Hillel Academy
Mathematics
Grade 8
Indices

What were those stupid ***Laws of Indices*** again ...

1. $a^x \times a^y = a$_____
2. $a^x \div a^y = a$_____
3. $(a^x)^y = a$_____
4. $a^0 =$ _____
5. $a^{-x} =$ _____
6. $a^{\frac{x}{y}} =$ _____

What's the big difference between "Simplify" and "Evaluate" ???.

SIMPLIFY means you should leave your answer in

EVALUATE means you should find the

Exercise 1

Express in index form:

1. $3 \times 3 \times 3 \times 3$
2. $4 \times 4 \times 5 \times 5 \times 5$
3. $3 \times 7 \times 7 \times 7$
4. $2 \times 2 \times 2 \times 7$
5. $\frac{1}{10 \times 10 \times 10}$
6. $\frac{1}{2 \times 2 \times 3 \times 3 \times 3}$
7. $\sqrt{15}$
8. $\sqrt[3]{3}$
9. $\sqrt[5]{10}$
10. $(\sqrt{5})^3$

Simplify:

11. $x^3 \times x^4$
12. $y^6 \times y^7$
13. $z^7 \div z^3$
14. $z^{50} \times z^{50}$
15. $m^3 \div m^2$
16. $e^{-3} \times e^{-2}$
17. $y^{-2} \times y^4$
18. $w^4 \div w^{-2}$
19. $y^{\frac{1}{2}} \times y^{\frac{1}{2}}$
20. $(x^2)^5$
21. $x^{-2} \div x^{-2}$
22. $w^{-3} \times w^{-2}$
23. $w^{-7} \times w^2$
24. $x^3 \div x^{-4}$
25. $(a^2)^4$
26. $(k^{\frac{1}{2}})^6$
27. $e^{-4} \times e^4$
28. $x^{-1} \times x^{30}$
29. $(y^4)^{\frac{1}{2}}$
30. $(x^{-3})^{-2}$
31. $z^2 \div z^{-2}$
32. $t^{-3} \div t$
33. $(2x^3)^2$
34. $(4y^5)^2$
35. $2x^2 \times 3x^2$
36. $5y^3 \times 2y^2$
37. $5a^3 \times 3a$
38. $(2a)^3$
39. $3x^3 \div x^3$
40. $8y^3 \div 2y$
41. $10y^2 \div 4y$
42. $8a \times 4a^3$
43. $(2x)^2 \times (3x)^3$
44. $4z^4 \times z^{-7}$
45. $6x^{-2} \div 3x^2$
46. $5y^3 \div 2y^{-2}$
47. $(x^2)^{\frac{1}{2}} \div (x^{\frac{1}{3}})^3$
48. $7w^{-2} \times 3w^{-1}$
49. $(2n)^4 \div 8n^0$
50. $4x^{\frac{3}{2}} \div 2x^{\frac{1}{2}}$

Exercise 2

Evaluate the following:

1. $3^2 \times 3$
2. 100^0
3. 3^{-2}
4. $(5^{-1})^{-2}$
5. $4^{\frac{1}{2}}$
6. $16^{\frac{1}{2}}$
7. $81^{\frac{1}{2}}$
8. $8^{\frac{1}{3}}$
9. $9^{\frac{3}{2}}$
10. $27^{\frac{1}{3}}$
11. $9^{-\frac{1}{2}}$
12. $8^{-\frac{1}{3}}$
13. $1^{\frac{5}{2}}$
14. $25^{-\frac{1}{2}}$
15. $1000^{\frac{1}{3}}$
16. $2^{-2} \times 2^5$
17. $2^4 \div 2^{-1}$
18. $8^{\frac{2}{3}}$
19. $27^{-\frac{2}{3}}$
20. $4^{-\frac{3}{2}}$
21. $36^{\frac{1}{2}} \times 27^{\frac{1}{3}}$
22. $10\,000^{\frac{1}{4}}$
23. $100^{\frac{3}{2}}$
24. $(100^{\frac{1}{2}})^{-3}$
25. $(9^{\frac{1}{2}})^{-2}$
26. $(-16{\cdot}371)^0$
27. $81^{\frac{1}{4}} \div 16^{\frac{1}{4}}$
28. $(5^{-4})^{\frac{1}{2}}$
29. $1000^{-\frac{1}{3}}$
30. $(4^{-\frac{1}{2}})^2$
31. $8^{-\frac{2}{3}}$
32. $100^{\frac{5}{2}}$
33. $1^{\frac{4}{3}}$
34. 2^{-5}
35. $(0{\cdot}01)^{\frac{1}{2}}$
36. $(0{\cdot}04)^{\frac{1}{2}}$
37. $(2{\cdot}25)^{\frac{1}{2}}$
38. $(7{\cdot}63)^0$
39. $3^5 \times 3^{-3}$
40. $(3\frac{3}{8})^{\frac{1}{3}}$
41. $(11\frac{1}{9})^{-\frac{1}{2}}$
42. $(\frac{1}{8})^{-2}$
43. $(\frac{1}{1000})^{\frac{2}{3}}$
44. $(\frac{9}{25})^{-\frac{1}{2}}$
45. $(10^{-6})^{\frac{1}{3}}$
46. $7^2 \div (7^{\frac{1}{2}})^4$
47. $(0{\cdot}0001)^{-\frac{1}{2}}$
48. $\frac{9^{\frac{1}{2}}}{4^{-\frac{1}{2}}}$
49. $\frac{25^{\frac{3}{2}} \times 4^{\frac{1}{2}}}{9^{-\frac{1}{2}}}$
50. $(-\frac{1}{7})^2 \div (-\frac{1}{7})^3$

Exercise 3

Rewrite without brackets:

1. $(5x^2)^2$
2. $(7y^3)^2$
3. $(10ab)^2$
4. $(2xy^2)^2$
5. $(4x^2)^{\frac{1}{2}}$
6. $(9y)^{-1}$
7. $(x^{-2})^{-1}$
8. $(2x^{-2})^{-1}$
9. $(5x^2y)^0$
10. $(\frac{1}{2}x)^{-1}$
11. $(3x)^2 \times (2x)^2$
12. $(5y)^2 \div y$
13. $(2x^{\frac{1}{2}})^4$
14. $(3y^{\frac{1}{3}})^3$
15. $(5x^0)^2$
16. $[(5x)^0]^2$
17. $(7y^0)^2$
18. $[(7y)^0]^2$
19. $(2x^2y)^3$
20. $(10xy^3)^2$

Simplify the following:

21. $(3x^{-1})^2 \div 6x^{-3}$
22. $(4x)^{\frac{1}{2}} \div x^{\frac{3}{2}}$
23. $x^2y^2 \times xy^3$
24. $4xy \times 3x^2y$
25. $10x^{-1}y^3 \times xy$
26. $(3x)^2 \times (\frac{1}{9}x^2)^{\frac{1}{2}}$
27. $z^3yx \times x^2yz$
28. $(2x)^{-2} \times 4x^3$
29. $(3y)^{-1} \div (9y^2)^{-1}$
30. $(xy)^0 \times (9x)^{\frac{1}{2}}$
31. $(x^2y)(2xy)(5y^3)$
32. $(4x^{\frac{1}{2}}) \times (8x^{\frac{3}{2}})$
33. $5x^{-3} \div 2x^{-5}$
34. $[(3x^{-1})^{-2}]^{-1}$
35. $(2a)^{-2} \times 8a^4$
36. $(abc^2)^3$

37. Write in the form 2^p (e.g. $4 = 2^2$):
    (a) 32 (b) 128 (c) 64 (d) 1
38. Write in the form 3^q:
    (a) $\frac{1}{27}$ (b) $\frac{1}{81}$ (c) $\frac{1}{3}$ (d) $9 \times \frac{1}{81}$

Evaluate, with $x = 16$ and $y = 8$.

39. $2x^{\frac{1}{2}} \times y^{\frac{1}{3}}$
40. $x^{\frac{1}{4}} \times y^{-1}$
41. $(y^2)^{\frac{1}{6}} \div (9x)^{\frac{1}{2}}$
42. $(x^2y^3)^0$
43. $x + y^{-1}$
44. $x^{-\frac{1}{2}} + y^{-1}$
45. $y^{\frac{1}{3}} \div x^{\frac{3}{4}}$
46. $(1000y)^{\frac{1}{3}} \times x^{-\frac{5}{2}}$
47. $(x^{\frac{1}{4}} + y^{-1}) \div x^{\frac{1}{4}}$
48. $x^{\frac{1}{2}} - y^{\frac{2}{3}}$
49. $(x^{\frac{3}{4}}y)^{-\frac{1}{3}}$
50. $\left(\frac{x}{y}\right)^{-2}$