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Answers to the Exercises

Chapter 1: Exponents & Radicals

EXERCISE 1:

- | | | |
|--------|-------------------|-----------------------|
| 1. 1 | 11. -36 | 20. 9 |
| 2. -1 | 12. 64 | 21. $\frac{1}{9}$ |
| 3. 1 | 13. -72 | 22. 125 |
| 4. -1 | 14. 108 | 23. $\frac{1}{125}$ |
| 5. 1 | 15. -648 | 24. 49 |
| 6. -1 | 16. 1 | 25. $\frac{1}{49}$ |
| 7. -1 | 17. $\frac{1}{6}$ | 26. 1,000 |
| 8. -27 | 18. $\frac{1}{4}$ | 27. $\frac{1}{1,000}$ |
| 9. -27 | 19. 1 | |
| 10. 27 | | |

EXERCISE 2:

1. $6x^5$

2. $\frac{8}{k^2}$

3. $15x^2$

4. -21

5. $\frac{1}{8x^6}$

6. $-\frac{9b^5}{a^3}$

7. $\frac{n^4}{2}$

8. a^4b^6

9. $\frac{y^2}{x^2}$

10. x^3

11. $\frac{x^6}{y^3}$

12. $\frac{3u^2}{4}$

13. $-8u^3v^3$

14. x^5

15. $3x^8$

16. x

17. x^9

18. $\frac{2}{x^3}$

19. $36m^8$

20. $\frac{1}{a^6}$

21. b^{12}

22. $\frac{m^4}{n}$

23. x^2

24. $\frac{1}{mn^2}$

25. k

26. $\frac{m^6}{n^9}$

27. $x^5y^7z^9$

EXERCISE 3:

1. $2\sqrt{3}$

2. $4\sqrt{6}$

3. $3\sqrt{5}$

4. $3\sqrt{2}$

5. $6\sqrt{3}$

6. $15\sqrt{3}$

7. $4\sqrt{2}$

8. $10\sqrt{2}$

9. $2\sqrt{2}$

10. $8\sqrt{2}$

11. $x = 50$

12. $x = 5$

13. $x = 2$

14. $x = 8$

15. $x = 21$

16. $x = \frac{1}{2}$

17. $x = 6$

18. $x = 6$

CHAPTER EXERCISE:

1. **B**

$$a^{-\frac{1}{2}} = 3$$

$$\frac{1}{a^{\frac{1}{2}}} = 3$$

$$1 = 3\sqrt{a}$$

$$\frac{1}{3} = \sqrt{a}$$

$$\frac{1}{9} = a$$

2. **A**

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

$$2^{x-y} = 2^3$$

$$x - y = 3$$

$$x = y + 3$$

3. **D** Raise each side to the 4th power:

$$y^5 = 10$$

$$(y^5)^4 = 10^4$$

$$y^{20} = 10,000$$

4. **B**

$$\sqrt[4]{x^2y^4} = (x^2y^4)^{\frac{1}{4}} = x^{2 \cdot \frac{1}{4}}y^{4 \cdot \frac{1}{4}} = x^{\frac{1}{2}}y^1 = y\sqrt{x}$$

5. **$\frac{5}{4}$** $\frac{\sqrt{x^3}}{\sqrt[4]{x}} = \frac{x^{\frac{3}{2}}}{x^{\frac{1}{4}}} = x^{\frac{3}{2} - \frac{1}{4}} = x^{\frac{6}{4} - \frac{1}{4}} = x^{\frac{5}{4}}$.Therefore, $c = \frac{5}{4}$.6. **C**

$$3^{x-3} = \frac{3^x}{3^3} = \frac{10}{3^3} = \frac{10}{27}$$

7. **B** To avoid any trickiness, it's best to plug in numbers. Let $a = 2$ and $b = 2$. Going through each choice,

A) $(-4)^2 = 16$

B) $(-4)^4 = 256$

C) $(2 \cdot 2)^2 = 16$

D) $2 \cdot 2^4 = 2 \cdot 16 = 32$

(B) is the largest.

8. **D** Cube both sides of the first equation,

$$(x^2)^3 = (y^3)^3$$

$$x^6 = y^9$$

Now y^9 can be replaced by x^6 ,

$$x^{3z} = y^9$$

$$x^{3z} = x^6$$

$$3z = 6$$

$$z = 2$$

9. **B**

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

Therefore, $a = \frac{3}{4}$ 10. **C**

$$x^{ac} \cdot x^{bc} = x^{30}$$

$$x^{ac+bc} = x^{30}$$

$$ac + bc = 30$$

$$(a + b)c = 30$$

$$5c = 30$$

$$c = 6$$

11. D

$$\begin{aligned}2^{2(2n+3)} &= 2^{3(n+5)} \\2(2n+3) &= 3(n+5) \\4n+6 &= 3n+15 \\n &= 9\end{aligned}$$

12. A $(-2)^{\frac{5}{3}} = \sqrt[3]{(-2)^5} =$
 $\sqrt[3]{-2 \cdot -2 \cdot -2} \cdot -2 \cdot -2 = -2 \cdot \sqrt[3]{-2 \cdot -2} =$
 $-2 \cdot \sqrt[3]{4}$

13. C

$$\begin{aligned}2^{x+3} - 2^x &= k(2^x) \\(2^x)(2^3) - 2^x &= k(2^x) \\2^x(2^3 - 1) &= k(2^x) \\2^x(7) &= k(2^x) \\7 &= k\end{aligned}$$

14. B Multiply the exponents.

$$\begin{aligned}(5^3)^{4k} &= (5^{\frac{1}{3}})^{24} \\5^{12k} &= 5^8\end{aligned}$$

Since the bases are the same, we can equate the exponents: $12k = 8$ and so $k = \frac{8}{12} = \frac{2}{3}$.

15. B The $2a$ means raised to the $2a$ power and the b on the bottom means the b th root.16. D Multiply both equations together. The left hand side gives x^5y^5 . The right hand side gives 80.