A.2 Homework Packet DO NOT LOSE

Algebra 2/Trig **Homework A.2.1: Exponent Rules** **Mrs. Dunphy**

1-33 EOO

1. $3z^2 \cdot 2z^3$
3. $(-t^4)^3$
5. $(3x^2y)(xy^2)$
7. $(-2u^2)(uv^3)(-u^2v^2)$
9. $(4a^3b^2)^2$
11. $(-3pq^4r^2)^3$
13. $(-z^3)(-z)^3$
15. $(s^2t)^3(st^3)^2$
17. $3y(y^3 - 2y^2 + 3)$
19. $rs^2(r^2 - 2rs - s^2)$
21. $z^{n-2} \cdot z^{n+2}$
23. $x^{m-1} \cdot x \cdot x^m$
25. $r^{h-2}(r^{h+1})^2$
27. $t(t^{n-1} + t^n + t^{n+1})$
29. $p^n(p^{m-n+1} + p^{m-n})$
31. $z^{m-n}(z^{n+m} - z^{n-m} + z^n)$
33. $(t^m)^n(t^n)^{n-m}$

3-19 ODD, 25, 27, 29

3. $\dfrac{-12p^3q}{4p^2q^2}$
5. $\dfrac{-15u^5v^3}{-25u^4v^2}$
7. $\left(\dfrac{3r}{s^2}\right)^3$
9. $\dfrac{3s}{t^2} \cdot \dfrac{s^2}{t}$
11. $\dfrac{3x^2}{y^2} \cdot \dfrac{3y}{6x}$
13. $\dfrac{rs^2t^3}{r^3s^2t}$
15. $\dfrac{u^2}{v}\left(\dfrac{3v}{u^2}\right)^2$
17. $\dfrac{(4r^2s^2)^2}{(4r^2s)^2}$
19. $\dfrac{(xyz^2)^2}{(x^2yz)^2}$
25. $\dfrac{a^{2m}b^{2m+1}}{(a^2b^2)^m}$
27. $\dfrac{(pq)^n}{pq^n}$
29. $\dfrac{t^{n+1}t^{n-1}}{t^n}$

Assignment: 3-11 ODD and 21-49 EOO
Write your work on separate paper!!

Write in simplest form without zero or negative exponents.

1. $3 \cdot 5^{-1}$
2. $(3 \cdot 5)^{-1}$
3. $(-3^{-1})^{-2}$
4. $(-2^{-2})^{-1}$
5. $(2^{-2} \cdot 3^{-1} \cdot 5^{0})^{-1}$
6. $5^{-1}(3^{-2} \cdot 2^{-3})^{0}$
7. $2\left(\frac{2}{5}\right)^{-2}$
8. $\left(\frac{3}{4}\right)^{-1}\left(\frac{4}{3}\right)^{-2}$

Re-write each expression without using fractions.

9. $\frac{7}{10{,}000}$
10. $\frac{3}{1000}$
11. $\frac{6x^2}{y^3}$
12. $\frac{x^2}{yz^4}$

Simplify each expression without using zero or negative exponents.

21. $\frac{3x^{-2}}{y^{-1}}$
22. $\frac{p^{-1}q^{-2}}{p^{-3}}$
23. $\frac{s^{-2}t^{-3}}{s^{-1}t^{0}}$
24. $\frac{6xy^{-1}}{-2x^{-2}y^{-1}}$
25. $\left(\frac{u^{-2}}{v}\right)^{-1}$
26. $\left(\frac{2}{h^2k^{-3}}\right)^{-2}$
27. $(2x^{-2}y^{2})^{-2}$
28. $\frac{(3x^{-2}y)^{-1}}{(2xy^{-2})^{0}}$
29. $3x^2(3xy^{-1})^{-2}$
30. $5t(s^{-1}t^{-2})^{-2}$
31. $\frac{(2x^{-1})^{-2}}{2(y^{-1})^{-2}}$
32. $\left(\frac{2pq^{-1}}{4q^2}\right)^{-1}$
33. $\left(\frac{x}{y^2}\right)^{-1}\left(\frac{x^{-2}}{y}\right)^{2}$
34. $\left(\frac{3}{t^2}\right)^{-1}\left(\frac{t}{3}\right)^{-2}$
35. $\left(\frac{p^{-2}q^{-1}}{p^{-1}q^{-2}}\right)^{-1}$
36. $\frac{(ax^2)^{-1}}{a^{-2}x^{-2}}$
37. $\left(\frac{x^2}{y^{-1}}\right)^{-2}\left(\frac{y^2}{x^{-1}}\right)^{2}$
38. $\frac{r^{-2}}{s^2}\left(\frac{1}{rs}\right)^{-2}$
39. $\left(\frac{u}{v^{-1}}\right)^{0}\left(\frac{u^{-1}}{v^2}\right)^{2}(uv^2)^{-1}$
40. $\left(\frac{a^0}{b}\right)^{-2}\left(\frac{a}{b^{-2}}\right)^{-2}$
41. $4x^3y^{-6} + (x^{-1}y^2)^{-3}$
42. $\left(\frac{u^2}{v}\right)^{2} + (-u^{-2}v)^{-2}$

Find a counterexample that proves each statement false.

43. $(x + y)^{-1}$ and $x^{-1} + y^{-1}$
44. $(xy)^{-1}$ and $\frac{x}{y}$
45. xy^{-1} and $\frac{1}{xy}$
46. $(1 - x)^{-2}$ and $1 - x^{-2}$

Find an expression that will make the statement true.

Sample 3 $x^{-3} + 2x^{-2} - 3x^{-1} = x^{-3}(\_\_?\_\_)$

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

47. $x^{-1} - 4x^{-2} + 2x^{-3} = x^{-3}(\_\_?\_\_)$
48. $2x^{-2} + x^{-1} - 3 = x^{-2}(\_\_?\_\_)$
49. $4 - 5x^{-1} + x^{-2} = x^{-2}(\_\_?\_\_)$
50. $x^{-1} - 9x^{-3} = x^{-3}(\_\_?\_\_)$

1-11 ODD: Simplify. If the expression does not represent a real number, write "not real".

1. $\sqrt{36}$
2. $\sqrt[3]{-8}$
3. $\sqrt{-\frac{1}{4}}$
4. $-\sqrt{\frac{1}{25}}$
5. $-\sqrt[4]{16}$
6. $(\sqrt[3]{5})^3$
7. $(\sqrt{2})^2$
8. $(-\sqrt{11})^2$
9. $(-\sqrt[3]{13})^3$
10. $\sqrt[4]{(-7)^4}$
11. $\sqrt[5]{(-6)^5}$
12. $\sqrt[6]{0}$

19-23 ODD: Simplify each statement. Be careful to observe the rules for using absolute value.

19. $\sqrt{w^2}$
20. $\sqrt{y^4}$
21. $(\sqrt[4]{y})^4$
22. $\sqrt[3]{x^3}$
23. $(\sqrt[4]{|y|})^4$
24. $(\sqrt[5]{z})^5$

1-13 ODD: Simplify. If the expression does not represent a real number, write "not real".

1. a. $\sqrt{16}$ b. $-\sqrt{16}$ c. $\sqrt{-16}$ d. $\sqrt[4]{16}$
2. a. $\sqrt{64}$ b. $\sqrt{-64}$ c. $\sqrt[3]{64}$ d. $\sqrt[3]{-64}$
3. a. $\sqrt{81}$ b. $-\sqrt{81}$ c. $\sqrt{-81}$ d. $\sqrt[4]{81}$
4. a. $\sqrt{144}$ b. $\sqrt{-144}$ c. $-\sqrt{144}$ d. $\sqrt[4]{-144}$
5. a. $\sqrt{0.01}$ b. $\sqrt{-0.01}$ c. $\sqrt[3]{0.001}$ d. $\sqrt[3]{-0.001}$
6. a. $\sqrt{0.04}$ b. $-\sqrt{0.04}$ c. $\sqrt{0.0004}$ d. $\sqrt{-0.0004}$
7. a. $\sqrt{7^2}$ b. $\sqrt[3]{7^3}$ c. $\sqrt[4]{(-7)^4}$ d. $\sqrt[5]{(-7)^5}$
8. a. $\sqrt{5^2}$ b. $\sqrt{-5^2}$ c. $\sqrt[3]{(-5)^3}$ d. $\sqrt[3]{-5^3}$
9. a. $\sqrt{\frac{1}{64}}$ b. $\frac{1}{\sqrt{64}}$ c. $\sqrt[3]{-\frac{1}{64}}$ d. $-\frac{1}{\sqrt[3]{64}}$
10. a. $\sqrt{\frac{1}{16}}$ b. $\sqrt{\frac{81}{16}}$ c. $\sqrt[4]{\frac{1}{16}}$ d. $\sqrt[4]{\frac{81}{16}}$
11. a. $\sqrt{10^2}$ b. $\sqrt{10^4}$ c. $\sqrt{10^6}$ d. $\sqrt{10^{20}}$
12. a. $\sqrt[3]{10^{-3}}$ b. $\sqrt[3]{10^{-6}}$ c. $\sqrt[3]{10^{-9}}$ d. $\sqrt[3]{10^{-30}}$
13. a. $\sqrt{a^2}$ b. $\sqrt{a^4}$ c. $\sqrt[3]{a^6}$ d. $\sqrt[6]{a^6}$
14. a. $\sqrt{-a^2}$ b. $\sqrt{(-a)^2}$ c. $\sqrt[4]{a^4}$ d. $\sqrt{a^6}$

33-37 ODD: Find the value(s) of x that ensure the expression represents a real number.

33. a. $\sqrt{x+1}$ b. $\sqrt{x-1}$ c. $\sqrt[3]{x-1}$ d. $\sqrt{x^2-1}$
34. a. $\sqrt{4-x}$ b. $\sqrt{4-x^2}$ c. $\sqrt[3]{4-x^2}$ d. $\sqrt{4+x^2}$
35. $\sqrt{x^3-9x}$
36. $\sqrt{16x-x^2}$
37. $\sqrt{\sqrt{x}-x}$
38. $\sqrt{x-\sqrt{x}}$

HW A.2.5A: 1-7 odd, 13-19 odd, 23, 25, 27, 31, 39, 41
HW A.2.5B: 21, 22, 29, 30, 32, 43-46 all

1. $\sqrt{52}$ **2.** $\sqrt{125}$ **3.** $\sqrt{162}$

4. $\sqrt{363}$ **5.** $\sqrt{196}$ **6.** $\sqrt{324}$

7. $\sqrt{\frac{8}{9}}$ **8.** $\sqrt{\frac{50}{49}}$ **9.** $\sqrt{\frac{4}{3}}$

10. $\sqrt{\frac{9}{5}}$ **11.** $\frac{4}{\sqrt{2}}$ **12.** $\frac{6}{\sqrt{3}}$

13. $\frac{\sqrt{270}}{\sqrt{6}}$ **14.** $\frac{\sqrt{96}}{\sqrt{3}}$ **15.** $\sqrt{30} \cdot \sqrt{42}$

16. $\sqrt{35} \cdot \sqrt{21}$ **17.** $\sqrt{6} \cdot \sqrt{\frac{2}{3}}$ **18.** $\sqrt{15} \cdot \sqrt{\frac{3}{5}}$

19. $\sqrt[3]{250}$ **20.** $\sqrt[3]{135}$ **21.** $\sqrt[3]{\frac{5}{4}}$

22. $\sqrt[3]{\frac{2}{9}}$ **23.** $\frac{9\sqrt{2}}{\sqrt{18}}$ **24.** $\frac{4\sqrt{3}}{\sqrt{12}}$

25. $(2\sqrt{7})^2$ **26.** $(3\sqrt{6})^2$ **27.** $\sqrt[3]{45} \cdot \sqrt[3]{12}$

28. $\sqrt[3]{20} \cdot \sqrt[3]{14}$ **29.** $\frac{\sqrt[3]{60}}{\sqrt[3]{36}}$ **30.** $\frac{\sqrt[3]{175}}{\sqrt[3]{50}}$

31. **a.** $\sqrt{32}$ **b.** $\sqrt[3]{32}$ **c.** $\sqrt[4]{32}$ **d.** $\sqrt[5]{32}$

32. **a.** $\sqrt{\frac{3}{8}}$ **b.** $\sqrt[3]{\frac{3}{8}}$ **c.** $\sqrt[4]{\frac{3}{8}}$ **d.** $\sqrt[5]{\frac{3}{8}}$

39. $\sqrt{18x^2}$ **40.** $\sqrt{12x^5}$

41. $\sqrt[3]{375a^5}$ **42.** $\sqrt[3]{16c^4}$

43. $\sqrt{\frac{x^2}{y^3}}$ **44.** $\sqrt{\frac{y^2}{x^5}}$

45. $\sqrt[3]{\frac{27a}{4b^4}}$ **46.** $\sqrt[3]{\frac{8c}{9d^5}}$

HW A.2.6: 1-41 EOO

Simplify each expression.

1. $\sqrt{50} + \sqrt{18}$
2. $\sqrt{45} - \sqrt{20}$
3. $3\sqrt{12} - \sqrt{48}$
4. $\sqrt{27} + 2\sqrt{75}$
5. $5\sqrt{2} - 2\sqrt{5}$
6. $7\sqrt{3} - 3\sqrt{7}$
7. $\sqrt{6} + \sqrt{36} + \sqrt{216}$
8. $\sqrt{5} + \sqrt{25} + \sqrt{125}$
9. $\sqrt{50} + \sqrt{63} - \sqrt{32}$
10. $\sqrt{18} + \sqrt{24} - \sqrt{54}$
11. $\sqrt[3]{54} + \sqrt[3]{40} + \sqrt[3]{16}$
12. $\sqrt[3]{24} - \sqrt[3]{56} + \sqrt[3]{81}$
13. $\sqrt{\frac{27}{5}} - \sqrt{\frac{3}{5}}$
14. $\sqrt{\frac{75}{2}} - \sqrt{\frac{3}{2}}$
15. $\sqrt{\frac{2}{3}} + \sqrt{\frac{3}{2}}$
16. $\sqrt{\frac{5}{2}} + \sqrt{\frac{2}{5}}$
17. $\sqrt[3]{4} + \sqrt[3]{\frac{1}{2}}$
18. $\sqrt[3]{16} - \sqrt[3]{\frac{1}{4}}$
19. $\sqrt{2}(\sqrt{8} + \sqrt{10})$
20. $\sqrt{3}(\sqrt{12} - \sqrt{24})$
21. $\sqrt{15}(\sqrt{3} + 2\sqrt{5})$
22. $\sqrt{7}(3\sqrt{14} - \sqrt{21})$
23. $2\sqrt{3}(\sqrt{48} - 5\sqrt{12})$
24. $3\sqrt{5}(\sqrt{5} + 2\sqrt{75})$
25. $\dfrac{\sqrt{6} - \sqrt{24}}{\sqrt{2}}$
26. $\dfrac{\sqrt{18} - \sqrt{6}}{\sqrt{3}}$
27. $\dfrac{4\sqrt{300} - \sqrt{108}}{\sqrt{12}}$
28. $\dfrac{\sqrt{40} - 2\sqrt{5}}{\sqrt{10}}$
29. $\sqrt{\frac{2}{3}}\left(\sqrt{\frac{27}{2}} - \frac{3}{\sqrt{2}}\right)$
30. $\sqrt{\frac{3}{8}}\left(\sqrt{\frac{3}{4}} + \frac{2}{\sqrt{3}}\right)$
31. $\sqrt[3]{5}(\sqrt[3]{200} - \sqrt[3]{16})$
32. $\sqrt[3]{40}(\sqrt[3]{25} + 2\sqrt[3]{5})$
33. $\dfrac{\sqrt[3]{18} + 3\sqrt[3]{54}}{\sqrt[3]{3}}$
34. $\dfrac{\sqrt[3]{320} + \sqrt[3]{1250}}{2\sqrt[3]{5}}$

Simplify each expression. Make sure to use the absolute value as necessary.

35. $\sqrt{8x^3} - x\sqrt{18x}$
36. $y^2\sqrt{45y} + 2y\sqrt{5y^3}$
37. $\sqrt{p^3r} + \sqrt{pr^3}$
38. $\sqrt{2a^2b^4} + \sqrt{8a^2b^4}$
39. $\sqrt{10a} - \dfrac{\sqrt{5a}}{\sqrt{2}} + \sqrt{\dfrac{2a}{5}}$
40. $\sqrt{6x} + \dfrac{\sqrt{2x}}{\sqrt{3}} - \sqrt{\dfrac{3x}{2}}$
41. $\sqrt{6w}(\sqrt{3w} + \sqrt{2w^3})$
42. $\sqrt{10t}(\sqrt{2t^5} - \sqrt{5t})$

HW A.2.7: 1-29 EOO, 31, 37, 41, 43

Simplify each expression.

1. $(3 + \sqrt{7})(3 - \sqrt{7})$

2. $(5 + \sqrt{2})(5 - \sqrt{2})$

3. $(\sqrt{7} + 1)^2$

4. $(\sqrt{5} + 2)^2$

5. $(1 + \sqrt{2})(3 + \sqrt{2})$

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

7. $\dfrac{1}{4 - \sqrt{3}}$

8. $\dfrac{1}{6 + \sqrt{3}}$

9. $(\sqrt{7} - \sqrt{2})^2$

10. $(3\sqrt{11} - \sqrt{10})^2$

11. $(3 + 4\sqrt{3})(2 - \sqrt{3})$

12. $(5 - \sqrt{2})(3 - 2\sqrt{2})$

13. $\dfrac{3}{\sqrt{5} + \sqrt{2}}$

14. $\dfrac{10}{2\sqrt{3} - \sqrt{7}}$

15. $(\sqrt{11} - \sqrt{7})(\sqrt{11} + \sqrt{7})$

16. $(\sqrt{13} - \sqrt{3})(\sqrt{13} + \sqrt{3})$

17. $(5 + \sqrt{3})(8 - 2\sqrt{3})$

18. $(3 + 2\sqrt{6})(4 - 5\sqrt{6})$

19. $\dfrac{\sqrt{15}}{\sqrt{3} + \sqrt{5}}$

20. $\dfrac{\sqrt{6}}{\sqrt{2} + \sqrt{3}}$

21. $(2\sqrt{5} + \sqrt{7})^2$

22. $(3\sqrt{2} + \sqrt{6})^2$

23. $(2\sqrt{3} + \sqrt{5})(2\sqrt{3} - \sqrt{5})$

24. $(3\sqrt{7} - 2\sqrt{5})(3\sqrt{7} + 2\sqrt{5})$

25. $(\sqrt{6} - \sqrt{15})^2$

26. $(2\sqrt{5} - \sqrt{10})^2$

27. $\dfrac{\sqrt{5} + \sqrt{3}}{2} \cdot \dfrac{\sqrt{5} - \sqrt{3}}{2}$

28. $\dfrac{2\sqrt{7} + 1}{3} \cdot \dfrac{2\sqrt{7} - 1}{3}$

29. $(5\sqrt{6} + 3\sqrt{2})(2\sqrt{6} - 4\sqrt{3})$

30. $(3\sqrt{5} + 2\sqrt{15})(4\sqrt{3} - 3\sqrt{15})$

31. $\dfrac{\sqrt{5} + 1}{\sqrt{5} - 3}$

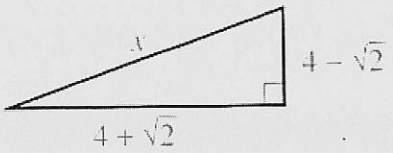
32. $\dfrac{2\sqrt{7} - \sqrt{3}}{\sqrt{7} + \sqrt{3}}$

37. **a.** What is the conjugate of $2\sqrt{5} - 3\sqrt{2}$?
b. What is the reciprocal of the conjugate of $2\sqrt{5} - 3\sqrt{2}$?
c. What is the conjugate of the reciprocal of $2\sqrt{5} - 3\sqrt{2}$?

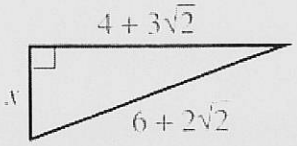
38. Show that the reciprocal of $\dfrac{\sqrt{5} + 1}{2}$ is also the conjugate of $\dfrac{\sqrt{5} + 1}{2}$.

Use the Pythagorean theorem to find x.

39.



40.



Simplify. Assume that each radical represents a real number.

41. $(\sqrt{n + 1} + \sqrt{n})(\sqrt{n + 1} - \sqrt{n})$

42. $(b + \sqrt{b})^2 - (b - \sqrt{b})^2$

43. $\dfrac{\sqrt{w}}{\sqrt{w} + 1} + \dfrac{\sqrt{w}}{\sqrt{w} - 1}$

44. $\sqrt{1 - y^2} + \dfrac{y^2}{\sqrt{1 - y^2}}$

HW A.2.8: 1-27 ODD, 29-41 EOO (Answers on the back)

Simplify each expression. If not possible, state why.

1. $81^{1/2}$
2. $27^{1/3}$
3. $49^{-1/2}$
4. $32^{-1/5}$
5. $4^{3/2}$
6. $27^{2/3}$
7. $16^{3/4}$
8. $25^{-3/2}$
9. $(-125)^{-1/3}$
10. $(-32)^{-3/5}$
11. $4^{-0.5}$
12. $\left(\frac{4}{9}\right)^{-1.5}$
13. $-8^{2/3}$
14. $-9^{3/2}$
15. $(5^{1/3})^{-3}$
16. $(7^{-2/3})^{3}$
17. $(16^{-5})^{1/20}$
18. $(27^{4})^{-1/12}$
19. $(9^{1/2} + 16^{1/2})^{2}$
20. $(8^{2/3} - 8^{1/3})^{3}$

Re-write each expression in *exponential form*.

21. $\sqrt{x^3y^5}$
22. $\sqrt[3]{p^4q}$
23. $\sqrt{a^{-2}b^3}$
24. $\sqrt[3]{x^6y^{-4}}$
25. $(\sqrt{a^{-2}b})^5$
26. $\sqrt[3]{8b^6c^{-4}}$
27. $\sqrt[4]{\frac{16^3 \cdot a^{-2}}{b^6}}$
28. $\frac{1}{\sqrt[4]{p^4q^{-8}}}$

Re-write each expression in simplified radical form. Hint: Convert to exponential form first.

29. $\sqrt[3]{4} \cdot \sqrt[3]{4}$
30. $\sqrt{8} \cdot \sqrt[6]{8}$
31. $\frac{\sqrt[3]{4}}{\sqrt[6]{2}}$
32. $\frac{\sqrt[5]{27^3}}{\sqrt[5]{9^2}}$
33. $\sqrt[10]{32} \div \sqrt[8]{4}$
34. $\sqrt[6]{8^3} \div \sqrt[6]{4^2}$
35. $\sqrt[4]{27} \cdot \sqrt[8]{9}$
36. $\sqrt[4]{128} \cdot \sqrt[8]{256}$

Convert into simplified exponential form.

37. $\sqrt{x} \cdot \sqrt[3]{x} \cdot \sqrt[6]{x}$
38. $\sqrt[3]{a^2} \cdot \sqrt[3]{a^4}$
39. $\sqrt[4]{x} \cdot \sqrt[6]{x} \div \sqrt[3]{x}$
40. $((b^{1/2})^{-2/3})^{3/4}$
41. $a^{1/2}(a^{3/2} - 2a^{1/2})$
42. $(x^{3/2} - 2x^{5/2}) \div x^{1/2}$

HW A.2.9: 1-17 ODD (Answers below)

Simplify each expression involving real number exponents.

1. a. $3^{\sqrt{2}} \cdot 3^{\sqrt{2}}$ **b.** $(3^{\sqrt{2}})^2$ **c.** $(3^{\sqrt{2}})^{\sqrt{2}}$ **d.** $\dfrac{3^{\sqrt{2}+2}}{3^{\sqrt{2}-2}}$

2. a. $7^{\sqrt{3}} \cdot 7^{\sqrt{2}}$ **b.** $(7^{\sqrt{3}})^2$ **c.** $(7^{\sqrt{3}})^{\sqrt{2}}$ **d.** $\dfrac{7^{\sqrt{3}+2}}{49}$

3. $(10^{\pi})^2$ **4.** $(5^{-\pi})^{-1}$ **5.** $\sqrt{6^{2\pi}}$ **6.** $\sqrt[3]{4^{6\pi}}$

7. $\dfrac{10^{\sqrt{3}-2}}{10^{\sqrt{3}+2}}$ **8.** $\dfrac{6^{\sqrt{2}} \cdot 6^{\sqrt{8}}}{6^{3\sqrt{2}}}$ **9.** $[(\sqrt{2})^{\pi}]^0$ **10.** $(\sqrt{3})^{\sqrt{2}}(\sqrt{3})^{-\sqrt{2}}$

11. $(2^{\sqrt{2}})^{-1/\sqrt{2}}$ **12.** $(\sqrt{2}^{\sqrt{2}})^{\sqrt{2}}$ **13.** $8^{1.2} \cdot 2^{-3.6}$ **14.** $\dfrac{25^{2.4}}{5^{5.8}}$

15. $\dfrac{(1+\sqrt{3})^{\pi-1}}{(1+\sqrt{3})^{\pi+1}}$ **16.** $\dfrac{(\sqrt{2}-1)^{2+\pi}}{(\sqrt{2}-1)^{\pi}}$ **17.** $\sqrt[4]{\dfrac{9^{1-\pi}}{9^{1+\pi}}}$ **18.** $\sqrt{\dfrac{2^{\sqrt{3}+3}}{8}}$

ANSWERS

1. a. $3^{\sqrt{2}} \cdot 3^{\sqrt{2}}$ $9^{\sqrt{2}}$ **b.** $(3^{\sqrt{2}})^2$ $9^{\sqrt{2}}$ **c.** $(3^{\sqrt{2}})^{\sqrt{2}}$ 9 **d.** $\dfrac{3^{\sqrt{2}+2}}{3^{\sqrt{2}-2}}$ 81

2. a. $7^{\sqrt{3}} \cdot 7^{\sqrt{2}}$ $7^{\sqrt{3}+\sqrt{2}}$ **b.** $(7^{\sqrt{3}})^2$ $49^{\sqrt{3}}$ **c.** $(7^{\sqrt{3}})^{\sqrt{2}}$ $7^{\sqrt{6}}$ **d.** $\dfrac{7^{\sqrt{3}+2}}{49}$ $7^{\sqrt{3}}$

3. $(10^{\pi})^2$ 100^{π} **4.** $(5^{-\pi})^{-1}$ 5^{π} **5.** $\sqrt{6^{2\pi}}$ 6^{π} **6.** $\sqrt[3]{4^{6\pi}}$ 16^{π}

7. $\dfrac{10^{\sqrt{3}-2}}{10^{\sqrt{3}+2}}$ $\dfrac{1}{10{,}000}$ **8.** $\dfrac{6^{\sqrt{2}} \cdot 6^{\sqrt{8}}}{6^{3\sqrt{2}}}$ 1 **9.** $[(\sqrt{2})^{\pi}]^0$ 1 **10.** $(\sqrt{3})^{\sqrt{2}}(\sqrt{3})^{-\sqrt{2}}$

11. $(2^{\sqrt{2}})^{-1/\sqrt{2}}$ $\dfrac{1}{2}$ **12.** $(\sqrt{2}^{\sqrt{2}})^{\sqrt{2}}$ 2 **13.** $8^{1.2} \cdot 2^{-3.6}$ 1 **14.** $\dfrac{25^{2.4}}{5^{5.8}}$ $\dfrac{1}{5}$

15. $\dfrac{(1+\sqrt{3})^{\pi-1}}{(1+\sqrt{3})^{\pi+1}}$ $\dfrac{2-\sqrt{3}}{2}$ **16.** $\dfrac{(\sqrt{2}-1)^{2+\pi}}{(\sqrt{2}-1)^{\pi}}$ $3-2\sqrt{2}$ **17.** $\sqrt[4]{\dfrac{9^{1-\pi}}{9^{1+\pi}}}$ $\dfrac{1}{3^{\pi}}$ **18.** $\sqrt{\dfrac{2^{\sqrt{3}+3}}{8}}$ $2^{\sqrt{3}/2}$

ANSWERS to HW A.2.1

1. $3z^2 \cdot 2z^3$ $6z^5$
2. $5r^2 \cdot r^4$ $5r^6$
3. $(-t^4)^3$ $-t^{12}$
4. $(-t^3)^4$ t^{12}
5. $(3x^2y)(xy^2)$ $3x^3y^3$
6. $(4p^2q)(p^2q^3)$ $4p^4q^4$
7. $(-2u^2)(uv^3)(-u^2v^2)$ $2u^5v^5$
8. $(r^2s)(-3rs^3)(2rs)$ $-6r^4s^5$
9. $(4a^3b^2)^2$ $16a^6b^4$
10. $(2c^2d^3)^3$ $8c^6d^9$
11. $(-3pq^4r^2)^3$ $-27p^3q^{12}r^6$
12. $(-x^2yz^3)^4$ $x^8y^4z^{12}$
13. $(-z^3)(-z)^3$ z^6
14. $(-c)^2(-c^4)$ $-c^6$
15. $(s^2t)^3(st^3)^2$ s^8t^9
16. $(2x^2y^3)^3(3x^3y)^2$ $72x^{12}y^{11}$
17. $3y(y^3 - 2y^2 + 3)$ $3y^4 - 6y^3 + 9y$
18. $x^2(x - 2x^2 + 3x^3)$ $x^3 - 2x^4 + 3x^5$
19. $rs^2(r^2 - 2rs - s^2)$ $r^3s^2 - 2r^2s^3 - rs^4$
20. $p^2q^3(p^2 - 4q)$ $p^4q^3 - 4p^2q^4$
21. $z^{n-2} \cdot z^{n+2}$ z^{2n}
22. $t^4 \cdot t^{k-4}$ t^k
23. $x^{m-1} \cdot x \cdot x^m$ x^{2m}
24. $y^{p+2} \cdot y^p \cdot y^{p-2}$ y^{3p}
25. $r^{h-2}(r^{h+1})^2$ r^{3h}
26. $s^3(s^{2k-1})^3$ s^{6k}
27. $t(t^{n-1} + t^n + t^{n+1})$ $t^n + t^{n+1} + t^{n+2}$
28. $x^2(x^k - x^{k-1} + x^{k-2})$ $x^{k+2} - x^{k+1} + x^k$
29. $p^n(p^{m-n+1} + p^{m-n})$ $p^{m+1} + p^m$
30. $s^{2n}(s^{2m-n} - s^{m-2n})$ $s^{2m+n} - s^m$
31. $z^{m-n}(z^{n+m} - z^{n-m} + z^n)$ $z^{2m} + z^m - 1$
32. $x^{h+k}(x^{2h-k} - x^{h-2k} + x^k)$ $x^{3h} - x^{2h-k} + x^{h+2k}$
33. $(t^m)^n(t^n)^{n-m}$ t^{n^2}
34. $(y^{h-k})^h(y^{h+k})^k$ $y^{h^2+k^2}$

3. $\dfrac{-12p^3q}{4p^2q^2}$ $-\dfrac{3p}{q}$

5. $\dfrac{-15u^5v^3}{-25u^4v^2}$ $\dfrac{3uv}{5}$

25. $\dfrac{a^{2m}b^{2m+1}}{(a^2b^2)^m}$ b

7. $\left(\dfrac{3r}{s^2}\right)^3$ $\dfrac{27r^3}{s^6}$

9. $\dfrac{3s}{t^2} \cdot \dfrac{s^2}{t}$ $\dfrac{3s^3}{t^3}$

27. $\dfrac{(pq)^n}{pq^n}$ p^{n-1}

11. $\dfrac{3x^2}{y^2} \cdot \dfrac{3y}{6x}$ $\dfrac{3x}{2y}$

13. $\dfrac{rs^2t^3}{r^3s^2t}$ $\dfrac{t^2}{r^2}$

29. $\dfrac{t^{n+1}t^{n-1}}{t^n}$ t^n

15. $\dfrac{u^2}{v}\left(\dfrac{3v}{u^2}\right)^2$ $\dfrac{9v}{u^2}$

17. $\dfrac{(4r^2s^2)^2}{(4r^2s)^2}$ s^2

19. $\dfrac{(xyz^2)^2}{(x^2yz)^2}$ $\dfrac{z^2}{x^2}$

ANSWERS to HW A.2.2

1. $3 \cdot 5^{-1}$ $\frac{3}{5}$

2. $(3 \cdot 5)^{-1}$ $\frac{1}{15}$

3. $(-3^{-1})^{-2}$ 9

4. $(-2^{-2})^{-1}$ -4

5. $(2^{-2} \cdot 3^{-1} \cdot 5^{0})^{-1}$ 12

6. $5^{-1}(3^{-2} \cdot 2^{-3})^{0}$ $\frac{1}{5}$

7. $2\left(\frac{2}{5}\right)^{-2}$ $\frac{25}{2}$

8. $\left(\frac{3}{4}\right)^{-1}\left(\frac{4}{3}\right)^{-2}$ $\frac{3}{4}$

9. $\frac{7}{10{,}000}$ 7×10^{-4}

10. $\frac{3}{1000}$ 3×10^{-3}

11. $\frac{6x^2}{y^3}$ $6x^2y^{-3}$

12. $\frac{x^2}{yz^4}$ $x^2y^{-1}z^{-4}$

21. $\frac{3x^{-2}}{y^{-1}}$ $\frac{3y}{x^2}$

22. $\frac{p^{-1}q^{-2}}{p^{-3}}$ $\frac{p^2}{q^2}$

23. $\frac{s^{-2}t^{-3}}{s^{-1}t^{0}}$ $\frac{1}{st^3}$

24. $\frac{6xy^{-1}}{-2x^{-2}y^{-1}}$ $-3x^3$

25. $\left(\frac{u^{-2}}{v}\right)^{-1}$ u^2v

26. $\left(\frac{2}{h^2k^{-3}}\right)^{-2}$ $\frac{h^4}{4k^6}$

27. $(2x^{-2}y^2)^{-2}$ $\frac{x^4}{4y^4}$

28. $\frac{(3x^{-2}y)^{-1}}{(2xy^{-2})^{0}}$ $\frac{x^2}{3y}$

29. $3x^2(3xy^{-1})^{-2}$ $\frac{y^2}{3}$

30. $5t(s^{-1}t^{-2})^{-2}$ $5s^2t^5$

31. $\frac{(2x^{-1})^{-2}}{2(y^{-1})^{-2}}$ $\frac{x^2}{8y^2}$

32. $\left(\frac{2pq^{-1}}{4q^2}\right)^{-1}$ $\frac{2q^3}{p}$

33. $\left(\frac{x}{y^2}\right)^{-1}\left(\frac{x^{-2}}{y}\right)^{2}$ $\frac{1}{x^5}$

34. $\left(\frac{3}{t^2}\right)^{-1}\left(\frac{t}{3}\right)^{-2}$ 3

35. $\left(\frac{p^{-2}q^{-1}}{p^{-1}q^{-2}}\right)^{-1}$ $\frac{p}{q}$

36. $\frac{(ax^2)^{-1}}{a^{-2}x^{-2}}$ a

37. $\left(\frac{x^2}{y^{-1}}\right)^{-2}\left(\frac{y^2}{x^{-1}}\right)^{2}$ $\frac{y^2}{x^2}$

38. $\frac{r^{-2}}{s^2}\left(\frac{1}{rs}\right)^{-2}$ 1

39. $\left(\frac{u}{v^{-1}}\right)^{0}\left(\frac{u^{-1}}{v^2}\right)^{2}(uv^2)^{-1}$ $\frac{1}{u^3v^6}$

40. $\left(\frac{a^0}{b}\right)^{-2}\left(\frac{a}{b^{-2}}\right)^{-2}$ $\frac{1}{a^2b^2}$

41. $4x^3y^{-6} + (x^{-1}y^2)^{-3}$ $\frac{5x^3}{y^6}$

42. $\left(\frac{u^2}{v}\right)^{2} + (-u^{-2}v)^{-2}$ $\frac{2u^4}{v^2}$

47. $x^{-1} - 4x^{-2} + 2x^{-3} = x^{-3}(\underline{\ ?\ })$ $x^2 - 4x + 2$

48. $2x^{-2} + x^{-1} - 3 = x^{-2}(\underline{\ ?\ })$ $2 + x - 3x^2$

49. $4 - 5x^{-1} + x^{-2} = x^{-2}(\underline{\ ?\ })$ $4x^2 - 5x + 1$

50. $x^{-1} - 9x^{-3} = x^{-3}(\underline{\ ?\ })$ $x^2 - 9$

A.2.4 Homework ANSWERS

1-11 ODD: Simplify. If the expression does not represent a real number, write "not real".

1. $\sqrt{36}$ 6
2. $\sqrt[3]{-8}$ -2
3. $\sqrt{-\frac{1}{4}}$ Not real
4. $-\sqrt{\frac{1}{25}}$ $-\frac{1}{5}$
5. $-\sqrt[4]{16}$ -2
6. $(\sqrt[3]{5})^3$ 5
7. $(\sqrt{2})^2$ 2
8. $(-\sqrt{11})^2$ 11
9. $(-\sqrt[3]{13})^3$ -13
10. $\sqrt[4]{(-7)^4}$ 7
11. $\sqrt[5]{(-6)^5}$ -6
12. $\sqrt[6]{0}$ 0

19-23 ODD: Simplify each statement. Be careful to observe the rules for using absolute value.

19. $\sqrt{w^2} = |w|$
20. $\sqrt{y^4} = y^2$
21. $(\sqrt[4]{y})^4 = |y|$
22. $\sqrt[3]{x^3} = |x|$
23. $(\sqrt[4]{|y|})^4 = y$
24. $(\sqrt[5]{z})^5 = z$

1-13 ODD: Simplify. If the expression does not represent a real number, write "not real".

1. a. $\sqrt{16}$ 4 b. $-\sqrt{16}$ -4 c. $\sqrt{-16}$ Not real d. $\sqrt[4]{16}$ 2
2. a. $\sqrt{64}$ 8 b. $\sqrt{-64}$ Not real c. $\sqrt[3]{64}$ 4 d. $\sqrt[3]{-64}$ -4
3. a. $\sqrt{81}$ 9 b. $-\sqrt{81}$ -9 c. $\sqrt{-81}$ Not real d. $\sqrt[4]{81}$ 3
4. a. $\sqrt{144}$ 12 b. $\sqrt{-144}$ Not real c. $-\sqrt{144}$ -12 d. $\sqrt[4]{-144}$ Not real
5. a. $\sqrt{0.01}$ 0.1 b. $\sqrt{-0.01}$ Not real c. $\sqrt[3]{0.001}$ 0.1 d. $\sqrt[3]{-0.001}$ -0.1
6. a. $\sqrt{0.04}$ 0.2 b. $-\sqrt{0.04}$ -0.2 c. $\sqrt{0.0004}$ 0.02 d. $\sqrt{-0.0004}$ Not real
7. a. $\sqrt{7^2}$ 7 b. $\sqrt[3]{7^3}$ 7 c. $\sqrt[4]{(-7)^4}$ 7 d. $\sqrt[5]{(-7)^5}$ -7
8. a. $\sqrt{5^2}$ 5 b. $\sqrt{-5^2}$ Not real c. $\sqrt[3]{(-5)^3}$ -5 d. $\sqrt[3]{-5^3}$ 5
9. a. $\sqrt{\frac{1}{64}}$ $\frac{1}{8}$ b. $\frac{1}{\sqrt{64}}$ $\frac{1}{8}$ c. $\sqrt[3]{-\frac{1}{64}}$ $-\frac{1}{4}$ d. $-\frac{1}{\sqrt[3]{64}}$ $-\frac{1}{4}$
10. a. $\sqrt{\frac{1}{16}}$ $\frac{1}{4}$ b. $\sqrt{\frac{81}{16}}$ $\frac{9}{4}$ c. $\sqrt[4]{\frac{1}{16}}$ $\frac{1}{2}$ d. $\sqrt[4]{\frac{81}{16}}$ $\frac{3}{2}$
11. a. $\sqrt{10^2}$ 10 b. $\sqrt{10^4}$ 10^2 c. $\sqrt{10^6}$ 10^3 d. $\sqrt{10^{20}}$ 10^{10}
12. a. $\sqrt[3]{10^{-3}}$ $\frac{1}{10}$ b. $\sqrt[3]{10^{-6}}$ $\frac{1}{10^2}$ c. $\sqrt[3]{10^{-9}}$ $\frac{1}{10^3}$ d. $\sqrt[3]{10^{-30}}$ $\frac{1}{10^{10}}$
13. a. $\sqrt{a^2}$ $|a|$ b. $\sqrt{a^4}$ a^2 c. $\sqrt[3]{a^6}$ a^2 d. $\sqrt[6]{a^6}$ $|a|$
14. a. $\sqrt{-a^2}$ Not real b. $\sqrt{(-a)^2}$ $|a|$ c. $\sqrt[4]{a^4}$ $|a|$ d. $\sqrt{a^6}$ $|a^3|$

33-37 ODD: Find the value(s) of x that ensure the expression represents a real number.

33. a. $\sqrt{x+1}$ $x \geq -1$ b. $\sqrt{x-1}$ $x \geq 1$ c. $\sqrt[3]{x-1}$ All reals d. $\sqrt{x^2-1}$ $x \leq -1$ or $x \geq 1$
34. a. $\sqrt{4-x}$ $x \leq 4$ b. $\sqrt{4-x^2}$ $-2 \leq x \leq 2$ c. $\sqrt[3]{4-x^2}$ All reals d. $\sqrt{4+x^2}$ All reals
35. $\sqrt{x^3-9x}$ $-3 \leq x \leq 0$ or $x \geq 3$
36. $\sqrt{16x-x^2}$ $0 \leq x \leq 16$
37. $\sqrt{\sqrt{x}-x}$ $0 \leq x \leq 1$
38. $\sqrt{x-\sqrt{x}}$ $x \geq 1$

HW A.2.5A: 1-7 odd, 13-19 odd, 23, 25, 27, 31, 39, 41
HW A.2.5B: 21, 22, 29, 30, 32, 43-46 all

1. $\sqrt{52}$ $2\sqrt{13}$

2. $\sqrt{125}$ $5\sqrt{5}$

3. $\sqrt{162}$ $9\sqrt{2}$

4. $\sqrt{363}$ $11\sqrt{3}$

5. $\sqrt{196}$ 14

6. $\sqrt{324}$ 18

7. $\sqrt{\frac{8}{9}}$ $\frac{2\sqrt{2}}{3}$

8. $\sqrt{\frac{50}{49}}$ $\frac{5\sqrt{2}}{7}$

9. $\sqrt{\frac{4}{3}}$ $\frac{2\sqrt{3}}{3}$

10. $\sqrt{\frac{9}{5}}$ $\frac{3\sqrt{5}}{5}$

11. $\frac{4}{\sqrt{2}}$ $2\sqrt{2}$

12. $\frac{6}{\sqrt{3}}$ $2\sqrt{3}$

13. $\frac{\sqrt{270}}{\sqrt{6}}$ $3\sqrt{5}$

14. $\frac{\sqrt{96}}{\sqrt{3}}$ $4\sqrt{2}$

15. $\sqrt{30}\cdot\sqrt{42}$ $6\sqrt{35}$

16. $\sqrt{35}\cdot\sqrt{21}$ $7\sqrt{15}$

17. $\sqrt{6}\cdot\sqrt{\frac{2}{3}}$ 2

18. $\sqrt{15}\cdot\sqrt{\frac{3}{5}}$ 3

19. $\sqrt[3]{250}$ $5\sqrt[3]{2}$

20. $\sqrt[3]{135}$ $3\sqrt[3]{5}$

21. $\sqrt[3]{\frac{5}{4}}$ $\frac{\sqrt[3]{10}}{2}$

22. $\sqrt[3]{\frac{2}{9}}$ $\frac{\sqrt[3]{6}}{3}$

23. $\frac{9\sqrt{2}}{\sqrt{18}}$ 3

24. $\frac{4\sqrt{3}}{\sqrt{12}}$ 2

25. $(2\sqrt{7})^2$ 28

26. $(3\sqrt{6})^2$ 54

27. $\sqrt[3]{45}\cdot\sqrt[3]{12}$ $3\sqrt[3]{20}$

28. $\sqrt[3]{20}\cdot\sqrt[3]{14}$ $2\sqrt[3]{35}$

29. $\frac{\sqrt[3]{60}}{\sqrt[3]{36}}$ $\frac{\sqrt[3]{45}}{3}$

30. $\frac{\sqrt[3]{175}}{\sqrt[3]{50}}$ $\frac{\sqrt[3]{28}}{2}$

31. **a.** $\sqrt{32}$ $4\sqrt{2}$ **b.** $\sqrt[3]{32}$ $2\sqrt[3]{4}$ **c.** $\sqrt[4]{32}$ $2\sqrt[4]{2}$ **d.** $\sqrt[5]{32}$ 2

32. **a.** $\sqrt{\frac{3}{8}}$ $\frac{\sqrt{6}}{4}$ **b.** $\sqrt[3]{\frac{3}{8}}$ $\frac{\sqrt[3]{3}}{2}$ **c.** $\sqrt[4]{\frac{3}{8}}$ $\frac{\sqrt[4]{6}}{2}$ **d.** $\sqrt[5]{\frac{3}{8}}$ $\frac{\sqrt[5]{12}}{2}$

39. $\sqrt{18x^2}$ $3|x|\sqrt{2}$

40. $\sqrt{12x^5}$ $2x^2\sqrt{3x}$

41. $\sqrt[3]{375a^5}$ $5a\sqrt[3]{3a^2}$

42. $\sqrt[3]{16c^4}$ $2c\sqrt[3]{2c}$

43. $\sqrt{\frac{x^2}{y^3}}$ $\frac{x|\sqrt{y}}{y^2}$

44. $\sqrt{\frac{y^2}{x^5}}$ $\frac{|y|\sqrt{x}}{x^3}$

45. $\sqrt[3]{\frac{27a}{4b^4}}$ $\frac{3\sqrt[3]{2ab^2}}{2b^2}$

46. $\sqrt[3]{\frac{8c}{9d^5}}$ $\frac{2\sqrt[3]{3cd}}{3d^2}$

HW A.2.6: 1-41 EOO

Simplify each expression.

6. Not possible 7. $6 + 7\sqrt{6}$ 8. $5 + 6\sqrt{5}$
9. $\sqrt{2} + 3\sqrt{7}$ 10. $3\sqrt{2} - \sqrt{6}$ 11. $5\sqrt[3]{2} + 2\sqrt[3]{5}$
12. $5\sqrt[3]{3} - 2\sqrt[3]{7}$

1. $\sqrt{50} + \sqrt{18}$ $8\sqrt{2}$
2. $\sqrt{45} - \sqrt{20}$ $\sqrt{5}$
3. $3\sqrt{12} - \sqrt{48}$ $2\sqrt{3}$
4. $\sqrt{27} + 2\sqrt{75}$ $13\sqrt{3}$
5. $5\sqrt{2} - 2\sqrt{5}$ Not possible
6. $7\sqrt{3} - 3\sqrt{7}$
7. $\sqrt{6} + \sqrt{36} + \sqrt{216}$
8. $\sqrt{5} + \sqrt{25} + \sqrt{125}$
9. $\sqrt{50} + \sqrt{63} - \sqrt{3}$
10. $\sqrt{18} + \sqrt{24} - \sqrt{54}$
11. $\sqrt[3]{54} + \sqrt[3]{40} + \sqrt[3]{16}$
12. $\sqrt[3]{24} - \sqrt[3]{56} + \sqrt[3]{8}$
13. $\sqrt{\frac{27}{5}} - \sqrt{\frac{3}{5}}$ $\frac{2\sqrt{15}}{5}$
14. $\sqrt{\frac{75}{2}} - \sqrt{\frac{3}{2}}$ $2\sqrt{6}$
15. $\sqrt{\frac{2}{3}} + \sqrt{\frac{3}{2}}$ $\frac{5\sqrt{6}}{6}$
16. $\sqrt{\frac{5}{2}} + \sqrt{\frac{2}{5}}$ $\frac{7\sqrt{10}}{10}$
17. $\sqrt[3]{4} + \sqrt[3]{\frac{1}{2}}$ $\frac{3\sqrt[3]{4}}{2}$
18. $\sqrt[3]{16} - \sqrt[3]{\frac{1}{4}}$ $\frac{3\sqrt[3]{2}}{2}$
19. $\sqrt{2}(\sqrt{8} + \sqrt{10})$ $4 + 2\sqrt{5}$
20. $\sqrt{3}(\sqrt{12} - \sqrt{24})$ $6 - 6\sqrt{2}$
21. $\sqrt{15}(\sqrt{3} + 2\sqrt{5})$ $3\sqrt{5} + 10\sqrt{3}$
22. $\sqrt{7}(3\sqrt{14} - \sqrt{21})$ $21\sqrt{2} - 7\sqrt{3}$
23. $2\sqrt{3}(\sqrt{48} - 5\sqrt{12})$ -36
24. $3\sqrt{5}(\sqrt{5} + 2\sqrt{75})$ $15 + 30\sqrt{15}$
25. $\frac{\sqrt{6} - \sqrt{24}}{\sqrt{2}}$ $-\sqrt{3}$
26. $\frac{\sqrt{18} - \sqrt{6}}{\sqrt{3}}$ $\sqrt{6} - \sqrt{2}$
27. $\frac{4\sqrt{300} - \sqrt{108}}{\sqrt{12}}$ 17
28. $\frac{\sqrt{40} - 2\sqrt{5}}{\sqrt{10}}$ $2 - \sqrt{2}$
29. $\sqrt{\frac{2}{3}}\left(\sqrt{\frac{27}{2}} - \frac{3}{\sqrt{2}}\right)$ $3 - \sqrt{3}$
30. $\sqrt{\frac{3}{8}}\left(\sqrt{\frac{3}{4}} + \frac{2}{\sqrt{3}}\right)$ $\frac{7\sqrt{2}}{8}$
31. $\sqrt[3]{5}(\sqrt[3]{200} - \sqrt[3]{16})$ $10 - 2\sqrt[3]{10}$
32. $\sqrt[3]{40}(\sqrt[3]{25} + 2\sqrt[3]{5})$ $10 + 4\sqrt[3]{25}$
33. $\frac{\sqrt[3]{18} + 3\sqrt[3]{54}}{\sqrt[3]{3}}$ $\sqrt[3]{6} + 3\sqrt[3]{18}$
34. $\frac{\sqrt[3]{320} + \sqrt[3]{1250}}{2\sqrt[3]{5}}$ $2 + \frac{5\sqrt[3]{2}}{2}$

Simplify each expression. Make sure to use the absolute value as necessary.

35. $\sqrt{8x^3} - x\sqrt{18x}$ $-x\sqrt{2x}$
36. $y^2\sqrt{45y} + 2y\sqrt{5y^3}$ $5y^2\sqrt{5y}$
37. $\sqrt{p^3r} + \sqrt{pr^3}$ $(p + r)\sqrt{pr}$
38. $\sqrt{2a^2b^4} + \sqrt{8a^2b^4}$ $3|a|b^2\sqrt{2}$
39. $\sqrt{10a} - \frac{\sqrt{5a}}{\sqrt{2}} + \sqrt{\frac{2a}{5}}$ $\frac{7\sqrt{10a}}{10}$
40. $\sqrt{6x} + \frac{\sqrt{2x}}{\sqrt{3}} - \sqrt{\frac{3x}{2}}$ $\frac{5\sqrt{6x}}{6}$
41. $\sqrt{6w}(\sqrt{3w} + \sqrt{2w^3})$ $3w\sqrt{2} + 2w^2\sqrt{3}$
42. $\sqrt{10t}(\sqrt{2t^5} - \sqrt{5t})$ $2t^3\sqrt{5} - 5t\sqrt{2}$

HW A.2.7: 1-29 EOO, 31, 37, 41, 43

Simplify each expression.

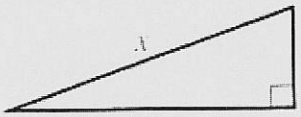
1. $(3+\sqrt{7})(3-\sqrt{7})$ 2
2. $(5+\sqrt{2})(5-\sqrt{2})$ 23
3. $(\sqrt{7}+1)^2$ $8+2\sqrt{7}$
4. $(\sqrt{5}+2)^2$ $9+4\sqrt{5}$
5. $(1+\sqrt{2})(3+\sqrt{2})$ $5+4\sqrt{2}$
6. $(6-\sqrt{3})(4+\sqrt{3})$ $21+2\sqrt{3}$
7. $\dfrac{1}{4-\sqrt{3}}$ $\dfrac{4+\sqrt{3}}{13}$
8. $\dfrac{1}{6+\sqrt{3}}$ $\dfrac{6-\sqrt{3}}{33}$
9. $(\sqrt{7}-\sqrt{2})^2$ $9-2\sqrt{14}$
10. $(3\sqrt{11}-\sqrt{10})^2$ $109-6\sqrt{110}$
11. $(3+4\sqrt{3})(2-\sqrt{3})$ $-6+5\sqrt{3}$
12. $(5-\sqrt{2})(3-2\sqrt{2})$ $19-13\sqrt{2}$
13. $\dfrac{3}{\sqrt{5}+\sqrt{2}}$ $\sqrt{5}-\sqrt{2}$
14. $\dfrac{10}{2\sqrt{3}-\sqrt{7}}$ $4\sqrt{3}+2\sqrt{7}$
15. $(\sqrt{11}-\sqrt{7})(\sqrt{11}+\sqrt{7})$ 4
16. $(\sqrt{13}-\sqrt{3})(\sqrt{13}+\sqrt{3})$ 10
17. $(5+\sqrt{3})(8-2\sqrt{3})$ $34-2\sqrt{3}$
18. $(3+2\sqrt{6})(4-5\sqrt{6})$ $-48-7\sqrt{6}$
19. $\dfrac{\sqrt{15}}{\sqrt{3}+\sqrt{5}}$ $\dfrac{5\sqrt{3}-3\sqrt{5}}{2}$
20. $\dfrac{\sqrt{6}}{\sqrt{2}+\sqrt{3}}$ $3\sqrt{2}-2\sqrt{3}$
21. $(2\sqrt{5}+\sqrt{7})^2$ $27+4\sqrt{35}$
22. $(3\sqrt{2}+\sqrt{6})^2$ $24+12\sqrt{3}$
23. $(2\sqrt{3}+\sqrt{5})(2\sqrt{3}-\sqrt{5})$ 7
24. $(3\sqrt{7}-2\sqrt{5})(3\sqrt{7}+2\sqrt{5})$ 43
25. $(\sqrt{6}-\sqrt{15})^2$ $21-6\sqrt{10}$
26. $(2\sqrt{5}-\sqrt{10})^2$ $30-20\sqrt{2}$
27. $\dfrac{\sqrt{5}+\sqrt{3}}{2}\cdot\dfrac{\sqrt{5}-\sqrt{3}}{2}$ $\dfrac{1}{2}$
28. $\dfrac{2\sqrt{7}+1}{3}\cdot\dfrac{2\sqrt{7}-1}{3}$ 3
29. $(5\sqrt{6}+3\sqrt{2})(2\sqrt{6}-4\sqrt{3})$ $60-60\sqrt{2}+12\sqrt{3}-12\sqrt{6}$
30. $(3\sqrt{5}+2\sqrt{15})(4\sqrt{3}-3\sqrt{15})$ $12\sqrt{15}-45\sqrt{3}+24\sqrt{5}-90$
31. $\dfrac{\sqrt{5}+1}{\sqrt{5}-3}$ $-2-\sqrt{5}$
32. $\dfrac{2\sqrt{7}-\sqrt{3}}{\sqrt{7}+\sqrt{3}}$ $\dfrac{17-3\sqrt{21}}{4}$

37. a. What is the conjugate of $2\sqrt{5}-3\sqrt{2}$? $2\sqrt{5}+3\sqrt{2}$
    b. What is the reciprocal of the conjugate of $2\sqrt{5}-3\sqrt{2}$? $\dfrac{2\sqrt{5}-3\sqrt{2}}{2}$
    c. What is the conjugate of the reciprocal of $2\sqrt{5}-3\sqrt{2}$? $\dfrac{2\sqrt{5}-3\sqrt{2}}{2}$

38. Show that the reciprocal of $\dfrac{\sqrt{5}+1}{2}$ is also the conjugate of $\dfrac{\sqrt{5}+1}{2}$.

Use the Pythagorean theorem to find x.

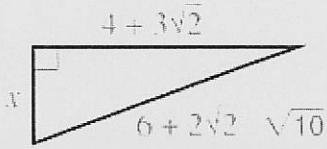
39.



$4-\sqrt{2}$

$4+\sqrt{2}$ 6

40.



$4+3\sqrt{2}$

$6+2\sqrt{2}$ $\sqrt{10}$

Simplify. Assume that each radical represents a real number.

41. $(\sqrt{n+1}+\sqrt{n})(\sqrt{n+1}-\sqrt{n})$ 1
42. $(b+\sqrt{b})^2-(b-\sqrt{b})^2$ $4b\sqrt{b}$
43. $\dfrac{\sqrt{w}}{\sqrt{w}+1}+\dfrac{\sqrt{w}}{\sqrt{w}-1}$ $\dfrac{2w}{w-1}$
44. $\sqrt{1-y^2}+\dfrac{y^2}{\sqrt{1-y^2}}$ $\dfrac{\sqrt{1-y^2}}{1-y^2}$

A.2-8 Answers

1. $81^{1/2}$ 9
2. $27^{1/3}$ 3
3. $49^{-1/2}$ $\frac{1}{7}$
4. $32^{-1/5}$ $\frac{1}{2}$
5. $4^{3/2}$ 8
6. $27^{2/3}$ 9
7. $16^{3/4}$ 8
8. $25^{-3/2}$ $\frac{1}{125}$
9. $(-125)^{-1/3}$ $-\frac{1}{5}$
10. $(-32)^{-3/5}$ $-\frac{1}{8}$
11. $4^{-0.5}$ $\frac{1}{2}$
12. $\left(\frac{4}{9}\right)^{-1.5}$ $\frac{27}{8}$
13. $-8^{2/3}$ -4
14. $-9^{3/2}$ -27
15. $(5^{1/3})^{-3}$ $\frac{1}{5}$
16. $(7^{-2/3})^{3}$ $\frac{1}{49}$
17. $(16^{-5})^{1/20}$ $\frac{1}{2}$
18. $(27^{4})^{-1/12}$ $\frac{1}{3}$
19. $(9^{1/2} + 16^{1/2})^{2}$ 49
20. $(8^{2/3} - 8^{1/3})^{3}$ 8

21. $\sqrt{x^3y^5}$ $x^{3/2}y^{5/2}$
22. $\sqrt[3]{p^4q}$ $p^{4/3}q^{1/3}$
23. $\sqrt{a^{-2}b^3}$ $a^{-1}b^{3/2}$
24. $\sqrt[3]{x^6y^{-4}}$ $x^2y^{-4/3}$
25. $(\sqrt{a^{-2}b})^5$ $a^{-5}b^{5/2}$
26. $\sqrt[3]{8b^6c^{-4}}$ $2b^2c^{4/3}$
27. $\sqrt[4]{\frac{16^3 \cdot a^{-2}}{b^6}}$ $8a^{-1/2}b^{3/2}$
28. $\frac{1}{\sqrt[4]{p^4q^{-8}}}$ $p^{-1}q^2$

29. $\sqrt[3]{4} \cdot \sqrt[3]{4}$ $2\sqrt[3]{2}$
30. $\sqrt{8} \cdot \sqrt[6]{8}$ 4
31. $\frac{\sqrt[3]{4}}{\sqrt[6]{2}}$ $\sqrt{2}$
32. $\frac{\sqrt[5]{27^3}}{\sqrt[5]{9^2}}$ 3
33. $\sqrt[10]{32} \div \sqrt[8]{4}$ $\sqrt[4]{2}$
34. $\sqrt[6]{8^3} \div \sqrt[6]{4^2}$ $\sqrt[6]{32}$
35. $\sqrt[4]{27} \cdot \sqrt[8]{9}$ 3
36. $\sqrt[4]{128} \cdot \sqrt[8]{256}$ $4\sqrt[4]{8}$

37. $\sqrt{x} \cdot \sqrt[3]{x} \cdot \sqrt[6]{x}$ x
38. $\sqrt[3]{a^2} \cdot \sqrt[3]{a^4}$ a^2
39. $\sqrt[4]{x} \cdot \sqrt[6]{x} \div \sqrt[3]{x}$ $x^{1/12}$
40. $((b^{1/2})^{-2/3})^{3/4}$ $b^{-1/4}$
41. $a^{1/2}(a^{3/2} - 2a^{1/2})$ $a^2 - 2a$
42. $(x^{3/2} - 2x^{5/2}) \div x^{1/2}$ $x - 2x^2$