

MAT 1033C
Worksheet
Radicals

$$\textcircled{1} \sqrt{27} = \boxed{3\sqrt{3}}$$

$3 \cdot 3 \cdot 3$

$$\textcircled{9} \sqrt[3]{81x^4y^2} = \boxed{3x\sqrt[3]{3xy^2}}$$

$3 \cdot 3 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y$

$$\textcircled{2} \sqrt{20} = \boxed{2\sqrt{5}}$$

$2 \cdot 2 \cdot 5$

$$\textcircled{10} \sqrt[4]{81} = \boxed{3}$$

$3 \cdot 3 \cdot 3 \cdot 3$

$$\textcircled{3} \sqrt{68} = \boxed{2\sqrt{17}}$$

$$\begin{array}{r} 2 \overline{)68} \\ 2 \overline{)34} \\ 17 \end{array}$$

$$\textcircled{11} \sqrt[5]{64x^8y^2z^{12}}$$

$$\begin{array}{r} 2 \overline{)64} \\ 2 \overline{)32} \\ 2 \overline{)16} \\ 2 \overline{)8} \\ 2 \overline{)4} \\ 2 \end{array}$$

$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$
 $y \cdot y$
 $z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z$

$$= \boxed{2xz^2\sqrt[5]{ax^3y^2z^2}}$$

$$\textcircled{4} \sqrt{162} = 3 \cdot 3 \sqrt{2} = \boxed{9\sqrt{2}}$$

$$\begin{array}{r} 2 \overline{)162} \\ 3 \overline{)81} \\ 3 \overline{)27} \\ 3 \overline{)9} \\ 3 \end{array}$$

$$\textcircled{5} \sqrt{8x^3} = \boxed{2x\sqrt{2x}}$$

$2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x$

$$\textcircled{12} \sqrt{2} \sqrt{8} = \sqrt{16} = \boxed{4}$$

$$\textcircled{6} \sqrt{32x^5y^2} = \boxed{4x^2y\sqrt{2x}}$$

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y$

$$\textcircled{13} \sqrt{6} \sqrt{4} = \sqrt{3 \cdot 2 \cdot 2 \cdot 2} = \boxed{2\sqrt{6}}$$

$$\textcircled{7} \sqrt{5x^6} = \boxed{x^3\sqrt{5}}$$

$5 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$

$$\textcircled{14} 2\sqrt{5} \cdot 3\sqrt{15} = 6\sqrt{75} = 3 \cdot 5 \cdot 5 = 6 \cdot 5 \sqrt{3} = \boxed{30\sqrt{3}}$$

$$\textcircled{8} \sqrt[3]{16} = \boxed{2\sqrt[3]{2}}$$

$2 \cdot 2 \cdot 2 \cdot 2$

Rationalize

FOIL

$$\begin{aligned} (15) \quad & (3 + \sqrt{2})(3 - \sqrt{2}) \\ & 9 - 3\sqrt{2} + 3\sqrt{2} - \sqrt{4} \\ & 9 - 2 = \boxed{7} \end{aligned}$$

$$(7) \quad \frac{1}{\sqrt{3x}} \cdot \frac{\sqrt{3x}}{\sqrt{3x}} = \frac{\sqrt{3x}}{3x}$$

have $3x$ | need $3x$

$(3 \cdot 3) (x \cdot x)$

$$\begin{aligned} (16) \quad & 2\sqrt{6}(\sqrt{8} - 3\sqrt{5}) \\ & 2\sqrt{48} - 6\sqrt{30} \\ & 2 \cdot 2 \cdot 2\sqrt{3} - 6 \cdot \sqrt{30} \end{aligned}$$

$$(2) \quad \frac{5x}{\sqrt{6x^3}} = \frac{5x}{x\sqrt{6x}}$$

$$\boxed{8\sqrt{3} - 6\sqrt{30}}$$

$2 \overline{)48}$
 $2 \overline{)24}$
 $2 \overline{)12}$
 $2 \overline{)6}$
 3

$2 \overline{)30}$
 $3 \overline{)15}$
 5

have $6x$ | need $6x$

$(6 \cdot 6) (x \cdot x)$

$$\begin{aligned} (17) \quad & (4 - \sqrt{2})^2 \\ & = (4 - \sqrt{2})(4 - \sqrt{2}) \\ & = 16 - 4\sqrt{2} - 4\sqrt{2} - \sqrt{4} \\ & = 16 - 8\sqrt{2} - 2 \\ & = \boxed{14 - 8\sqrt{2}} \end{aligned}$$

$$\begin{aligned} & \frac{5x}{x\sqrt{6x}} \cdot \frac{\sqrt{6x}}{\sqrt{6x}} = \frac{5x\sqrt{6x}}{6x^2} \\ & = \frac{5\sqrt{6x}}{6x} \end{aligned}$$

$$\begin{aligned} (18) \quad & \sqrt{2x^3y^4} \sqrt{8x^5y^3} \\ & = \sqrt{16x^8y^7} \\ & = \boxed{4x^4y^3\sqrt{y}} \end{aligned}$$

$$(3) \quad \frac{4x^2y}{\sqrt{2x^3y^6}} = \frac{4x^2y}{xy^3\sqrt{2x}}$$

$$(19) \quad \sqrt{(2x^3)^2} = \boxed{2x^3}$$

$$\frac{4x^2y}{xy^3\sqrt{2x}} \cdot \frac{\sqrt{2x}}{\sqrt{2x}} = \frac{4x^2y\sqrt{2x}}{xy^3(2x)}$$

$$(20) \quad \sqrt[3]{27y^9} = \boxed{3y^3}$$

$(3 \cdot 3 \cdot 3)$

have $2x$ | need $2x$

$(2 \cdot 2) (x \cdot x)$

$$= \frac{4x^2y\sqrt{2x}}{2x^2y^3} = \frac{2\sqrt{2x}}{y^3}$$

$$(4) \frac{3}{\sqrt[3]{x^4}} \cdot \frac{\sqrt[3]{x^2}}{\sqrt[3]{x^2}} = \frac{3 \sqrt[3]{x^2}}{x^2}$$

have | need
 $x \cdot x \cdot x \cdot x$ | xx
 $(xxx)(xxx)$

$$(5) \frac{\sqrt[3]{64x^3}}{\sqrt{4y}} \cdot \frac{4x}{\sqrt[3]{4y}} \cdot \frac{\sqrt[3]{2y^2}}{\sqrt[3]{2y^2}} = 4x \frac{\sqrt[3]{2y^2}}{\sqrt[3]{2y^2}}$$

have | need
 $2 \cdot 2 \cdot y$ | $2 \cdot y \cdot y$
 $(2 \cdot 2 \cdot 2)(y \cdot y \cdot y)$

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

$$(6) \sqrt{\frac{72x^6y^9}{2x^4y^{13}}} = \sqrt{\frac{36x^2}{y^4}} = \frac{6x}{y^2}$$

$$(7) \frac{5}{\sqrt[4]{x^3y^2z^8}} \cdot \frac{\sqrt[4]{xy^2}}{\sqrt[4]{xy^2}} = \frac{5 \sqrt[4]{xy^2}}{xyz^2}$$

have | need
 $(x \cdot x \cdot x) \cdot (y \cdot y) \cdot (z \cdot z \cdot z \cdot z) \cdot (z \cdot z \cdot z \cdot z)$
 x | $y \cdot y$

$$(8) \frac{7}{\sqrt[3]{x^5y^8}} \cdot \frac{\sqrt[3]{xy}}{\sqrt[3]{xy}} = \frac{7 \sqrt[3]{xy}}{x^2y^3}$$

have | need
 $(x \cdot x \cdot x) \cdot (x \cdot x) \cdot (y \cdot y \cdot y) \cdot (y \cdot y \cdot y) \cdot (y \cdot y)$
 x | y

$$\textcircled{9} \quad \frac{3}{\sqrt{3}} = \frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{3}}{3} = \boxed{\sqrt{3}}$$

$$\textcircled{10} \quad \frac{4x}{\sqrt{16x^4}} = \frac{4x}{4x^2} = \boxed{\frac{1}{x}}$$

$$\textcircled{11} \quad \frac{1}{\sqrt{5}} = \frac{1}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \boxed{\frac{\sqrt{5}}{5}}$$