$$12x^2 + 18x$$
$$\boxed{6x(2x + 3)}$$

$$10x^2 + 25x + 15$$
$$\boxed{5(2x^2 + 5x + 3)}$$

$$x^4 - 8x^3 + x^2$$
$$\boxed{x^2(x^2 - 8x + 1)}$$

$$2x(x+3) + 5(x+3)$$
$$\boxed{(2x+5)(x+3)}$$

$$12x^2y^5 - 30x^4y^2$$
$$\boxed{6x^2y^2(2y^3 - 5x^2)}$$
$$12x^2y^5 - 30x^4y^2$$

$$14x^4 + 6x^2$$
$$\boxed{2x^2(7x^2 + 3)}$$

$$30k^3 + 6k^2$$
$$\boxed{6k^2(5k + 1)}$$

$$44k^5 - 66k^4 + 77k^3$$
$$11k^3(4k^2 - 6k + 7)$$

$$15k^4 + 35k^3 + 20k^2$$
$$5k^2(3k^2 + 7k + 4)$$

▷ $6x^3 + 8x^2 - 4x$

$\boxed{2x(3x^2 + 4x - 2)}$

▷ $12k^3 - 30k^4$

$\boxed{6k^3(2 - 5k)}$

$12k^3 - 30k^4$

▷ $x^3 - 8x^2 - 2x + 16$

$(x^3 - 8x^2) + (-2x + 16)$

$x^2(x - 8) - 2(x - 8)$

$(x^2 - 2)(x - 8)$

▷ $6n^4 + 20n^3 + 14n^2$

$2n^2(3n^2 + 10n + 7)$

▷ $(x^2 + x - 6)(2x^2 + 4x)$

$(x+3)(x-2) \, 2x(x + 2)$

▷ $7x^5 - 21x^4 + 14x^3$

$7x^3(x^2 - 3x + 2)$

$7x^3(x - 2)(x - 1)$

▷ $(3x^2 - 12x)(x^2 - 2x + 1)$

$\boxed{3x(x - 4)(x - 1)(x - 1)}$

$$\blacktriangleright (x^3 - 8x^2) + (-2x + 16)$$

$$x^2(x-8) - 2(x-8)$$

$$\boxed{(x^2 - 2)(x-8)}$$

$$\blacktriangleright 9b^8 + 24b^3$$

$$3b^3(3b^5 + 8)$$

$$(U + V)^2 = U^2 + 2UV + V^2$$

$$(U - V)^2 = (U - V)(U - V)$$

$$U^2 - UV - UV - V^2$$

$$U^2 - 2UV - V^2$$

$$\blacktriangleright 36x^4 - (y+3)^2$$

$$\blacktriangleright 25x^4 - 30x^2 + 9$$

$$(5x^2)^2 \qquad (-3)^2$$

$$\boxed{(5x^2 - 3)(5x^2 - 3)}$$

$$2 \cdot 5x^2 \cdot -3$$

$$10x^2 \cdot -3$$

$$-30x^2$$

$$\blacktriangleright x^2 - 49y^2 \qquad (a+b)(a-b)$$

$$a = x \quad b = 7y \quad a^2 - b^2$$

$$\boxed{(x + 7y)(x - 7y)}$$

▶ $49q^4 - 4$

$a = \sqrt[2]{49q^4} = 7q^2$

$b = 2$

$\boxed{\left(7q^2 + 2\right)\left(7q^2 - 2\right)}$

$49q^4 - \cancel{14q^2} + \cancel{14q^2} - 4$

$49q^4 - 4$

▶ $49m^4 + 140m^2 + 100$

$\left(7m^2\right)^2 + 2 \cdot 7m^2 \cdot 10 + \left(10\right)^2$

$\left(u + v\right)^2 = \boxed{\left(7m^2 + 10\right)^2}$

▶ $16x^2 - 49y^2$

$a = \left(4x\right)^2$

$b = \left(7y\right)$

$\boxed{\left(4x + 7y\right)\left(4x - 7y\right)}$

$16x^2 - \cancel{28xy} + \cancel{28xy} - 49y^2$

$16x^2 - 49y^2$

▶ $9m^2 + 30mn + 25n^2$

$\left(3m\right)^2 + 2 \cdot 3m \cdot 5n + \left(5n\right)^2$

$\left(u + v\right)^2 = \boxed{\left(3m + 5n\right)^2}$

$\left(3m + 5n\right)\left(3m + 5n\right)$

$9m^2 + 15mn + 15mn + 25n^2$

$9m^2 + 30mn + 25n^2$

▶ $4p^2 - 25q^2$

$(2p)^2 - (5q)^2$

$(a + b)(a - b)$

$\boxed{(2p + 5q)(2p - 5q)}$

$4p^2 - \cancel{10pq} + \cancel{10pq} - 25q^2$

$4p^2 - 25q^2$

▶ $4x^2 + 36xy + 81y^2$

$(2x)^2 + 2 \cdot 2x \cdot 9y + (9y)^2$

$(u + v)^2 = \boxed{(2x + 9y)^2}$

$(2x + 9y)(2x + 9y)$

$4x^2 + 18xy + 18xy + 81y^2$

$4x^2 + 36xy + 81y^2$

▶ $49p^8 + 42p^4 + 9$

$(7p^4)^2 + 2 \cdot 7p^4 \cdot 3 + (3)^2$

$(u + v)^2 = \boxed{(7p^4 + 3)^2}$

$(7p^4 + 3)(7p^4 + 3)$

$49p^8 + 21p^4 + 21p^4 + 9$

$49p^8 + 42p^4 + 9$

▶ $49c^2 + 70cd + 25d^2$

$(7c)^2 + 2 \cdot 7c \cdot 5d + (5d)^2$

$(u + v)^2 = \boxed{(7c + 5d)^2}$

$(7c + 5d)(7c + 5d)$

$49c^2 + 35cd + 35cd + 25d^2$

$49c^2 + 70cd + 25d^2$

▷ $16n^6 + 40n^3 + 25$

$\left(4n^3\right)^2 + 2\cdot 4n^3 \cdot 5 + \left(5\right)^2$

$\left(U+v\right)^2 = \boxed{\left(4n^3 + 5\right)^2}$

$\left(4n^3 + 5\right)\left(4n^3 + 5\right)$

$16n^6 + 20n^3 + 20n^3 + 25$

$16n^6 + 40n^3 + 25$

▷ $\left(3x - 2y\right)\left(2y - 3x\right)$

$6xy - 9x^2 - 4y^2 + 6xy$

$12xy - 9x^2 - 4y^2$

$-9x^2 + 12xy - 4y^2$

$\left(2k + 5r\right)\left(2k - 5r\right)$

$4k^2 - \cancel{10kr} + \cancel{10kr} - 25r^2$

$\boxed{4k^2 - 25r^2}$

▷ $\left(5b - 2\right)^2 + 4$

$\left(5b - 2\right)\left(5b - 2\right) + 4$

$25b^2 - 10b - 10b + 4 + 4$

$25b^2 - 20b + 8$

$\left(2x^2 + y^2\right)\left(2x^2 - y^2\right)$

$4x^4 - \cancel{2x^2y^2} + \cancel{2x^2y^2} - y^4$

$4x^4 - y^4$

$(3x + 2y)^2$

$(3x + 2y)(3x + 2y)$

$9x^2 + 6xy + 6xy + 4y^2$

$9x^2 + 12xy + 4y^2$

$(x^2 + 1)^2$

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

$x^4 + x^2 + x^2 + 1$

$x^4 + 2x^2 + 1$

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

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

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

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

$x^4 + 2x^2 + 1$

$$S_n = \frac{a(1-r^n)}{(1-r)}$$

a = first term

r = common ratio

n = # of terms

$$\frac{1\left(1-(-0.99)^{80}\right)}{1-(-0.99)}$$

▷ $2 + 8 + 32 + \ldots$

$a = 2, \quad r = 4$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$= \frac{2(1-4^8)}{1-4}$$

$$= \frac{2(1-65536)}{-3}$$

$$= \boxed{43690}$$

▷ $a = 3$
$r = 4$
$n = 8$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$= \frac{3(1-4^8)}{1-4} = \boxed{65535}$$

▷ $n = 6$
$r = 5$
$S_n = 15624$

$$15624 = \frac{a(1-5^6)}{1-5}$$

$$15624 = \frac{a(1-15625)}{-4}$$

$$\,\cdot -4 \qquad \overset{=-4}{} \,\cdot -4$$

$$\frac{-62496}{-15624} = \frac{-15624a}{-15624} \qquad \boxed{a=4}$$

▶ $7 + 21 + 63 + \ldots$

$\underbrace{}_{3} \underbrace{}_{3}$

$a = 7$ $S_n = \dfrac{a(1-r^n)}{1-r} = \dfrac{7(1-3^9)}{1-3} = \boxed{68887}$

$r = 3$

$n = 9$

▶ $24 + 12 + 6 + 3 + \ldots$ $a = 24, \; r = \dfrac{1}{2}, \; n = 25$

$S_n = \dfrac{a(1-r^n)}{1-r} = \boxed{\dfrac{24\left(1 - \frac{1}{2}^n\right)}{1 - \frac{1}{2}}}$

$S_{(25)} = \dfrac{24\left(1 - \frac{1}{2}^{25}\right)}{1 - \frac{1}{2}} = 47.999 = \boxed{48_M}$

▷ $a = 42,000 \quad r = 1.04$

$$S_n = \frac{42,000\left(1 - (1.04)^n\right)}{1 - 1.04} = \boxed{42,000\left(\frac{1 - (1.04)^n}{-0.04}\right)}$$

▷ $a + a^2 + a^3 + a^4 \qquad r = \frac{3}{4} \quad n = 4 \quad S_n = 175$

$\underbrace{\qquad}_{3/4}\underbrace{\qquad}_{3/4}\underbrace{\qquad}_{3/4}$

$175M$

$$S_n = \frac{a(1 - r^n)}{1 - r} \implies 175 = \frac{a\left(1 - \left(\frac{3}{4}\right)^4\right)}{1 - \frac{3}{4}}$$

$64 + 48 + 36 + 27$

$$175 = \frac{a\left(\frac{175}{256}\right)}{\frac{1}{4}}$$

▷ $a = 27, \ r = \frac{2}{3}, \ n = 5$

$$S(5) = \frac{27\left(1 - \left(\frac{2}{3}\right)^5\right)}{1 - \frac{2}{3}} = 70.\overline{3}$$

$\frac{175}{4} = \frac{175}{256}(a)$

$\approx \boxed{70\,\text{km}}$

$\frac{175}{256} \qquad \frac{175}{256}$

$$\boxed{a = 64}$$

▷ $a = 150$ $r = 1.15$

$$S_n = \frac{a(1-r^n)}{1-r} = \frac{150(1-1.15^n)}{1-1.15} = \boxed{150\left(\frac{1-1.15^n}{1-1.15}\right)}$$

▷ $(3x-2y)(2y-3x)$

$6xy - 9x^2 - 4y^2 + 6xy$

$-9x^2 + 12xy - 4y^2$

$(2u+5r)(2u-5r)$

$4u^2 - \cancel{10ur} + \cancel{10ur} - 25r^2$

$\boxed{4u^2 - 25r^2}$

▷ $a = 35,000$, $r = 1.03$

$$S_n = \frac{a(1-r^n)}{1-r} = \frac{35,000(1-1.03^n)}{1-1.03} = \frac{35,000(1-1.03^n)}{-0.03}$$

$(5b-2)^2 + 4$

$(5b-2)(5b-2) + 4$

$25b^2 - 10b - 10b + 4 + 4$

$25b^2 - 20b + 8$

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

$4x^4 - 2x^2y^2 + 2x^2y^2 - y^4$

$\boxed{4x^4 - y^4}$

$a = 24, \; r = 0.5$

$S_n = \dfrac{a(1-r^n)}{1-r} = \dfrac{24(1-0.5^n)}{1-0.5} = \boxed{\dfrac{24 \cdot (1-0.5^n)}{0.5}}$

$(3x+2y)(3x+2y)$

$9x^2 + 6xy + 6xy + 4y^2$

$9x^2 + 12xy + 4y^2$

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

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

$9x^2 - 4y^2 + 8y^2$

$9x^2 + 4y^2$

▷ $7x^5 - 21x^4 + 14x^3$

$7x^3(x^2 - 3x + 2)$

$\boxed{7x^3(x-2)(x-1)}$

▷ $6n^4 + 20n^3 + 14n^2$

$\boxed{2n^2(3n^2 + 10n + 7)}$

▷ $a = ?\ ,\ r = \frac{3}{4},\ n = 3,\ S_n = 83.25$

$S_n = \dfrac{a(1-r^n)}{1-r}$

$83.25 = \dfrac{a\left(1-\left(\frac{3}{4}\right)^3\right)}{1-\frac{3}{4}}$

$83.25 = \dfrac{a\left(\frac{37}{64}\right)}{\frac{1}{4}}$

$\cdot\frac{1}{4} \quad \dfrac{\cancel{\frac{1}{4}}}{\frac{1}{4}}$

$\dfrac{20.8125}{\frac{37}{64}} = \dfrac{\frac{37}{64}a}{\frac{37}{64}} \quad \Rightarrow \quad \boxed{a = 36}$

▷ $12x^5 = (4x^2)(c)$

$\dfrac{12x^5}{4x^2} = \boxed{3x^3}$

▷ $36c^2 - 84cd + 49d^2$

$(6c)^2 - 2 \cdot 6c \cdot 7d + (7d)^2$

$(U-V)^2 = \boxed{(6c-7d)^2}$

$(6c-7d)(6c-7d)$

$36c^2 - 42cd - 42cd + 49d^2$

$36c^2 - 84cd + 49d^2$

$$\blacktriangleright (x^2+1)^2 \qquad\qquad = (x^2-1)^2 + (2x)^2$$

$$(x^2+1)(x^2+1) \qquad\qquad (x^2-1)(x^2-1) + (2x)^2$$

$$x^4 + x^2 + x^2 + 1 \qquad\qquad x^4 - x^2 - x^2 + 1$$

$$x^4 + 2x^2 + 1 \qquad\qquad x^4 - 2x^2 + 1 + (4x^2)$$

$$= \quad x^4 + 2x^2 + 1$$

$$\blacktriangleright (3x^2 - 12x)(x^2 - 2x + 1) \qquad \blacktriangleright 64y^6 - 48y^3 + 9$$

$$3x(x-4)(x-1)(x-1) \qquad\qquad (8y^3)^2 - 2\cdot 8y^3 \cdot 3 + (3)^2$$

$$(U-V)^2 = \boxed{(8y^3 - 3)^2}$$

$$(8y^3 - 3)(8y^3 - 3)$$

$$64y^6 - 24y^3 - 24y^3 + 9$$

$$64y^6 - 48y^3 + 9$$