

Period: _____

Name: Key

Chapter 1 Assignment – Radical Expressions & Equations

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Show all of your work.

1) Simplify (1 mark each):

a) $\sqrt{16x^7}$

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

b) $\sqrt{90}$

$$\sqrt{9 \cdot 10}$$
$$3\sqrt{10}$$

c) $\sqrt{20x^8y^5}$

$$\sqrt{4 \cdot 5x^8y^5}$$
$$2x^4y^2\sqrt{5y}$$

d) $\sqrt[3]{125m^{11}}$

$$5m^3\sqrt[3]{m^2}$$

ANSWER: $4x^3\sqrt{x}$

ANSWER: $3\sqrt{10}$

ANSWER: $2x^4y^2\sqrt{5y}$

ANSWER: $5m^3\sqrt[3]{m^2}$

2) Change to an entire radical (1 mark each):

a) $4\sqrt{5}$

$$\sqrt{4^2 \cdot 5}$$
$$= \sqrt{16 \cdot 5}$$
$$= \sqrt{80}$$

ANSWER: $\sqrt{80}$

b) $2\sqrt[3]{6}$

$$\sqrt[3]{2^3 \cdot 6}$$
$$\sqrt[3]{8 \cdot 6}$$
$$= \sqrt[3]{48}$$

ANSWER: $\sqrt[3]{48}$

3) Write another way, then simplify (1 mark):

$$162^{\frac{1}{4}}$$
$$= \sqrt[4]{162}$$
$$= \sqrt[4]{81} \cdot \sqrt[4]{2}$$
$$= 3\sqrt[4]{2}$$

ANSWER: $3\sqrt[4]{2}$

4) Simplify (2 marks each):

a) $-6\sqrt{12} + 2\sqrt{8} - 5\sqrt{75}$

$$-6\sqrt{4 \cdot 3} + 2\sqrt{4 \cdot 2} - 5\sqrt{25 \cdot 3}$$

$$-6(2)\sqrt{3} + 2(2)\sqrt{2} - 5(5)\sqrt{3}$$

$$-12\sqrt{3} + 4\sqrt{2} - 25\sqrt{3}$$

$$4\sqrt{2} - 37\sqrt{3}$$

ANSWER: $4\sqrt{2} - 37\sqrt{3}$

b) $3\sqrt[3]{16x^4y^5} - xy\sqrt[3]{54xy^2}$

$$3\sqrt[3]{8 \cdot 2x^4y^5} - xy\sqrt[3]{27 \cdot 2xy^2}$$

$$3(2)xy\sqrt[3]{2xy^2} - 3xy\sqrt[3]{2xy^2}$$

$$6xy\sqrt[3]{2xy^2} - 3xy\sqrt[3]{2xy^2}$$

$$3xy\sqrt[3]{2xy^2}$$

ANSWER: $3xy\sqrt[3]{2xy^2}$

5) Simplify (2 marks each):

a) $-2\sqrt{6x}(3\sqrt{2x})$

$$-2(3)\sqrt{6x(2x)}$$

$$-6\sqrt{12x^2}$$

$$-6\sqrt{4 \cdot 3x^2}$$

$$-6(2)x\sqrt{3}$$

$$-12x\sqrt{3}$$

ANSWER: $-12x\sqrt{3}$

b) $(2\sqrt{3} - \sqrt{2})(2\sqrt{3} + 3\sqrt{2})$

$$2\sqrt{3}(2\sqrt{3}) + 2\sqrt{3}(3\sqrt{2}) - \sqrt{2}(2\sqrt{3}) - \sqrt{2}(3\sqrt{2})$$

$$4(3) + 6\sqrt{3 \cdot 2} - 2\sqrt{2 \cdot 3} - 3(2)$$

$$12 + 6\sqrt{6} - 2\sqrt{6} - 6$$

$$6 + 4\sqrt{6}$$

ANSWER: $6 + 4\sqrt{6}$

6) Simplify (2 marks each):

a) $\frac{-42\sqrt[3]{48x^6}}{7\sqrt[3]{3x^2}} \cdot \frac{(\sqrt[3]{3x^2})^2}{(\sqrt[3]{3x^2})^2}$

$$\frac{-42\sqrt[3]{48x^6} \cdot \sqrt[3]{9x^4}}{7(3x^2)}$$

$$= \frac{-42\sqrt[3]{432x^{10}}}{21x^2}$$

$$= \frac{-2\sqrt[3]{216 \cdot 2x^{10}}}{x^2} = \frac{-2(6)x^3\sqrt[3]{2x}}{x^2}$$

ANSWER: $-12x\sqrt[3]{2x}$

b) $\frac{-x\sqrt{3} \cdot \sqrt{2x}}{3\sqrt{2x} \cdot \sqrt{2x}}$

$$\frac{-x\sqrt{3 \cdot 2x}}{3(2x)}$$

$$\frac{-x\sqrt{6x}}{6x}$$

$$\frac{-\sqrt{6x}}{6}$$

ANSWER: $\frac{-\sqrt{6x}}{6}$

c) $\frac{1-\sqrt{3}}{\sqrt{3}+2} \cdot \frac{(\sqrt{3}-2)}{(\sqrt{3}-2)}$

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

$$\frac{3\sqrt{3}-5}{3-4} = \frac{3\sqrt{3}-5}{-1}$$

$$= -1(3\sqrt{3}-5)$$

ANSWER: $-3\sqrt{3} + 5$
or $5 - 3\sqrt{3}$

$$-6\sqrt[3]{6x^4} = -6\sqrt[3]{8 \cdot 2x^3 \cdot x}$$

$$= -12x\sqrt[3]{2x}$$

7) Solve and check (2 marks each):

$x \leq 9$

a) $3\sqrt{9-x} + 12 = -18$

$$\begin{aligned} 3\sqrt{9-x} &= -30 \\ \sqrt{9-x} &= -10 \\ (9-x)^2 &= (-10)^2 \\ 9-x &= 100 \\ -x &= 91 \\ x &= -91 \end{aligned}$$

CHECK(S):

$$\begin{aligned} 3\sqrt{9-(-91)} + 12 &= -18 \\ 3\sqrt{100} + 12 &= -18 \\ 3(10) + 12 &= -18 \\ 30 + 12 &= -18 \\ 42 &= -18 \\ &X \end{aligned}$$

ANSWER(S):
No solution

b) $\sqrt{2y-3} - 7 = 2$

$$\begin{aligned} \sqrt{2y-3} &= 9 \\ 2y-3 &= 81 \\ 2y &= 84 \\ y &= 42 \end{aligned}$$

CHECK(S):

$$\begin{aligned} \sqrt{2(42)-3} - 7 &= 2 \\ \sqrt{84-3} - 7 &= 2 \\ \sqrt{81} - 7 &= 2 \\ 9 - 7 &= 2 \\ 2 &= 2 \\ &\checkmark \end{aligned}$$

ANSWER(S):
 $y = 42$

9) Solve and check (4 marks): $\sqrt{2x^2-7} = 3-x$

$x \geq \sqrt{\frac{7}{2}}$

$$(\sqrt{2x^2-7})^2 = (3-x)^2$$

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

$$2x^2 - 7 = 9 - 3x - 3x + x^2$$

$$2x^2 - 7 = 9 - 6x + x^2$$

$$+6x \quad -x^2 \quad -9 \quad -9 \quad +6x \quad -x^2$$

$$x^2 + 6x - 16 = 0$$

$$(x+8)(x-2) = 0$$

$$x = -8, \quad x = 2$$

$$2x^2 - 7 \geq 0$$

$$2x^2 \geq 7$$

$$x^2 \geq \frac{7}{2}$$

$$x \geq \pm \sqrt{\frac{7}{2}}$$

$$x \geq -\sqrt{\frac{7}{2}}$$

CHECK(S):

$$\begin{aligned} x &= -8 \\ \sqrt{2(-8)^2-7} &= 3-(-8) \\ \sqrt{2(64)-7} &= 3+8 \\ \sqrt{128-7} &= 11 \\ \sqrt{121} &= 11 \\ 11 &= 11 \\ &\checkmark \end{aligned}$$

$$x = 2$$

$$\begin{aligned} \sqrt{2(2)^2-7} &= 3-(2) \\ \sqrt{2(4)-7} &= 1 \\ \sqrt{8-7} &= 1 \\ \sqrt{1} &= 1 \\ 1 &= 1 \\ &\checkmark \end{aligned}$$

ANSWER(S):

$$x = -8, 2$$

(Flip the page!)

$$\frac{3\sqrt{11}^2}{\sqrt{11}} \text{ cm}$$

10) The volume of a sphere is $V = \frac{4}{3}\pi r^3$. If the volume of a sphere is 36cm^3 , what is the radius? (answer in exact form) (3 marks)

$$\begin{aligned} 3 \times 36 &= \frac{4}{3} \pi r^3 && \rightarrow r = \sqrt[3]{\frac{27}{\pi}} \\ \frac{108}{4\pi} &= \frac{4\pi r^3}{4\pi} && r = \frac{\sqrt[3]{27}}{\sqrt[3]{\pi}} \\ \sqrt[3]{\frac{27}{\pi}} &= \sqrt[3]{r^3} && r = \frac{3 \cdot (\sqrt[3]{\pi})^2}{\sqrt[3]{\pi} \cdot (\sqrt[3]{\pi})^2} \\ &&& r = \frac{3\sqrt[3]{\pi^2}}{\pi} \end{aligned}$$

SENTENCE ANSWER:

The radius has an exact length of $\frac{3\sqrt[3]{\pi^2}}{\pi}$ cm