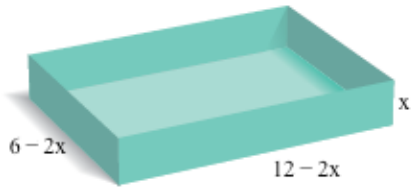
Period 4, 8/29/24

The volume, of a rectangular solid with length L, width W, and height H is given by the formula V = LWH.

Use this formula to write a polynomial in standard form that models, or represents, the volume of the open box.



The volume of the open box is $4x^3 - 36x^2 + 72x$.

(Simplify your answer. Type your answer in standard form.)

$(12-2x)(6-2x)\cdot x$

$(72-24x-12x+4x^2)\cdot x$

$72x-24x^2-12x^2+4x^3$

$4x^3-36x^2+72x$

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

$9a^2-100=(3a)^2-10^2=(3a-10)(3a+10)$

$a^3-b^3=(a-b)(a^2+ab+b^2)$

$27x^6-1000=3^3x^6-10^3=(3x^2)^3-10^3=(3x^2-10)\left((3x^2)^2+3x^2\cdot 10+10^2\right)$

$(\sqrt{3}x-\sqrt{10})(\sqrt{3}x+\sqrt{10})(9x^4+30x^2+100)$

$a^3+b^3=(a+b)(a^2-ab+b^2)$

Grouping

$2x^3-3x^2-14x+21$

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

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

Check

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

$2x^3-14x-3x^2+21$

$2x^3-3x^2-14x+21$

$2a^2+11ab+5b^2$

$2\cdot 5=10$

$2+5=7$

$-2+-5=-7$

$10+1=11$

$-10+-1=-11$

$2a^2+10ab+1ab+5b^2$

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

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

$5b^2+3ab$

$b(5b+3a)$

$x^3 + 1000 = x^3 + 10^3 = (x+10)(x^2 - 10x + 10^2)$

$(x+10)(x^2-10x+100)$

Factor the expression completely or state that the polynomial is prime.

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

Factor the algebraic expression.

$x^{3/5} - x^{1/5}$

$x^{\frac{1}{5}}(x^{2/5} - 1)$

$x^{\frac{1}{5}}(x^{\frac{1}{5}} + 1)(x^{\frac{1}{5}} - 1)$

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

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

Factor completely.

$6x^2(x+4) - 13x(x+4) - 8(x+4)$

$(x+4)(6x^2 - 13x - 8)$

$6 \cdot -8 = -48$

$-16 + 3 = -13$

$6x^2 - 16x + 3x - 8$

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

$(x+4)(2x+1)(3x-8)$

$y^2 - 9 = y^2 - 3^2$

$y^5 - 81y$

$y(y^4 - 81)$

$y[(y^2)^2 - 9^2]$

$y(y^2+9)(y^2-9)$

$y(y^2+9)(y+3)(y-3)$

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

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

$(5a-2)^2 = (5a-2)(5a-2) = 25a^2-10a-10a+4$

$25a^2-20a+4$

$25a^2-20a+4$

$\sqrt[6]{128x^9}$ $\quad 128 = 2^7$

$\sqrt[6]{2^7x^9} = 2\cdot x\sqrt[6]{2^1x^3} = 2x\sqrt[6]{2x^3}$

$\sqrt[4]{256x^9}$ $\quad 256 = 2^8$

$\sqrt[4]{2^8x^9} = 2\cdot 2\cdot x\cdot x\sqrt[4]{x}$

$4x^2\sqrt[4]{x}$

$\sqrt[5]{243x^6} = \sqrt[5]{3^5x^6}$

$3\cdot x\sqrt[5]{x}$

$\sqrt[3]{343y^4} = \sqrt[3]{7^3y^4} = 7\cdot y\sqrt[3]{y}$

$\sqrt[3]{81x^5y^{10}} = \sqrt[3]{3^4x^5y^{10}} = 3\cdot x\cdot y^3\sqrt[3]{3x^2y^1}$

$\sqrt[3]{3\cdot3\cdot3\cdot3\cdot x\cdot x\cdot x\cdot x\cdot x\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y}$

$\sqrt[3]{81x^5y^{10}} = \sqrt[3]{3^4x^5y^{10}} = 3^{\frac{4}{3}}x^{\frac{5}{3}}y^{\frac{10}{3}} = 3^{1\frac{1}{3}}x^{1\frac{2}{3}}y^{3\frac{1}{3}}$

$3^1x^1y^3\sqrt[3]{3x^2y}$

$\sqrt[4]{243x^7y^9} = \sqrt[4]{3^5x^7y^9} = 3 \cdot x \cdot y^2 \sqrt[4]{3x^3y^1}$

$\sqrt[3]{64x^9y^{10}z^7} = \sqrt[3]{2^6x^9y^{10}z^7} = 2 \cdot 2 \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot z z \sqrt[3]{yz^1}$

$4x^3y^3z^2 \sqrt[3]{yz}$

$\sqrt[5]{128x^6y^{15}z^4} = \sqrt[5]{2^7x^6y^{15}z^4} = 2 \cdot x \cdot y^3 \sqrt[5]{2^2xz^4}$

$2xy^3 \sqrt[5]{4xz^4}$

$\sqrt[4]{81a^4m^{11}} = \sqrt[4]{3^4a^4m^{11}} = 3 \cdot a \cdot m^2 \sqrt{m^3}$

$\sqrt[4]{625x^{-5}y^9} = \sqrt{\frac{5^4y^9}{x^5}} = \frac{\sqrt[4]{5^4y^9}}{\sqrt[4]{x^5}} = \frac{5 \cdot y^2 \sqrt[4]{y} \cdot \sqrt[4]{x^3}}{x \sqrt[4]{x} \cdot \sqrt[4]{x^3}}$

$\frac{5y^2 \sqrt[4]{x^3y}}{x \cdot \underbrace{\sqrt[4]{x^4}}_{x}} = \frac{5y^2 \sqrt[4]{x^3y}}{x^2}$

$\sqrt[4]{x^2y^{-3}} = \frac{\sqrt[4]{x^2} \sqrt[4]{y^1}}{\sqrt[4]{x^3} \cdot \sqrt[4]{y^4}} = \frac{\sqrt[4]{x^2y}}{\sqrt[4]{y^4}} = \frac{\sqrt[4]{x^2x}}{y}$

$$\sqrt[3]{x^7y^{-4}} = \frac{\sqrt[3]{x^7}}{\sqrt[3]{y^4}} = \frac{x^2\sqrt[3]{x}\,\sqrt[3]{y^2}}{y\underbrace{\sqrt[3]{y}\,\sqrt[3]{y^2}}_{\sqrt[3]{y^3}=y}} = \frac{x^2\sqrt[3]{xy^2}}{y^2}$$

$$\sqrt[4]{\frac{32x^{-6}y^2}{z^2}} = \frac{\sqrt[4]{2^5y^2}}{\sqrt[4]{x^6z^2}} = \frac{2\sqrt[4]{2y^2}\,\sqrt[4]{x^2z^2}}{x\underbrace{\sqrt[4]{x^2z^2}\,\sqrt[4]{x^2z^2}}_{\sqrt[4]{x^4z^4}}} = \frac{2\sqrt[4]{2x^2y^2z^2}}{x\cdot x\cdot z}$$

$$\frac{2\sqrt[4]{2x^2y^2z^2}}{x^2z}$$

$$\sqrt[3]{\frac{32x^2y^{-4}}{z^5}} = \frac{\sqrt[3]{2^5x^2}}{\sqrt[3]{y^4z^5}} = \frac{2\cdot\sqrt[3]{2^2x^2}\,\sqrt[3]{y^2z}}{y\cdot z\,\sqrt[3]{yz^2}\,\sqrt[3]{y^2z}} = \sqrt[3]{y^3z^3}$$

$$\frac{2\sqrt[3]{4x^2y^2z}}{y\cdot z\cdot y\cdot z} = \frac{2\sqrt[3]{4x^2y^2z}}{y^2z^2}$$

$$\sqrt[6]{\frac{64x^3y^{-5}}{z^2}} = \frac{\sqrt[6]{2^6x^3}\,\sqrt[6]{yz^4}}{\sqrt[6]{y^5z^2}\,\sqrt[6]{yz^4}} = \frac{2\sqrt[6]{x^3yz^4}}{yz}$$

$$\sqrt[6]{y^5z^2}\,\sqrt[6]{yz^4} = \sqrt[6]{y^6z^6}$$

$$\sqrt[4]{\frac{x^5y^{-7}}{a^3z^{-2}}} = \frac{\sqrt[4]{x^5z^2}}{\sqrt[4]{a^3y^7}} = \frac{x\sqrt[4]{xz^2}\cdot\sqrt[4]{ay}}{y\sqrt[4]{a^3y^3}\cdot\sqrt[4]{ay}} = \frac{x\sqrt[4]{xz^2ay}}{y^2\cdot a}$$

$$\sqrt[4]{a^3y^3}\cdot\sqrt[4]{ay} = \sqrt[4]{a^4y^4}$$

$$y\cdot a\cdot y$$

$$\sqrt[5]{\frac{64x^{-14}}{y^{-3}}} = \sqrt[5]{\frac{2^6y^3}{x^{14}}} = \frac{\sqrt[5]{2^6y^3}}{\sqrt[5]{x^{14}}} = \frac{2\sqrt[5]{2y^3}\,\sqrt[5]{x}}{x\cdot x\sqrt[5]{x^4}\,\sqrt[5]{x}} = \frac{2\sqrt[5]{2xy^3}}{x^3}$$

$$\sqrt[5]{x^4}\,\sqrt[5]{x} = \sqrt[5]{x^5}$$

$$\sqrt[4]{\frac{243x^{-3}}{y^{-5}}} = \frac{\sqrt[4]{3^5y^5}}{\sqrt[4]{x^3}} = \frac{3\cdot y\sqrt[4]{3y}\,\sqrt[4]{x^1}}{\sqrt[4]{x^3}\,\sqrt[4]{x^1}} = \frac{3y\sqrt[4]{3xy}}{x}$$

$$\sqrt[4]{x^3}\,\sqrt[4]{x^1} = \sqrt[4]{x^4}$$

$$3a^{2/3} = (a^5)^{\frac{2}{3}} = a^{\frac{10}{3}} = a^{3\frac{1}{3}} = 8\sqrt[3]{a}$$

$$81^{2/3} = (3^4)^{2/3} = 3^{\frac{8}{3}} = 3^{2\frac{2}{3}} = 9\sqrt[3]{3^2} = 9\sqrt[3]{9}$$

$$625^{\frac{3}{3}} = (5^4)^{\frac{2}{3}} = 5^{\frac{8}{3}} = 5^{2\frac{2}{3}} = 25\sqrt[3]{5^2} = 25\sqrt[3]{25}$$

$$\sqrt{\frac{18}{a^2bc}} = \frac{\sqrt{3^2\cdot 2}}{\sqrt{a^2\cdot b\cdot c}} = \frac{3\sqrt{2}}{a\sqrt{b\cdot c}}\cdot\frac{\sqrt{bc}}{\sqrt{bc}} = \frac{3\sqrt{2bc}}{a\cdot b\cdot c}$$

$\sqrt{b^2c^2}$

18 → 9, 2 → 3, 3

$$\sqrt[3]{\frac{72}{a^3b^2c}} = \frac{\sqrt[3]{3^2\cdot 2^3}}{\sqrt[3]{a^3b^2c}} = \frac{2\sqrt[3]{9}\,\sqrt[3]{bc^2}}{a\sqrt[3]{b^2c}\,\sqrt[3]{bc^2}} = \frac{2\sqrt[3]{9bc^2}}{abc}$$

$\sqrt[3]{b^3c^3} = bc$

72 → 9, 8 → 3, 3, 2·2·2

$$\sqrt[6]{\frac{256}{x^2y^2z^5}} = \frac{\sqrt[6]{2^8}\,\sqrt[6]{x^4y^4z}}{\sqrt[6]{x^2y^2z^5}\,\sqrt[6]{x^4y^4z^1}} = \frac{2\sqrt[6]{2^2x^4y^4z}}{xyz}$$

$\sqrt[6]{x^6y^6z^6}$

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

$$\sqrt[5]{\sqrt[3]{\sqrt[4]{m}}} = \left(\left(m^{\frac{1}{4}}\right)^{\frac{1}{3}}\right)^{\frac{1}{5}} = \left(m^{\frac{1}{12}}\right)^{\frac{1}{5}} = m^{\frac{1}{60}} = \sqrt[60]{m}$$

$$\sqrt{\sqrt[3]{\sqrt[5]{x}}} = \left(\left(x^{\frac{1}{5}}\right)^{\frac{1}{3}}\right)^{\frac{1}{2}} = \left(x^{\frac{1}{15}}\right)^{\frac{1}{2}} = x^{\frac{1}{30}} = \sqrt[30]{x}$$

$$\sqrt[5]{\sqrt[3]{\sqrt{\sqrt[4]{a}}}} = \left(\left(\left(a^{\frac{1}{4}}\right)^{\frac{1}{2}}\right)^{\frac{1}{3}}\right)^{\frac{1}{5}} = \left(\left(a^{\frac{1}{8}}\right)^{\frac{1}{3}}\right)^{\frac{1}{5}} = \left(a^{\frac{1}{24}}\right)^{\frac{1}{5}} = a^{\frac{1}{120}} = \sqrt[120]{a}$$

$$\frac{\sqrt[5]{x^4}\sqrt[4]{y}}{\sqrt[4]{y^7}\cdot\sqrt[4]{y}} = \frac{x^{\frac{4}{5}}\cdot y^{\frac{1}{4}}}{\sqrt[4]{y^8}} = \frac{x^{\frac{16}{20}}y^{\frac{5}{20}}}{y^2} = \frac{\sqrt[20]{x^{16}y^5}}{y^2}$$

$$\frac{\sqrt[4]{x^7}\cdot\sqrt[7]{y^4}}{\sqrt[7]{y^3}\cdot\sqrt[7]{y^4}} = \frac{x^{\frac{7\cdot7}{4\cdot7}}y^{\frac{4\cdot4}{7\cdot4}}}{\sqrt[7]{y^7}} = \frac{x^{\frac{49}{28}}y^{\frac{16}{28}}}{y} = \frac{x^{1\frac{21}{28}}y^{\frac{16}{28}}}{y}$$

$$\frac{x\sqrt[28]{x^{21}y^{16}}}{y}$$

$$\frac{\sqrt[5]{a^7}\sqrt[3]{b^2}}{\sqrt[3]{b^4}\sqrt[3]{b^2}} = \frac{a\sqrt[5]{a^2}\sqrt[3]{b^2}}{\sqrt[3]{b^6}} = \frac{a\cdot a^{\frac{2\cdot3}{5\cdot3}}b^{\frac{2\cdot5}{3\cdot5}}}{b^2} = \frac{a\sqrt[15]{a^6b^{10}}}{b^2}$$

$$\frac{3(\sqrt{x}-\sqrt{y})}{(\sqrt{x}+\sqrt{y})(\sqrt{x}-\sqrt{y})} = \frac{3(\sqrt{x}-\sqrt{y})}{x-y}$$

$$x - \sqrt{xy} + \sqrt{xy} - y$$

$$\frac{a(\sqrt{b}+\sqrt{c})}{(\sqrt{b}-\sqrt{c})(\sqrt{b}+\sqrt{c})} = \frac{a(\sqrt{b}+\sqrt{c})}{b-c}$$

$$b + \sqrt{bc} - \sqrt{bc} - c$$

$$\frac{(\sqrt{m}-4)(\sqrt{a}+\sqrt{b})}{(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})} = \frac{(\sqrt{m}-4)(\sqrt{a}+\sqrt{b})}{a-b} = \frac{\sqrt{am}+\sqrt{bm}-4\sqrt{a}-4\sqrt{b}}{a-b}$$

$a + \sqrt{ab} - \sqrt{ab} - b$

$$\frac{6(\sqrt{m}-4)}{(\sqrt{m}+4)(\sqrt{m}-4)} = \frac{6(\sqrt{m}-4)}{m-16} = \frac{6\sqrt{m}-24}{m-16}$$

$m - 4\sqrt{m} + 4\sqrt{m} - 16$

$$\frac{(-\sqrt{x}+\sqrt{a})(2+\sqrt{m})}{(2-\sqrt{m})(2+\sqrt{m})} = \frac{-2\sqrt{x}+2\sqrt{a}-\sqrt{mx}+\sqrt{am}}{4-m}$$

$$\frac{(m+\sqrt{3})(3-\sqrt{x})}{(3+\sqrt{x})(3-\sqrt{x})} = \frac{(m+\sqrt{3})(3-\sqrt{x})}{9-x} = \frac{3m+3\sqrt{3}-m\sqrt{x}-3\sqrt{x}}{9-x}$$