

Warmup

2³ ← Index
 ← Base

A convenient way of writing $2 \times 2 \times 2$ is

Exercise 1.1

Write the following in index form:

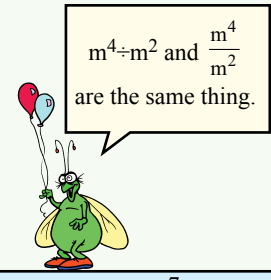
$2a \times 2 \times a \times 2a \times a \times a$ $= 2^3 a^5$	$c d d d c c c d$ $= c^5 d^4$
---	----------------------------------



- | | | |
|---------------------------|--|--|
| 1 $2b \times 2 \times 2b$ | 2 $abbaaabb$ | 3 $3 \times 3x \times 3x \times 3 \times 3x \times 3x$ |
| 4 $xyyyxxxxyy$ | 5 $10d \times 10d \times 10d \times 10d$ | 6 $5pp55p5ppp5$ |

Index Law 1
 $a^m \times a^n = a^{m+n}$

Index Law 2
 $a^m \div a^n = a^{m-n}$



Simplify and write the following in index form:

$10^3 \times 10^2 = 10 \times 10 \times 10 \times 10 \times 10 = 10^5$ or $10^3 \times 10^2 = 10^{3+2} = 10^5$	$a^2 \times a^5 = a \times a \times a \times a \times a \times a \times a = a^7$ or $a^2 \times a^5 = a^{2+5} = a^7$
---	---

- | | | | |
|-----------------------|--|-----------------------------------|------------------------------|
| 7 $10^2 \times 10^4$ | 8 $3^3 \times 3^2$ | 9 $2^4 \times 2^3$ | 10 $10^5 \times 10^3$ |
| 11 $x^2 \times x^3$ | 12 $x^4 \times x^2$ | 13 $4.1^3 \times 4.1^3$ | 14 $d^3 \times d^5$ |
| 15 $x \times x^4$ | 16 $y^3 \times y$ $y = y^1$ | 17 $0.2^3 \times 0.2^4$ | 18 $a^3 \times a^2$ |
| 19 2.3×2.3^5 | 20 $10^2 \times 10^3$ | 21 $10^3 \times 10^5 \times 10^2$ | 22 $x^4 \times x^2 \times x$ |

Simplify and write the following in index form:

$10^3 \div 10^2 = \frac{2 \times 2 \times 2}{2 \times 2} = 10$ $10 = 10^1$ or $10^3 \div 10^2 = 10^{3-2} = 10$	$a^6 \div a^2 = \frac{a \times a \times a \times a \times a \times a}{a \times a} = a \times a \times a \times a = a^4$ or $a^6 \div a^2 = a^{6-2} = a^4$
--	--

- | | | | |
|------------------------|-----------------------|---------------------------------|--|
| 23 $10^4 \div 10^2$ | 24 $10^4 \div 10^3$ | 25 $4^6 \div 4^2$ | 26 $2^2 \div 2^2$ |
| 27 $x^6 \div x^3$ | 28 $y^4 \div y^2$ | 29 $10^6 \div 10^3$ | 30 $a^4 \div a^3$ |
| 31 $10^5 \div 10$ | 32 $b^5 \div b^3$ | 33 $3^5 \div 3^4$ | 34 $10^4 \div 10$ |
| 35 $x^8 \div x^3$ | 36 $4.3^5 \div 4.3^2$ | 37 $10^7 \times 10^3 \div 10^5$ | 38 $y^5 \div y^5$ |
| 39 $\frac{10^5}{10^3}$ | 40 $\frac{x^7}{x^4}$ | 41 $\frac{a^7 \times a^2}{a^4}$ | 42 $\frac{10^7 \times 10^3}{10^4 \times 10^6}$ |

Index Law 3

$$(a^m)^n = a^{m \times n}$$

Zero Index

$$a^0 = 1$$

Negative Index

$$a^{-m} = \frac{1}{a^m}$$

Exercise 1.2

Simplify and write the following in index form:

$(b^4)^2 = (b \times b \times b \times b)^2$ $= (b \times b \times b \times b) \times (b \times b \times b \times b)$ $= \underline{b^8}$ <p>or $(b^4)^2 = b^{4 \times 2} = \underline{b^8}$</p>	$10^4 \times (10^2)^3 = 10^4 \times 10^6 = \underline{10^{10}}$ $(b^4)^2 b^3 = b^8 \times b^3 = \underline{b^{11}}$
---	---

1 $(b^2)^4$

2 $(b^2)^3$

3 $(b^3)^2$

4 $(10^3)^2$

5 $(x^2)^2$

6 $(x^2)^5$

7 $(y^3)^4$

8 $(y^5)^2$

9 $10^3(10^2)^2$

10 $x^5(x^3)^2$

11 $(2^3)^2 2^5$

12 $b^3(b^3)^5$

Simplify each of the following:

$10^0 = \underline{1}$	$h^0 = \underline{1}$	$3 \times 5^0 = 3 \times 1 = \underline{3}$	$5b^0 = 5 \times 1 = \underline{5}$
------------------------	-----------------------	---	-------------------------------------

13 10^0

14 h^0

15 x^0

16 a^0

17 5×10^0

18 $5a^0$

19 4×3^0

20 2×1^0

21 $(x^0)^2 \times x$

22 $b^2(b^0)^3$

23 $10(10^5)^0$

24 $10 \times (10^0)^2$

Write each of the following using a negative index:

$\frac{1}{10^3} = \underline{10^{-3}}$	$\frac{1}{b^5} = \underline{b^{-5}}$	$\frac{1}{10} = \underline{10^{-1}}$	$\frac{1}{10000} = \frac{1}{10^4} = \underline{10^{-4}}$
--	--------------------------------------	--------------------------------------	--

25 $\frac{1}{10^5}$

26 $\frac{1}{b^4}$

27 $\frac{1}{10}$

28 $\frac{1}{100}$

Simplify and write the following in index form:

$10^2 \times 10^{-3} = 10^{2-3} = \underline{10^{-1}}$	$10^{-3} \div 10^{-4} = 10^{-3-(-4)} = 10^{-3+4} = \underline{10}$
--	--

29 $10^{-3} \times 10^2$

30 $10^{-2} \times 10^4$

31 $10^5 \div 10^{-3}$

32 $10^{-4} \div 10^{-2}$

33 $5^{-2} \times 5^3$

34 $10^{-2} \times 10^6$

35 $x^4 \div x^{-2}$

36 $10^{-2} \div 10^4$

37 $x^{-5} \times x^4 \times x^3$

38 $y^4 \times y^{-7} \times y^2$

39 $10^{-5} \div 10^3$

40 $y^4 \div y^{-5}$

$(10^{-2})^4 = 10^{-2 \times 4} = \underline{10^{-8}}$	$9(10^0)^{-3} = 9 \times 10^{0 \times -3} = 9 \times 1 = \underline{9}$
--	---

41 $(10^{-2})^4$

42 $(2^{-3})^5$

43 $(a^2)^{-3}$

44 $(10^{-5})^{-2}$

45 $(y^2)^4$

46 $2(x^{-3})^0$

47 $(y^4)^{-4}$

48 $(y^{-1})^{-7}$