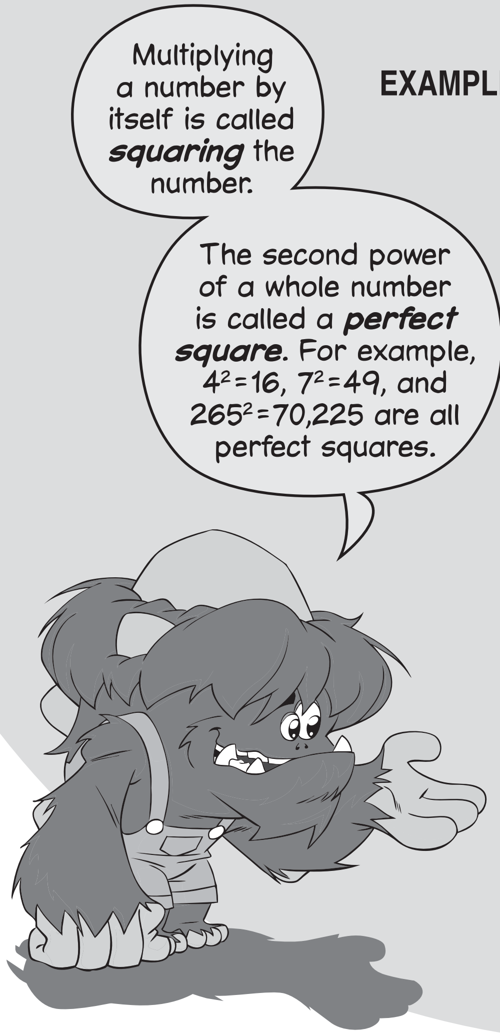


EXAMPLE | Write 3^6 as a the square of a number.

To begin, we write 3^6 as a product of six 3's:

$$3^6 = 3\times3\times3\times3\times3\times3.$$

From six 3's, we can make two groups of three 3's:

$$\begin{aligned}3^6 &= 3\times3\times3\times3\times3\times3\\ &= (3\times3\times3)\times(3\times3\times3).\end{aligned}$$

Since we are multiplying (3×3×3) by itself, we write (3×3×3)×(3×3×3) as a perfect square:

$$\begin{aligned}3^6 &= 3\times3\times3\times3\times3\times3\\ &= (3\times3\times3)\times(3\times3\times3)\\ &= (3\times3\times3)^2\\ &= 27^2.\end{aligned}$$

So, we have $3^6 = \mathbf{27^2}$.

PRACTICE | Write each expression below as the square of a number.

74. $5^4 = \square^2$

75. $2^8 = \square^2$

76. $(6\times8)\times(6\times8) = \square^2$

77. $2\times6\times7\times2\times6\times7 = \square^2$

78. $3^2\times8^4 = \square^2$

79. $2^4\times3^6 = \square^2$

80. ★ Squaring a number, then squaring the result, is the same as raising the original number to the _____ power.

EXAMPLE | Write 49^2 as a power of 7.

$49^2 = 49 \times 49$. Since $49 = 7 \times 7$, we can replace each 49 with 7×7:

$$49^2 = 49 \times 49 = (7 \times 7) \times (7 \times 7).$$

So, we have $49^2 = 7 \times 7 \times 7 \times 7 = \mathbf{7^4}$.

PRACTICE | Write each power below.

81. Write 16^2 as a power of 4. **81.** ____________

82. Write 16^2 as a power of 2. **82.** ____________

83. Write 27^2 as a power of 3. **83.** ____________

84. $15^2 = 1^2 \times 15^2 = 15^2 \times 1^2$. Find another way to write 15^2 as a product of two perfect squares. **84.** $15^2 = \square^2 \times \square^2$

PRACTICE | Draw lines to connect each power on the left with an equal expression on the right.

85.	18^2	$3^3 \times 2^6$
86.	24^2	$3^3 \times 2^3$
87.	6^3	$3^4 \times 2^2$
88.	12^3	$3^2 \times 2^6$

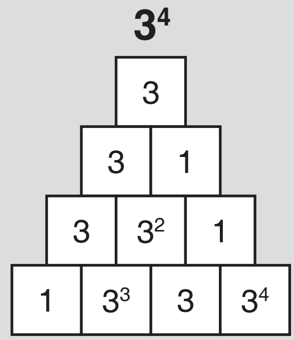
89. Which is greater, 14^2 or 7^3? **89.** ____________

90. ★ Which is greater, 15^3 or 5^5? **90.** ____________

In a **Pyramid Descent** puzzle, the goal is to find a path of touching squares, one per row, from the top to the bottom of the pyramid.

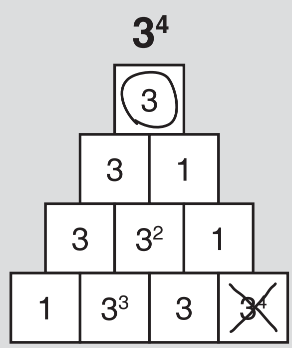
The product of the numbers on the path must equal the number shown above the pyramid.

EXAMPLE | Complete the Pyramid Descent puzzle below.

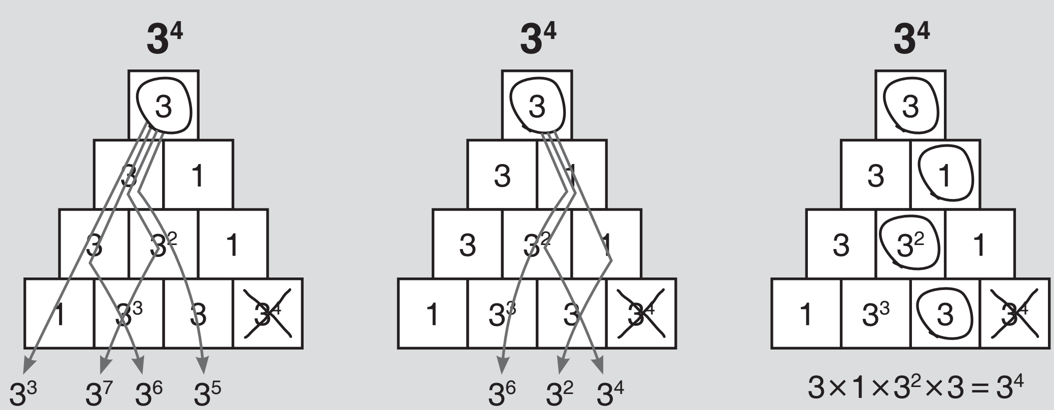


Since $3^4 = 3\times3\times3\times3$, we look for a path that includes four 3's. We can use only one square per row. So, the 3 at the top of the pyramid must be included in our product.

Since we must use the 3 at the top of the pyramid, we cannot use the 3^4 at the bottom of the pyramid, because $3\times3^4 = 3^5$. We circle the 3 on top and cross out the 3^4 on the bottom.



Now, we look for a path of squares that gives us a product of 3^4, beginning with the 3 at the top of the pyramid. Below are the seven possible paths. The only path whose product is 3^4 is shown by the numbers circled on the right.



PRACTICE | Complete each Pyramid Descent puzzle below.

91. 5^4

5
5 1
1 5 5
5 1 5 1

92. 6^2

6
1 6
6 6 1
1 6 6 6

93. 16^3

16
1 1
16 1 16
1 16 1 1

94. 2^5

2
2^3 1
1 2 2^3
1 2^3 2^2 1

95. 3^5

3^2
1 3
3^2 3^3 3
3 3^2 3 3^2
3^2 3 1 3^3 1

96. 17^5

17
1 1
1 17^2 17
17 1 17 1
17^2 17 1 17^2 1