July 23, 2022

$x^2 = 81$

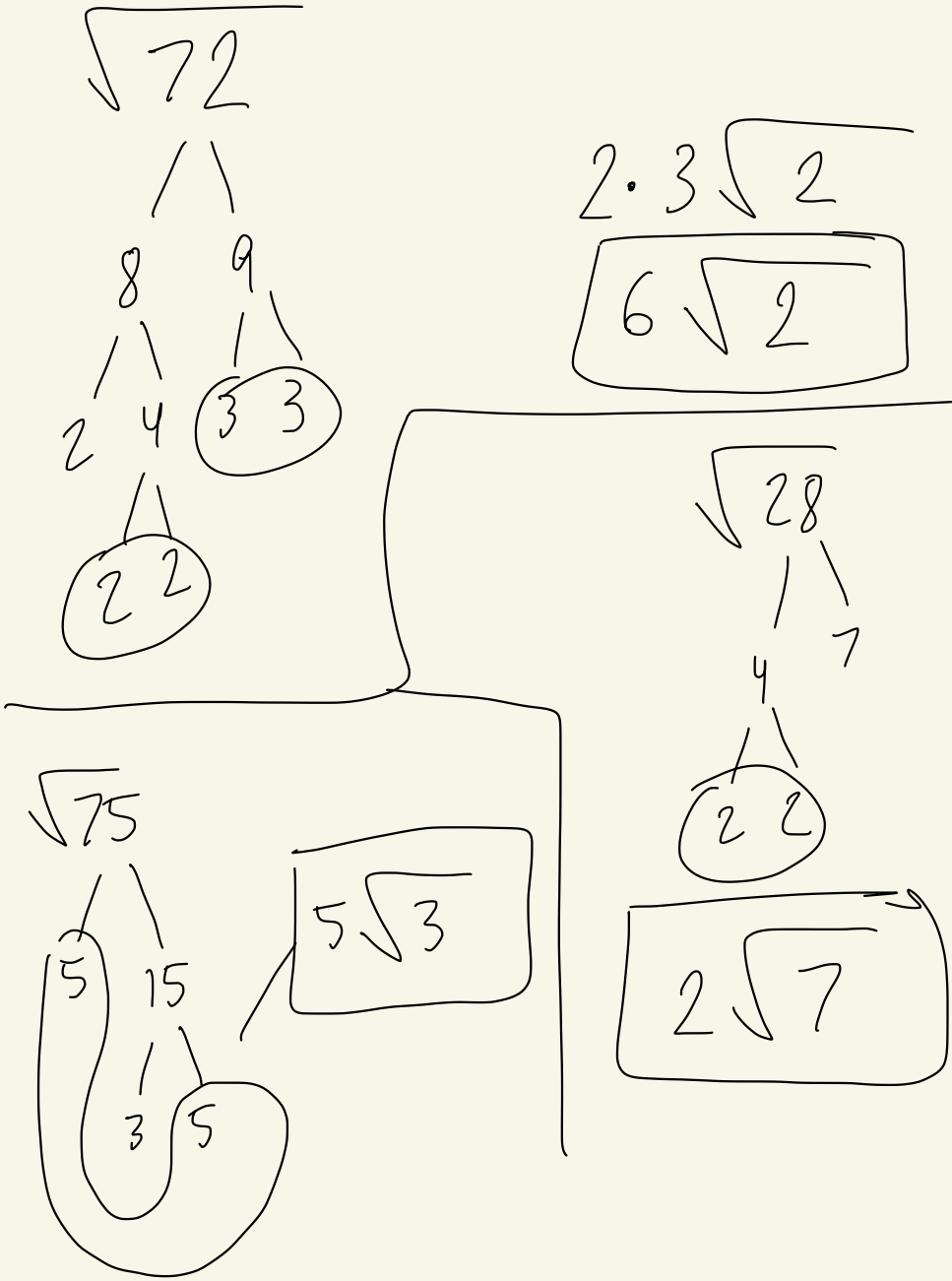
$\sqrt{x^2} = \sqrt{81}$

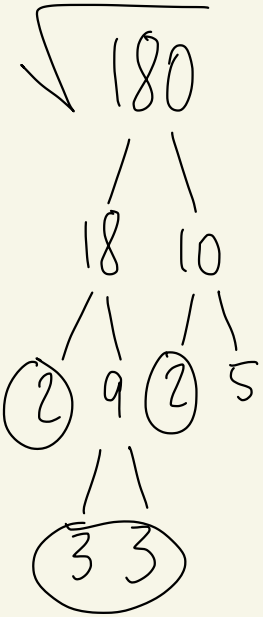
$x = \pm\sqrt{81}$

$x = \sqrt{81}$	$x = -\sqrt{81}$

$\sqrt{\frac{9}{100}} = \frac{3}{10}$

$\sqrt{\frac{64}{121}} = \boxed{\frac{8}{11}}$


72
8
9
2
4
3
3
2
2
2·3√2
6√2
28
4
7
2
2
75
5
15
3
5
5√3
2√7



$2 \cdot 3\sqrt{5} = \boxed{6\sqrt{5}}$

$$3\sqrt{500x^3}$$

$$3\sqrt{500} \cdot \sqrt{x^3}$$

$$100 \cdot 5$$

$$3\sqrt{10^2 \cdot 5} \cdot \sqrt{x^2 \cdot x}$$

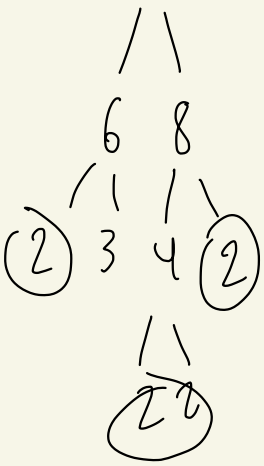
$$3 \cdot 10 \cdot \sqrt{5} \cdot x \cdot \sqrt{x}$$

$$30 \cdot x \cdot \sqrt{5} \cdot \sqrt{x}$$

$$30 \cdot x \cdot \sqrt{5x}$$

$$30x\sqrt{5x}$$

$\sqrt{48b^7}$



$2 \cdot 2\sqrt{3b^7} = 4\sqrt{3b^7}$

$\sqrt{3b^2 \cdot b^2 \cdot b^2 \cdot b}$

$4b^3\sqrt{3b}$

$\sqrt{52x^4}$

$\sqrt{52x^2 \cdot x^2}$

$x^2\sqrt{52}$

$2 \cdot 26$

$13 \cdot 2$

$2 \cdot x^2\sqrt{13}$

$\boxed{2x^2\sqrt{13}}$

$\sqrt{56z^7} = \sqrt{56z^2 \cdot z^2 \cdot z^2 \cdot z}$

$z^3\sqrt{56z}$

$8 \cdot 7$

$4 \cdot 2$

$2 \cdot 2$

$2z^3\sqrt{2 \cdot 7z}$

$\boxed{2z^3\sqrt{14z}}$

$\sqrt{39y^9}$

$y^4\sqrt{39y}$

13 3

$\boxed{y^4\sqrt{39y}}$

$\sqrt{80b^2}$

$b\sqrt{80}$

10 8

5 2 2 4

2 2

$2 \cdot 2 \cdot b\sqrt{5}$

$\boxed{4b\sqrt{5}}$

$2\sqrt{7x} \cdot 3\sqrt{14x^2}$

$2 \cdot 3\sqrt{7x \cdot 14x^2}$

$6\sqrt{7 \cdot x \cdot 2 \cdot 7 \cdot x^2}$

$6 \cdot \sqrt{49x^2} \cdot \sqrt{2x}$

$6 \cdot 7x\sqrt{2x}$

$\boxed{42x\sqrt{2x}}$

$\sqrt{2a} \cdot \sqrt{14a} \cdot \sqrt{5a}$

$\sqrt{2 \cdot a \cdot 14 \cdot a \cdot 5 \cdot a}$

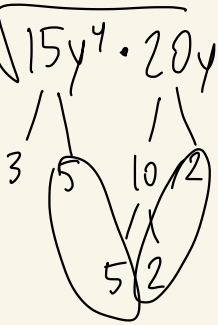
$\sqrt{a^2 \cdot a \cdot 2 \cdot 2 \cdot 7 \cdot 5}$

$2a\sqrt{a \cdot 7 \cdot 5}$

$\boxed{2a\sqrt{35a}}$

$6\sqrt{15y^4} \cdot 2\sqrt{20y^2}$

$12\sqrt{15y^4 \cdot 20y^2}$

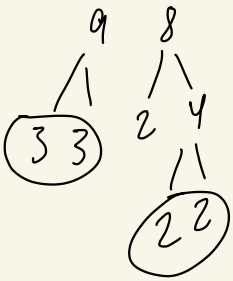


$12 \cdot 5 \cdot 2\sqrt{3y^4 \cdot y^2}$

$120\sqrt{3y^2 \cdot y^2 \cdot y^2}$

$120y^3\sqrt{3}$

$\sqrt{72x^3z^3}$



$3 \cdot 2\sqrt{2x^3z^3}$

$6\sqrt{2x^2 \cdot x \cdot z^2 \cdot z}$

$6xz\sqrt{2xz}$

$\sqrt{24b^3} \cdot \sqrt{40b^2} \cdot \sqrt{b^2}$

$\sqrt{24b^3 \cdot 40b^2 \cdot b^2}$

8 3 8 5 b b

2 4 2 4

2 2 2 2

$2\sqrt{7x} \cdot 3\sqrt{14x^2}$

$2 \cdot 3\sqrt{7x \cdot 14x^2}$

$6\sqrt{7x \cdot 14x^2}$

x

7 7 2 x x

$6 \cdot 7 \cdot x\sqrt{2x}$

$42x\sqrt{2x}$

$2 \cdot 2 \cdot 2 \cdot b\sqrt{5 \cdot b^3 \cdot b^2 \cdot 3}$

$8b\sqrt{5 \cdot b^3 \cdot b^2 \cdot 3}$

b b b b b

$8b^3\sqrt{5b \cdot 3}$

$8b^3\sqrt{15b}$

$\sqrt{12}$

6 2

3 2

$2\sqrt{3}$

$\sqrt{63}$

9 7

3 3

$3\sqrt{7}$

$\sqrt{72}$

9 8

3 3 2 4

2 2

$3 \cdot 2\sqrt{2} \Rightarrow \boxed{6\sqrt{2}}$

$\sqrt{20x^8} \Rightarrow \sqrt{20x^2 \cdot x^2 \cdot x^2 \cdot x^2}$

4 5

2 2

$2x^4\sqrt{5}$

$\sqrt{80b^2}$

$b \cdot b$

8 10

4 2 2 5

2 2

$2 \cdot 2 \cdot b\sqrt{5}$

$\boxed{4b\sqrt{5}}$

$2\sqrt{7x} \cdot 3\sqrt{14x^2}$

$2 \cdot 3\sqrt{7x \cdot 14x^2}$

7 7 2

$6 \cdot 7x\sqrt{2x}$

$42x\sqrt{2x}$

$\sqrt{z} \cdot \sqrt{30z^2} \cdot \sqrt{35z^3}$

$\sqrt{z \cdot 30z^2 \cdot 35z^3}$

6 5 7 5

3 2

$5\sqrt{3 \cdot 2 \cdot 7 \cdot z \cdot z^2 \cdot z^3}$

$5z^3\sqrt{42}$

$\sqrt{8x^3y^2}$

4 2

2 2

$2\sqrt{2x^3y^2}$

$2xy\sqrt{2x}$

$x^9 = 12^2 \cdot 12^7$

$\sqrt[9]{x^9} = \sqrt[9]{12^9}$

$\boxed{x = 12}$

$3^4 \cdot 3^2 = 3^6$

$a \cdot a^7 = \boxed{a^8}$

$6^5 = 6^x \cdot 6^4$

$\boxed{x = 1}$

$(ab)^c = a^c b^c$

$(a^3)^2 = a^3 \cdot a^3 = a^{3+3} = a^6$

$(a^3)^2 = a^{3 \cdot 2} = a^6$

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

$$\frac{6^7}{6^3} = 6^{7-3} = 6^4$$

$$\frac{3^4}{3^{10}} = \frac{\cancel{3\cdot3\cdot3\cdot3}}{\cancel{3\cdot3\cdot3\cdot3}\cdot3\cdot3\cdot3\cdot3\cdot3\cdot3} = \frac{1}{3^6}$$

$$3^{4-10} = 3^{-6} = \frac{1}{3^6}$$

$$\left(\frac{a^3b^4}{a^2b^1}\right)^3 = \left(ab^3\right)^3 = a^3\left(b^3\right)^3 = a^3b^9$$

$$\frac{25xy^6}{20y^5x^2} = \frac{25}{20}\cdot\frac{x^1}{x^2}\cdot\frac{y^6}{y^5}$$

$$\frac{5}{4}\cdot\frac{1}{x}\cdot\frac{y}{1} = \boxed{\frac{5y}{4x}}$$

$$\frac{y^9}{y^2} = y^{9-2} = \boxed{y^7}$$

$$\frac{y^6}{y^x} = y^0$$

$$\boxed{x = 6}$$

$$\left(\frac{8^2}{4^4}\right)^3$$

$$\left(\frac{8}{4} \cdot \frac{1^2}{1^4}\right)^3$$

$$2 \cdot 1^{-2} = \left(2^{-2}\right)^3 = 2^{-2 \cdot 3 = -6} = \boxed{2^{-6}}$$

$$a^n = \frac{a^n}{1}$$

$$a^{-n} = \frac{1}{a^n}$$

$$y^{-3} \cdot y^5 = y^{(-3+5)} = y^2$$

$$\frac{1}{y^3} \cdot \frac{y^5}{1} = \frac{y^5}{y^3} = y^{5-3} = y^2$$

$$\frac{12^{-7}}{12^{-5}} = 12^{(-7-(-5))} = 12^{(-7+5)} = \boxed{12^{-2}}$$

$$\frac{b^{-2}}{b^4} = b^{(-2-4)} = \boxed{b^{-6}}$$

$$y^{-4} \cdot y^3 = y^{(-4+3)} = \boxed{y^{-1}}$$

$$(y^{11})(y^{-8}) = y^{(11+(-8))} = \boxed{y^3}$$

$$\frac{5^{10}}{5^{12}} = 5^{(10-12)} = \boxed{5^{-2}}$$

$$\frac{z^7}{z^{-14}} = z^{(7-(-14))} = z^{(7+14)} = \boxed{z^{21}}$$

$$b^{-6} \cdot b^{11} = b^{(-6+11)} = \boxed{b^5}$$

$$q^{-3} \cdot q^{12} = q^{(-3+12)} = \boxed{q^9}$$

$$(a^{-2} \cdot 8^{7})^{2}$$

$$(a^{-2})^{2} \cdot (8^{7})^{2}$$

$$a^{-4} 8^{14}$$

$$\left(\frac{2^{-10}}{4^{2}}\right)^{7} = \frac{(2^{-10})^{7}}{(4^{2})^{7}}$$

$$= \frac{2^{-70}}{4^{14}} = \frac{2^{-70}}{(2^{2})^{14}}$$

$$= \frac{2^{-70}}{2^{28}} = 2^{-70}$$

$$= \boxed{2^{-98}}$$

$$(2^{-4} \cdot z^{-3})^{5}$$

$$2^{-4.5} \cdot z^{-3.5}$$

$$2^{-20} \cdot z^{-15} = \boxed{\frac{1}{2^{20} \cdot z^{15}}}$$

$$\left(\frac{8^{-5}}{2^{-2}}\right)^{-4} = \frac{\left(8^{-5\cdot -4}\right)}{\left(2^{-2\cdot -4}\right)} = \boxed{\frac{8^{20}}{2^{8}}}$$

$$\left(6^{-4}\cdot 8^{-7}\right)^{-9}$$

$$6^{-4\cdot -9}\cdot 8^{-7\cdot -9}$$

$$\boxed{6^{36}\cdot 8^{63}}$$

$$\left(\frac{X^{4}}{7^{-8}}\right)^{-7} = \frac{X^{4\cdot -7}}{7^{-8\cdot -7}}$$

$$= \frac{X^{-28}}{7^{56}}$$

$$= \boxed{X^{-28}\cdot 7^{-56}}$$

$(9 \cdot 10^{9})(-2 \cdot 10^{-3})$

$9 \cdot (-2) \cdot 10^{9} \cdot 10^{-3}$

$-18 \cdot 10^{9-3}$

$\boxed{-18 \cdot 10^{6}}$

$-18,000,000$

$\dfrac{4000}{4 \cdot 10^{-5}}$

$\boxed{1000 \cdot 10^{5}}$

or $\dfrac{4000}{4 \cdot 10^{-5}} = \dfrac{4 \cdot 10^{3}}{4 \cdot 10^{-5}} = 10^{3-(-5)}$

$= 10^{3+5}$

$= \boxed{10^{8}}$

$$\frac{9 \cdot 10^7}{3 \cdot 10^3} = 3 \cdot 10^{7-3} = \boxed{3 \cdot 10^4}$$

$$\frac{-8 \cdot 10^7}{-4 \cdot 10^6} = 2 \cdot 10^{7-6} = 2 \cdot 10^1 = \boxed{20}$$

$$\frac{9 \cdot 10^7}{3 \cdot 10^{-2}} = 3 \cdot 10^{7-(-2)} = 3 \cdot 10^{7+2} = \boxed{3 \cdot 10^9}$$

$$\frac{8 \cdot 10^3}{4 \cdot 10^2} = 2 \cdot 10^{3-2} = 2 \cdot 10^1 = \boxed{20}$$

$$(9 \cdot 10^9)(-2 \cdot 10^{-3}) = -18 \cdot 10^{9-3} = \boxed{-18 \cdot 10^6}$$

$$(3 \cdot 10^4) \cdot 0.002 = (3 \cdot 10^4)(2 \cdot 10^{-3})$$

$$= 6 \cdot 10^{4-3} = 6 \cdot 10^1 = 6 \cdot 10 = \boxed{60}$$

$92{,}000{,}000 \qquad 30{,}000$

$92 \cdot 10^6 \qquad 3 \cdot 10^4$

$$\frac{90 \cdot 10^6}{3 \cdot 10^4} = 30 \cdot 10^2 = 3 \cdot 10^3$$

$$\frac{6 \cdot 10^{24}}{1 \cdot 10^2} = 6 \cdot 10^{24-2} = \boxed{6 \cdot 10^{22}}$$

$0.000009 = 9 \cdot 10^{-6}$

$0.00000003 = 3 \cdot 10^{-8}$

$$\frac{9 \cdot 10^{-6}}{3 \cdot 10^{-8}}$$

$3 \cdot 10^{-6-(-8)}$

$3 \cdot 10^{-6+8}$

$\boxed{3 \cdot 10^2}$

$$\frac{8 \cdot 10^3}{1 \cdot 10^{-4}} = 8 \cdot 10^{3-(-4)} = 8 \cdot 10^{3+4} = \boxed{8 \cdot 10^7}$$

$3.457 \cdot 10^{-10}$

$120{,}000 = 1.2 \cdot 10^5$

$1.2 \cdot 100{,}000$

$12 = 1.2 \cdot 10^1$

$3.102 \cdot 10^2$

$= 3.102 \times 100$

$= 310.200$

$= 310.2$

$0.00281 \cdot 10^3 = 2.81 \cdot 10^{-3}$

$13{,}040{,}000$

$\boxed{1.304 \cdot 10^7}$

$52{,}000$

$\boxed{5.2 \cdot 10^4}$

52 thousandths $= 0.052$

$5.2 \cdot 10^{-2}$

0.00019

$1.9 \cdot 10^{-4}$

$5.401 \cdot 10^{-1}$

=

0.5401

427,000

$4.27 \cdot 10^{5}$

$3.868 \cdot 10^{9}$

3.868000000

3,868,000,000

3,868,000,000.

$3.868 \cdot 10^{9}$

31,000,000,000.

$3.1 \cdot 10^{10}$

$2.456 \cdot 10^{11}$

2,456,000,000,000

245,600,000,000

0.3643

$3.643 \cdot 10^{-1}$

78,000,000

$7.8 \cdot 10^{7}$

$$\frac{1.50 \cdot 10^5}{5.0 \cdot 10^1} = 0.3 \cdot 10^{5-1} = 0.3 \cdot 10^4$$

$$3.0 \cdot 10^3$$

$$\frac{1.88 \cdot 10^6}{2000} = \frac{1.88 \cdot 10^6}{2 \cdot 10^3}$$

$$0.94 \cdot 10^{6-3} = 0.94 \cdot 10^3 \rightarrow 9.4 \cdot 10^2$$

$$(8 \cdot 10^{-3}) \times (0.0002)$$

$$(8 \cdot 10^{-3}) \times (2 \cdot 10^{-4})$$

$$16 \cdot 10^{-3-4} = 16 \cdot 10^{-7} = 1.6 \cdot 10^{-6}$$

$$\frac{1.20 \cdot 10^6}{6.0 \cdot 10^5} = 0.2 \cdot 10^1 = 2.0 \cdot 10^0$$

$$(3.0 \cdot 10^3) \cdot (5.0 \cdot 10^1)$$

$$15.0 \cdot 10^{3+1} = 15.0 \cdot 10^4 = 1.5 \cdot 10^5$$

$$\frac{2.40 \times 10^2}{3.0 \times 10^{-1}} = 0.8 \cdot 10^{2-(-1)} = 0.8 \cdot 10^{2+1}$$

$$= 0.8 \cdot 10^3$$

$$= 8.0 \cdot 10^2$$

$$(940) \cdot (2 \cdot 10^3)$$

$$(9.4 \cdot 10^2) \cdot (2 \cdot 10^3)$$

$$18.8 \cdot 10^{2+3} = 18.8 \cdot 10^5 = 1.88 \cdot 10^6$$

$4.1 \cdot 10^{-2} - 2.6 \cdot 10^{-3}$

$41 \cdot 10^{-3} - 2.6 \cdot 10^{-3}$

$(41 - 2.6)\,10^{-3}$

$38.4 \cdot 10^{-3}$

$\boxed{3.84 \cdot 10^{-2}}$

$2.8 \cdot 10^{-3} - 0.00065$

$2.8 \cdot 10^{-3} - 0.65 \cdot 10^{-3}$

$(2.8 - 0.65) \cdot 10^{-3}$

$\boxed{2.15 \cdot 10^{-3}}$

$8.8 \cdot 10^{7} + 3.1 \cdot 10^{8}$

$0.88 \cdot 10^{8} + 3.1 \cdot 10^{8}$

$(0.88 + 3.1) \cdot 10^{8}$

$3.98 \cdot 10^{8}$

$1.4 \cdot 10^{9} - 8.6 \cdot 10^{8}$

$1.4 \cdot 10^{9} - 0.86 \cdot 10^{9}$

$0.54 \cdot 10^{9}$

$\boxed{5.4 \cdot 10^{8}}$

$4.1 \cdot 10^{-2} - 2.6 \cdot 10^{-3}$

$41 \cdot 10^{-3} - 2.6 \cdot 10^{-3}$

$(41 - 2.6) \cdot 10^{-3}$

$38.4 \cdot 10^{-3}$

$\boxed{3.84 \cdot 10^{-2}}$

$3600 - 6.3 \cdot 10^{2}$

$36.0 \cdot 10^{2} - 6.3 \cdot 10^{2}$

$29.7 \cdot 10^{2}$

$\boxed{2.97 \cdot 10^{3}}$

$2.3 \cdot 10^8 + 4.7 \cdot 10^7$

$2.3 \cdot 10^8 + 0.47 \cdot 10^8$

$\boxed{2.77 \cdot 10^8}$

$6.4 \cdot 10^5 + 36000$

$6.4 \cdot 10^5 + 0.36000 \cdot 10^5$

$\boxed{6.76 \cdot 10^5}$

$$\frac{(4.6 \cdot 10^6)(0.2)}{50000\,(2.3 \cdot 10^{-2})}$$

$0.2 = 2.0 \cdot 10^{-1}$

$50000 = 5 \cdot 10^4$

$$\frac{(4.6 \cdot 10^6)(2.0 \cdot 10^{-1})}{(5.0 \cdot 10^4)(2.3 \cdot 10^{-2})} = \frac{9.2 \cdot 10^{6-1} = 9.2 \cdot 10^5}{11.5 \cdot 10^{4-2} = 11.5 \cdot 10^2}$$

$$\frac{9.2 \cdot 10^5}{11.5 \cdot 10^2} = 0.8 \cdot 10^{5-2} = 0.8 \cdot 10^3$$

$$= \boxed{8 \cdot 10^2}$$

$$\frac{(5 \text{ liters})(40\%)}{90 \cdot 10^{-15}} = \frac{2}{9 \cdot 10^{-14}} = \frac{0.22}{10^{-14}}$$

$$0.22 \cdot 10^{14} = 2.2 \cdot 10^{13}$$

$$\frac{1.2278 \cdot 10^{13}}{3.086 \cdot 10^{8}} = 0.3978613 \cdot 10^{13-8=5}$$

$$= 0.3978613 \cdot 10^{5}$$

$$= 3.978613 \cdot 10^{4}$$

or

$39,786.13

$$(3 \cdot 10^{8})(5 \cdot 10^{2})$$

$$15 \cdot 10^{8+2} = 15 \cdot 10^{10} = 1.5 \cdot 10^{11}$$

150 billion meters

150,000,000,000 meters

$1.8 \cdot 10^{11} - 7.2 \cdot 10^{10}$

$1.8 \cdot 10^{11} - .72 \cdot 10^{11}$

$\boxed{1.08 \cdot 10^{11}}$

$(1.15 \cdot 10^5)(3.65 \cdot 10^2)$

$4.1975 \cdot 10^{5+2=7}$

$4.1975 \cdot 10^7$

$\boxed{4.2 \cdot 10^7}$

$2.7 \cdot 10^4 - 3.7 \cdot 10^3$

$27 \cdot 10^3 - 3.7 \cdot 10^3$

$23.3 \cdot 10^3$

$2.33 \cdot 10^4$

$(4 \cdot 10^4)(1 \cdot 10^{-4})$

$4 \cdot 10^{4-4} = \boxed{4 \cdot 10^0}$

$(2.2 \cdot 10^6)(4 \cdot 10^0)$

$8.8 \cdot 10^{6+0}$

$8.8 \cdot 10^6$

$1.4 \cdot 10^9 - 1.1 \cdot 10^8$

$14 \cdot 10^8 - 1.1 \cdot 10^8$

$12.9 \cdot 10^8$

$\boxed{1.29 \cdot 10^9}$

$(5.1 \cdot 10^{-4}) + (8 \cdot 10^{-3})$

$0.51 \cdot 10^{-3} + 8 \cdot 10^{-3}$

$\boxed{8.51 \cdot 10^{-3}}$

$\frac{1.1 \cdot 10^{9}}{9.1 \cdot 10^{1}} = 0.120879 \cdot 10^{8}$

$1.20879 \cdot 10^{7}$

$1.21 \cdot 10^{7}$

$k^2 = 0.49$

$\sqrt{\frac{36}{169}} = \frac{6}{13}$

$(3^{-8} \cdot 7^3)^{-2}$

$3^{-8 \cdot -2} \cdot 7^{3 \cdot -2}$

$3^{16} \cdot 7^{-6}$

$0.00045 - 2.5 \cdot 10^{-5}$

$45 \cdot 10^{-5} - 2.5 \cdot 10^{-5}$

$42.5 \cdot 10^{-5}$

$4.25 \cdot 10^{-4}$

$1.4 \cdot 10^8 + 9.4 \cdot 10^6$

$140 \cdot 10^6 + 9.4 \cdot 10^6$

$149.4 \cdot 10^6$

$1.494 \cdot 10^8$

$\frac{2.357 \cdot 10^{12}}{1.18 \cdot 10^{11}}$

$2,357,000,000,000$

$2.357 \cdot 10^{12}$

$2 \cdot 10^1$

$118,000,000,000 \rightarrow 1.18 \cdot 10^{11}$

$$\left(\sqrt{17.8}\right)^2 = 17.8$$

$$\frac{4^{11}}{4^{-8}} = 4^{11-(-8)} = 4^{11+8} = \boxed{4^{19}}$$

$$(x^3)^3 = x^n$$

$$x^{3\cdot 3} = x^n$$

$$x^9 = x^n$$

$$\boxed{n = 9}$$

$$\frac{y^5}{y^3} = y^{5-3} = \boxed{y^2}$$

$$(9^2 \cdot 9^2)^1 = (9^4)^1 = \boxed{9^4}$$

$$9 \cdot 9 \cdot 9 \cdot 9 = \boxed{9^4}$$

$$\left(\frac{9^{10}}{9^8}\right)^2 = (9^2)^2 = \boxed{9^4}$$