x-6)}{(x-4)(x+4)} \end{aligned}$$

$$\begin{aligned} \text{g)} \quad & \frac{x^2+7x+12}{3ax+18a} \div \frac{x^2-9}{3ax^2+30ax+72a} \\ & = \frac{(x+3)(x+4)}{3a(x+6)} \div \frac{(x-3)(x+3)}{3a(x^2+10x+24)} \\ & = \frac{(x+3)(x+4)}{3a(x+6)} \times \frac{3a(x+4)(x+6)}{(x-3)(x+3)} \\ & = \frac{(x+4)}{1} \times \frac{(x+4)}{(x-3)} \\ & = \frac{(x+4)^2}{(x-3)} \end{aligned}$$

$$\begin{aligned} \text{h)} \quad & \frac{x^2+5x+4}{x^2-49} \times \frac{4x-28}{x^2+13x+36} \\ & = \frac{(x+1)(x+4)}{(x-7)(x+7)} \times \frac{4(x-7)}{(x+4)(x+9)} \\ & = \frac{(x+1)}{(x+7)} \times \frac{4}{(x+9)} \\ & = \frac{4(x+1)}{(x+7)(x+9)} \end{aligned}$$



$$\begin{aligned}
 \text{i)} \quad & \frac{12-2x}{x^2+15x+56} \times \frac{x^2-49}{3x^2-18x} \\
 &= \frac{2(6-x)}{(x+7)(x+8)} \times \frac{(x-7)(x+7)}{3x(x-6)} \\
 &= \frac{-2(x-6)}{(x+8)} \times \frac{(x-7)}{3x(x-6)} \\
 &= \frac{-2}{(x+8)} \times \frac{(x-7)}{3x} \\
 &= \frac{-2(x-7)}{3x(x+8)}
 \end{aligned}$$

$$\begin{aligned}
 \text{j)} \quad & \frac{x^2+5x+6}{x^2-64} \div \frac{9x-72}{x^2+11x+24} \\
 &= \frac{(x+1)(x+5)}{(x-8)(x+8)} \div \frac{9(x-8)}{(x+3)(x+8)} \\
 &= \frac{(x+1)(x+5)}{(x-8)(x+8)} \times \frac{(x+3)(x+8)}{9(x-8)} \\
 &= \frac{(x+1)(x+5)}{(x-8)} \times \frac{(x+3)}{9(x-8)} \\
 &= \frac{(x+1)(x+5)(x+3)}{9(x-8)^2}
 \end{aligned}$$

