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Answers to the Exercises

Chapter 1: Exponents & Radicals

EXERCISE 1:

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

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. $\boxed{B}$

$$a^{-\frac{1}{2}} = 3$$
$$\frac{1}{a^{\frac{1}{2}}} = 3$$
$$1 = 3\sqrt{a}$$
$$\frac{1}{3} = \sqrt{a}$$
$$\frac{1}{9} = a$$

2. $\boxed{C}$ It's obvious that there will be a bunch of 1's, but how many? Well, how many even numbers are there between 2 and 50? If we take the list

$$2, 4, 6, \ldots, 48, 50$$

and divide each element by 2,

$$1, 2, 3, \ldots, 24, 25$$

we can clearly see that there are 25 numbers. Therefore, n is the sum of twenty-five 1's. The answer is 25.

3. $\boxed{D}$

$$2^{2(2n+3)} = 2^{3(n+5)}$$
$$2(2n+3) = 3(n+5)$$
$$4n+6 = 3n+15$$
$$n = 9$$

4. $\boxed{A}$

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

5. $\boxed{C}$

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

6. $\boxed{D}$ Multiply both equations together. The left hand side gives x^5y^5. The right hand side gives 80.

7. $\boxed{B}$ 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. $\boxed{B}$ The $2a$ means raised to the $2a$ power and the b on the bottom means the bth root.

9. $\boxed{D}$ 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,

$$x^{3z} = y^9$$
$$x^{3z} = x^6$$
$$3z = 6$$
$$z = 2$$

10. $\boxed{C}$

$$2^{x+3} - 2^x = k(2^x)$$
$$(2^x)(2^3) - 2^x = k(2^x)$$
$$2^x(2^3 - 1) = k(2^x)$$
$$2^x(7) = k(2^x)$$
$$7 = k$$

11. $\boxed{B}$

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

Therefore, $a = \frac{3}{4}$

12. $\boxed{A}$ Squaring both sides ("unsimplifying" will get you the same result),

$$\begin{aligned}(2\sqrt{x+2})^2 &= (3\sqrt{2})^2\\ 4(x+2) &= 18\\ 4x+8 &= 18\\ 4x &= 10\\ x &= 2.5\end{aligned}$$

13. $\boxed{C}$

$$\begin{aligned}x^{ac}\cdot x^{bc} &= x^{30}\\ x^{ac+bc} &= x^{30}\\ ac+bc &= 30\\ (a+b)c &= 30\\ 5c &= 30\\ c &= 6\end{aligned}$$

14. $\boxed{8,000}$ Multiply the first equation by n to get

$$n^4 = nx$$

Substitute this into the left side of the second equation,

$$nx = 20x$$

$$n = 20$$

Using the first equation,
$x = n^3 = (20)^3 = 8,000$

15. $\boxed{111}$

$$x^7y^6 = 3$$

Multiply both sides by xy,

$$x^8y^7 = 3xy$$

We do this to make the following substitution,

$$3xy = 333$$

$$xy = 111$$