

$$\textcircled{1} \quad \sqrt{10000} = \sqrt{(100)(100)} = \sqrt{(100)^2} = 100$$

$$\textcircled{2} \quad \sqrt{\frac{49}{144}} = \frac{7}{12}$$

$$\textcircled{3} \quad \begin{aligned} a^2 + b^2 &= c^2 \\ 16^2 + b^2 &= (17)^2 \end{aligned} \quad \begin{aligned} b^2 &= 17^2 - 16^2 \\ b &= \sqrt{17^2 - 16^2} = \sqrt{33} = \boxed{5.74456} \end{aligned}$$

$$\textcircled{4} \quad \begin{aligned} &\text{Diagram: A rectangle with diagonal 32 and one side 21. Next to it, a right triangle with hypotenuse c, side a, and side b.} \\ a^2 + (21)^2 &= (32)^2 \\ a^2 &= 32^2 - 21^2 = 583 \\ a &= \sqrt{583} = \boxed{24.15} \end{aligned}$$

$$\textcircled{5} \quad \begin{aligned} (5, -6) \\ (-5, 6) \end{aligned} \quad d = \sqrt{(5+5)^2 + (-6-6)^2} = \sqrt{(25)^2 + (-36)^2} = \sqrt{1921} = \boxed{43.83}$$

$$\textcircled{6} \quad \begin{aligned} (2, -2) \\ (-6, 1) \end{aligned} \quad d = \sqrt{(2+6)^2 + (-2-1)^2} = \sqrt{(8)^2 + (-3)^2} = \sqrt{64+9} = \boxed{8.54}$$

$$\textcircled{7} \quad \sqrt{3} \cdot \sqrt{3} = \boxed{3} \quad \textcircled{8} \quad \sqrt{10} \cdot \sqrt{30} = \boxed{\sqrt{300}} \quad \textcircled{9} \quad \sqrt{18a} \cdot \sqrt{2b} = \sqrt{36ab} = \boxed{6\sqrt{ab}}$$

$$\textcircled{10} \quad \sqrt{250} = \sqrt{25 \cdot 10} = \boxed{5\sqrt{10}} \quad \textcircled{11} \quad -2\sqrt{54} = -2\sqrt{9 \cdot 6} = -2 \cdot 3\sqrt{6} = \boxed{-6\sqrt{6}}$$

$$\textcircled{12} \quad \sqrt{6} \cdot \sqrt{15} = \sqrt{2 \cdot 3 \cdot 3 \cdot 5} = \sqrt{3^2 \cdot 2 \cdot 5} = \boxed{3\sqrt{10}}$$

$$\textcircled{13} \quad \begin{aligned} \sqrt{18} \cdot \sqrt{24} &= \sqrt{2 \cdot 9 \cdot 3 \cdot 8} \\ &= \sqrt{9} \sqrt{16} \cdot \sqrt{3} \\ &= 3 \cdot 4 \sqrt{3} \\ &= \boxed{12\sqrt{3}} \end{aligned} \quad \textcircled{14} \quad \frac{6\sqrt{30}}{18\sqrt{15}} = \frac{1}{3} \sqrt{\frac{30}{15}} = \boxed{\frac{1}{3}\sqrt{2}}$$

$$(15) \sqrt{\frac{5}{2}} \cdot \sqrt{\frac{16}{32}} = \sqrt{\frac{5 \cdot 16}{2 \cdot 32}} = \sqrt{\frac{5 \cdot 1}{2 \cdot 2}} = \boxed{\sqrt{\frac{5}{4}}}$$

$$(16) \sqrt{49x^3} = \boxed{7x\sqrt{x}}$$

$$(17) \sqrt{18x^6} = \sqrt{2 \cdot 9(x^3)^2} = \boxed{3x^3\sqrt{2}}$$

$$(18) 5\sqrt{10} + 3\sqrt{10} = \boxed{8\sqrt{10}}$$

$$(19) 6\sqrt[5]{4} + 7\sqrt[5]{4} - 9\sqrt[5]{4} = \boxed{4\sqrt[5]{4}}$$

$$(20) 4\sqrt{128} - 2\sqrt{32} = 4\sqrt{4 \cdot 4 \cdot 4 \cdot 2} - 2\sqrt{4 \cdot 2} \\ = 4 \cdot 4 \cdot 2\sqrt{2} - 2 \cdot 2\sqrt{2} = 32\sqrt{2} - 4\sqrt{2} = \boxed{28\sqrt{2}}$$

$$(21) 4\sqrt[3]{r^5} + 3\sqrt[3]{27r^5} = 4r\sqrt[3]{r^2} + 3 \cdot 3 \cdot r\sqrt[3]{r^2} = \boxed{13r\sqrt[3]{r^2}}$$

$$(22) 4\sqrt{7} \cdot \sqrt{3} - 2\sqrt{21} = 4\sqrt{21} - 2\sqrt{21} = \boxed{2\sqrt{21}}$$

$$(23) 3\sqrt{12y} - 2\sqrt{3y}\sqrt{15} = 3\sqrt{4 \cdot 3y} - 2 \cdot \sqrt{25} \sqrt{3y} \\ = \underbrace{3 \cdot 2\sqrt{3y}}_6 - \underbrace{2 \cdot 5\sqrt{3y}}_{10} = \boxed{-4\sqrt{3y}}$$

$$(24) \frac{\sqrt{4}}{\sqrt{24}} = \sqrt{\frac{4}{24}} = \sqrt{\frac{1}{6}} = \frac{\sqrt{1}}{\sqrt{6}} = \frac{1}{\sqrt{6}} \quad \text{Now Rationalize: } \frac{1}{\sqrt{6}} \frac{\sqrt{6}}{\sqrt{6}} = \boxed{\frac{\sqrt{6}}{6}}$$

$$(25) \frac{2\sqrt{5}}{3\sqrt{15}} \quad \text{simplify first} \quad \frac{2 \cdot \sqrt{5}}{3 \cdot \sqrt{3 \cdot 5}} = \frac{2\sqrt{5}}{3 \cdot 5\sqrt{3}} = \frac{2\sqrt{5}}{15\sqrt{3}}$$

$$\text{Rationalize: } \frac{2\sqrt{5}}{15\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{15}}{15 \cdot 3} = \boxed{\frac{2\sqrt{15}}{45}}$$

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$$\sqrt{\frac{3}{2}} \cdot \sqrt{\frac{5}{6}} = \sqrt{\frac{3 \cdot 5}{2 \cdot 6}} = \sqrt{\frac{5}{2 \cdot 2}} = \sqrt{\frac{5}{4}} = \frac{\sqrt{5}}{\sqrt{4}} = \boxed{\frac{\sqrt{5}}{2}}$$

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$$\sqrt{\frac{20 \cdot a^3 b^4}{6a^2}} = \sqrt{\frac{10ab^4}{3}} = \cancel{\sqrt{\frac{10ab^4}{3}}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{30ab^4}}{3}}$$

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$$\frac{\sqrt[3]{9}}{\sqrt[3]{4}} \cdot \frac{\sqrt[3]{4^2}}{\sqrt[3]{4^2}} = \frac{\sqrt[3]{9 \cdot 4^2}}{\sqrt[3]{4^3}} = \boxed{\frac{\sqrt[3]{9 \cdot 4^2}}{4}}$$

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$$\frac{3}{\sqrt[3]{49}} \cdot \frac{3}{\sqrt[3]{7^2}} \cdot \frac{\sqrt[3]{7}}{\sqrt[3]{7}} = \frac{3\sqrt[3]{7}}{\sqrt[3]{7^3}} = \boxed{\frac{3\sqrt[3]{7}}{7}}$$

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$$\sqrt{5}(\sqrt{2} + 4\sqrt{7}) = \sqrt{4 \cdot 3} \cdot \sqrt{5} + 4\sqrt{7} \cdot \sqrt{5} = \boxed{2\sqrt{15} + 4\sqrt{35}}$$

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$$(4\sqrt{5} + \sqrt{3})(\sqrt{2} - \sqrt{7}) = 4\sqrt{5}\sqrt{2} - 4\sqrt{5}\sqrt{7} + \sqrt{3}\sqrt{2} - \sqrt{3}\sqrt{7} \\ = \boxed{4\sqrt{10} - 4\sqrt{35} + \sqrt{6} - \sqrt{21}}$$

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$$\frac{4}{\sqrt{3}+2} \frac{\sqrt{3}-2}{\sqrt{3}-2} = \frac{4(\sqrt{3}-2)}{(\sqrt{3})^2 - (2)^2} = \frac{4(\sqrt{3}-2)}{3-4} = \boxed{-4(\sqrt{3}-2)}$$

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$$\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} \frac{(\sqrt{3}-\sqrt{2})}{(\sqrt{3}-\sqrt{2})} = \frac{(\sqrt{3})^2 - (\sqrt{2})^2}{(\sqrt{3})^2 - 2\sqrt{3}\sqrt{2} + (2)^2} = \frac{3-2}{3+2-2\sqrt{6}} \\ = \boxed{\frac{1}{5-2\sqrt{6}}}$$

$$(34) \quad \frac{8\sqrt{7} + 12}{14} = \frac{2(4\sqrt{7} + 6)}{2 \cdot 7} = \boxed{\frac{4\sqrt{7} + 6}{7}}$$

$$(35) \quad \frac{12 + 6\sqrt{6}}{8} = \frac{2(6 + 3\sqrt{6})}{2 \cdot 4} = \boxed{\frac{6 + 3\sqrt{6}}{4}}$$

$$(36) \quad 8 - \sqrt{y} = 2$$

$$6 = \sqrt{y}$$

$$\boxed{36 = y}$$

$$(37) \quad \sqrt{3x+3} = 2\sqrt{3x}$$

$$(\sqrt{3x+3})^2 = (2\sqrt{3x})^2$$

$$3x+3 = 4 \cdot 3x$$

$$3 = 12x - 3x$$

$$3 = 9x$$

$$\boxed{x = \frac{1}{3}}$$

$$(38) \quad \sqrt{x+1} + 9 = 0$$

$$(\sqrt{x+1})^2 = (-9)^2$$

$$x+1 = 81$$

$$\boxed{x = 80}$$

$$(39) \quad (s)^2 = (\sqrt{s^2 + 4s + 4})^2$$

$$s^2 = s^2 + 4s + 4$$

$$0 = 4s + 4$$

$$4s = -4$$

$$\boxed{s = -1}$$

$$(40) \quad 0 = 7 - \sqrt{r}$$

$$(7)^2 = (\sqrt{r})^2$$

$$\boxed{49 = r}$$

$$(41) \quad \sqrt{x+11} - 1 = x - 2$$

$$(\sqrt{x+11})^2 = (x-1)^2$$

$$x+11 = x^2 - 2x + 1$$

$$0 = x^2 - 3x - 10$$

$$0 = (x-5)(x+2)$$

$$0 = x-5 \quad 0 = x+2$$

$$\boxed{x = 5} \quad \boxed{x = -2}$$

$$(42) \quad 3\sqrt{p+6} = p+6$$

$$(3\sqrt{p+6})^2 = (p+6)^2$$

$$9(p+6) = p^2 + 12p + 36$$

$$9p + 54 = p^2 + 12p + 36$$

$$0 = p^2 + 3p - 18$$

$$0 = (p+6)(p-3)$$

$$0 = p+6 \quad 0 = p-3$$

$$\boxed{p = -6} \quad \boxed{p = 3}$$

$$(43) \quad \sqrt[3]{5x-4} = \sqrt[3]{x^2}$$

$$\left(\sqrt[3]{5x-4}\right)^3 = \left(\sqrt[3]{x^2}\right)^3$$

$$5x-4 = x^2$$

$$0 = x^2 - 5x + 4$$

$$0 = (x-4)(x-1)$$

$$0 = x-4 \quad 0 = x-1$$

$$\boxed{4 = x}$$

$$\boxed{1 = x}$$

$$(44) \quad 25^{1/2} = \sqrt{25} = \boxed{5}$$

$$(45) \quad 8^{1/3} = \sqrt[3]{8} = \boxed{2}$$

$$(46) \quad 64^{3/2} = \left(\sqrt{64}\right)^3 = (8)^3 = \boxed{512}$$

$$(47) \quad 16^{-3/4} = \frac{1}{16^{3/4}} = \frac{1}{\left(\sqrt[4]{16}\right)^3} = \frac{1}{2^3} = \boxed{\frac{1}{8}}$$

$$(48) \quad 5^{1/2} \cdot 5^{3/2} = 5^{4/2} = 5^2 = \boxed{25}$$

$$(49) \quad 7^{5/8} \cdot 7^{3/8} = 7^{8/8} = \boxed{7}$$

$$(50) \quad \left(\frac{r^{1/2}}{s^{1/2}}\right)^{2/3} = \left(s^{1/2} r^{1/2}\right)^{2/3} = s^{\frac{1}{2} \cdot \frac{2}{3}} r^{\frac{1}{2} \cdot \frac{2}{3}} = \boxed{s^{1/3} r^{1/3}}$$

$$(51) \quad \frac{8^{3/5} \cdot 8^{-8/5}}{8^{-2}} = \frac{8^{-5/5}}{8^{-2}} = \frac{8^{-1}}{8^{-2}} = \frac{8^2}{8^1} = \boxed{8}$$

$$(52) \quad \sqrt[4]{7^2} = 7^{2/4} = \boxed{7^{1/2}}$$

$$(53) \quad \sqrt[8]{81^2} = 81^{2/8} = 81^{1/4} = \sqrt[4]{81} = \boxed{3}$$

$$(54) \quad \sqrt[8]{a^2} = a^{2/8} = \boxed{a^{1/4}}$$