Real Numbers Test

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[8] 1. Write each radical in simplest form. Show your work.

[2] a. $\sqrt{112}$

$= \sqrt{16}\sqrt{7}$

$= 4\sqrt{7}$

[2] b. $3\sqrt{192x^3}$

$= 3\sqrt{64x^2}\sqrt{3x}$

$= 3 \cdot 8x\sqrt{3x}$

$= 24x\sqrt{3x}$

[2] c. $-\sqrt[4]{240}$

$= -\sqrt[4]{16}\sqrt[4]{15}$

$= -2\sqrt[4]{15}$

[2] d. $4\sqrt[3]{324}$

$= 4\sqrt[3]{27}\sqrt[3]{12}$

$= 4 \cdot 3\sqrt[3]{12}$

$= 12\sqrt[3]{12}$

[8] 2. Write as a whole radical. Show your work.

[2] a. $-5\sqrt{11}$

$= -\sqrt{25}\sqrt{11}$

$= -\sqrt{275}$

[2] b. $4\sqrt[3]{3}$

$= \sqrt[3]{64}\sqrt[3]{3}$

$= \sqrt[3]{192}$

[2] c. $-3g\sqrt[4]{6g^2}$

$= -\sqrt[4]{81g^4} \cdot \sqrt[4]{6g^2}$

$= -\sqrt[4]{486g^6}$

[2] d. $2x^2y\sqrt[3]{7xy^2}$

$= \sqrt[3]{8x^6y^3} \cdot \sqrt[3]{7xy^2}$

$= \sqrt[3]{56x^7y^5}$

[12] 3. Simplify. Show your work.

[2] a. $2\sqrt{24} \cdot \sqrt{10}$

$= 2 \cdot 2\sqrt{6} \cdot \sqrt{10}$

$= 4 \cdot \sqrt{60}$

$= 4 \cdot 2\sqrt{15}$

$= 8\sqrt{15}$

[2] b. $\frac{8\sqrt{6}}{6\sqrt{10}}$

$= \frac{4\sqrt{3}}{3\sqrt{5}}$

$= \frac{4\sqrt{3}}{3\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{4\sqrt{15}}{15}$

[2] c. $27^x(81^x \cdot 9^{2x})$

$= 3^{3x}(3^{4x} \cdot 3^{4x})$

$= 3^{3x}(3^{8x})$

$= 3^{11x}$

[2] d. $a^5(a^{2y} \cdot a^{4y})^2$

$= a^5(a^{6y})^2$

$= a^5(a^{12y})$

$= a^{12y+5}$

[2] e. $\frac{\sqrt{2}}{\sqrt[4]{4}}$

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

$= 2^{\frac{1}{2}} \div 2^{\frac{1}{2}}$

$= 2^0$

$= 1$

[2] f. $\sqrt[3]{x^2} \cdot \sqrt[4]{x}$

$= x^{\frac{2}{3}} \cdot x^{\frac{1}{4}}$

$= x^{\frac{8}{12}} \cdot x^{\frac{3}{12}}$

$= x^{\frac{11}{12}}$

$= \sqrt[12]{x^{11}}$

[4] 4. Evaluate. Show your work.

[2] a. $-\left(\frac{16}{81}\right)^{\frac{5}{4}}$

$= -\left(\sqrt[4]{\frac{16}{81}}\right)^{5}$

$= -\left(\frac{2}{3}\right)^{5}$

$= -\frac{32}{243}$

[2] b. $\left(\frac{64}{27}\right)^{-\frac{4}{3}}$

$= \left(\frac{27}{64}\right)^{\frac{4}{3}}$

$= \left(\sqrt[3]{\frac{27}{64}}\right)^{4}$

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

$= \frac{81}{256}$

[4] 5. A rectangular solid has a length $\frac{3}{2}$ times the width and a height twice its width. If the volume of the rectangular solid is 648 cm^3, determine the dimensions of the rectangular solid. Show your work!

$V = l \cdot w \cdot h \quad V = 648 \qquad l = \frac{3}{2}w \qquad h = 2w$

$\left(\frac{3}{2}w\right)(w)(2w) = 648$

$3w^3 = 648$

$w^3 = 216$

$w = 6 \qquad$ so, $\qquad l = \frac{3}{2}(6) = 9 \qquad h = 2(6) = 12$

For the rectangular solid, the length is 9 cm, width is 6 cm, and the height is 12 cm.

[4] 6. The dimensions of a rectangular prism are: length $2\sqrt{10}$ cm, width $3\sqrt{14}$ cm, and height $\sqrt{35}$ cm. Determine the **area** of the **rectangular base** and the **volume** of the **rectangular prism**. Show your work!

Area of Base, B

$= lw$

$= (2\sqrt{10})(3\sqrt{14})$

$= 6\sqrt{2}\sqrt{5}\sqrt{2}\sqrt{7}$

$= 6 \cdot 2\sqrt{5 \cdot 7}$

$= 12\sqrt{35}$

Volume of Prism, V

$= Bh$

$= (12\sqrt{35})(\sqrt{35})$

$= 12 \cdot 35$

$= 420$

or

$= lwh$

$= (2\sqrt{10})(3\sqrt{14})(\sqrt{35})$

$= 6\sqrt{2}\sqrt{5}\sqrt{2}\sqrt{7}\sqrt{5}\sqrt{7}$

$= 6 \cdot 2 \cdot 5 \cdot 7$

$= 420$

The area of the rectangular base is $12\sqrt{35}$ cm^2, while the volume is 420 cm^3.

[2] 7. Simplify. Show your work!

[1] a. $\sqrt[8]{16}$

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

$= 2^{\frac{4}{8}}$

$= 2^{\frac{1}{2}}$

$= \sqrt{2}$

[1] b. $\sqrt[9]{27}$

$= \sqrt[9]{3^3}$

$= 3^{\frac{3}{9}}$

$= 3^{\frac{1}{3}}$

$= \sqrt[3]{3}$