Week two-session 1

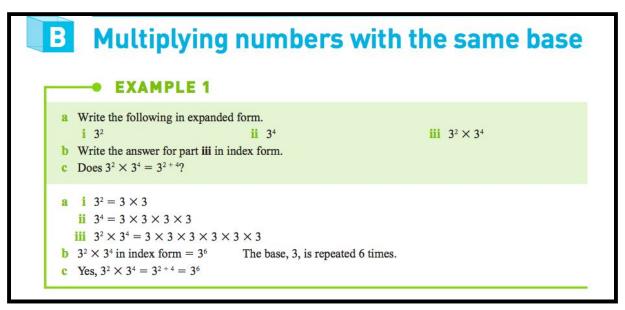
WALT multiplying numbers with exponents

Success criteria I know I can add powers when multiplying numbers with powers

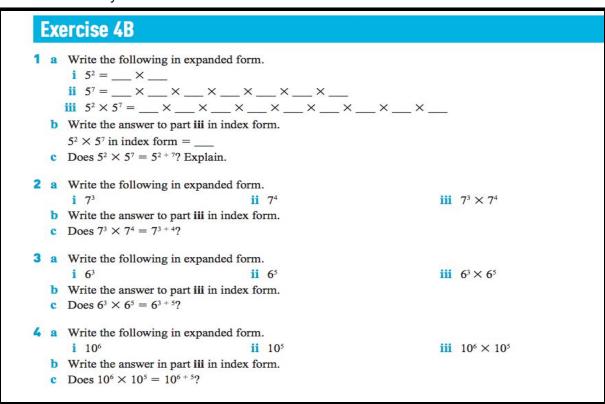
Algebra In Action x

Multiplying numbers with exponents

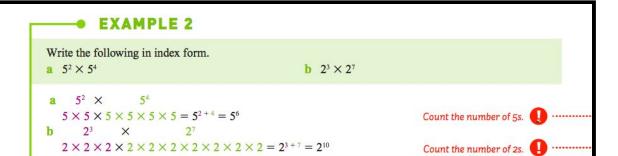
Warm-up activity DO Now use your calculator and say your answers

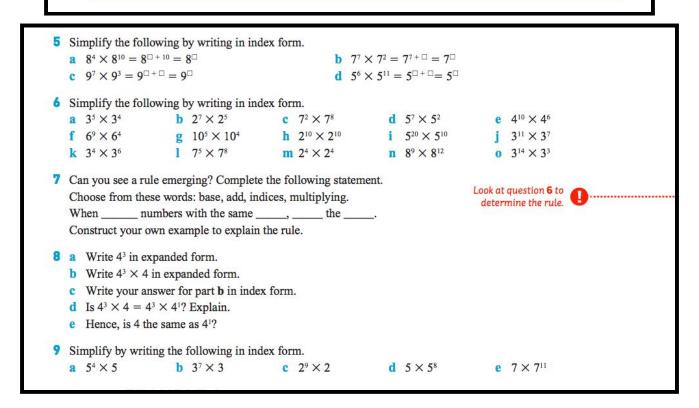


Discuss and then work in your books



Exercise 4B 1 a i $5^2 = 5 \times 5$ ii $5^7 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$ b $5^2 \times 5^7$ in index form = 5^9 c Yes, 5 is being multiplied 9 (2 + 7) times. 2 a i 7×7×7 $ii 7 \times 7 \times 7 \times 7$ iii $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$ b 77 c Yes $3 a i 6 \times 6 \times 6$ $ii 6 \times 6 \times 6 \times 6 \times 6$ iii $6 \times 6 \times 6$ 4 a i $10 \times 10 \times 10 \times 10 \times 10 \times 10$ ii $10 \times 10 \times 10 \times 10 \times 10$ b 1011 c Yes





Check your answers

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1 a i 5^2 = 5 \times 5
      ii 5^7 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5
     b 5^2 \times 5^7 in index form = 5^9
  c Yes, 5 is being multiplied 9 (2 + 7) times.
2 a i 7×7×7
                                ii 7 \times 7 \times 7 \times 7
     iii 7×7×7×7×7×7×7
  b 77
                                 c Yes
3 a i 6 \times 6 \times 6
                                 ii 6 \times 6 \times 6 \times 6 \times 6
     iii 6 \times 6
   b 68
4 a i 10 \times 10 \times 10 \times 10 \times 10 \times 10
      ii 10 \times 10 \times 10 \times 10 \times 10
     b 1011
                                 c Yes
5 a 8^4 \times 8^{10} = 8^{4+10} = 8^{14}
  b 7^7 \times 7^2 = 7^{7+2} = 7^9
  9^7 \times 9^3 = 9^{7+3} = 9^{10}
   d 5^6 \times 5^{11} = 5^{6+11} = 5^{17}
6 a 39
                 b 212
                                c 710
                                                d 59
  e 416
                 f 613
                                 g 109
                                                h 220
  i 530
                                                713
                j 318
                                k 310
  m 28
                 n 8<sup>21</sup>
                                 0 317
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7 Rule: When multiplying numbers with the same base, add the indices.
8 a 4 × 4 × 4
b 4 × 4 × 4 × 4
c 4<sup>4</sup>
d Yes, 4 is being multiplied 4 times.
e Yes
9 a 5<sup>5</sup>
b 3<sup>8</sup>
c 2<sup>10</sup>
d 5<sup>9</sup>
e 7<sup>12</sup>
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Now working with variables Day 2

WALT use indices rules for multiplication, division and raising powers **Success Criteria:** I know how to apply the rule when multiplying- add the powers and when raising the powers by powers inside the bracket when dividing subtract the powers

Watch a video on basics of index notation

	a $2^3 \times 2^5 \times 2^4$	g by writing in index form.		Remember: You can add indices if the bases are the same.	0			
	a $2^3 \times 2^5 \times 2^4 = 2^3$	$^{+5+4} = 2^{12}$	b $3^5 \times 3^6 \times 3^3 =$	$3^{5+6+3} = 3^{14}$				
16	Complete the followin	g to write the answer in ind	lex form.					
	a $4^2 \times 4 \times 4^5 = 4 \times 4 = 4^{2+1+5} = 4^{\square}$							
	b $6^2 \times 6^4 \times 6^3 = 6 \times 6$							
	c $10^5 \times 10^2 \times 10^8$ d $2^7 \times 2^{13} \times 10^{13}$							
	e $p^3 \times p^6 \times p^2$	$\mathbf{f} m^7 \times m^4$	$\times m^2 \times m^5$	Letters can also be a base.	0			
17	7 Simplify the following by writing in index form.							
	a $2^4 \times 2^6 \times 2^3$	b $3^8 \times 3^3 \times 3^7$	c $5^3 \times 5^7 \times 5^4$	d $9^2 \times 9^5 \times 9^4$				
	$e^{4^6 \times 4^3 \times 4}$	$\mathbf{f} a^4 \times a^5 \times a^2$	$\mathbf{g} y^7 \times y^3 \times y^2$	h $n^9 \times n^8 \times n^2$				
	$i p^6 \times p^3 \times p^{11}$	$j t^4 \times t^1 \times t^2$						
18	Summary of findings: Complete each statement and copy it into your exercise book.							
	Choose from these words: 1, index, letters, bases, add.							
	a Only indices if the are the same.							
	b Indices is the plural of the word							
	Bases can be numbers or							

Check your answers

- 18 a Only add indices if the bases are the same.
 - b Indices is the plural of the word index.
 - Bases can be numbers or letters.
 - d A single digit or letter has an index value of 1.

Raising a number to a power

EXAMPLE 1

Simplify each of the following by writing it in expanded form. Record your findings in index form.

a
$$(3^2)^3 = (3 \times 3)^3$$

= $(3 \times 3) \times (3 \times 3) \times (3 \times 3) = 3 \times 3 \times 3 \times 3 \times 3 \times 3$

Exercise 4C

Simplify each of the following by writing in expanded form. Record your findings in index form.

d
$$(7^3)^5 = (7 \times 7 \times _)^5$$

= $(7 \times 7 \times _) \times (7 \times 7 \times _)$
= 7^{\square}

- 2 Can you see a rule emerging?
 - a Review your answers for question 1.

$$(4^4)^3 = 4^{\square}$$
 $(8^3)^2 = 8^{\square}$ $(2^5)^3 = 2^{\square}$ $(7^3)^5 = 7^{\square}$

Write the rule in your own words.

- b Complete the rule below based on your findings from part a. Copy it into your exercise book. When raising a number to a higher power, _____ the indices.
- 3 Write each of the following in index form by applying the rule.

Write each of the following in index form by applying the rule.

a
$$(a^2)^2$$
 b $(b^6)^9$
 c $(c^7)^6$
 d $(d^5)^{11}$
 e $(e^4)^{10}$

 f $(f^2)^7$
 g $(g^9)^6$
 h $(h^{11})^3$
 i $(i^4)^5$
 j $(j^4)^2$

 k $(k^7)^8$
 l $(l^5)^8$
 m $(m^6)^6$
 n $(n^9)^3$
 o $(o^9)^7$

Check your answers

Exercise 4C 1 a $(4 \times 4 \times 4 \times 4)^3 = (4 \times 4 \times 4 \times 4) \times (4 \times 4 \times 4 \times 4)$ $\times (4 \times 4 \times 4 \times 4)$ =412**b** $(8 \times 8 \times 8)^2 = (8 \times 8 \times 8) \times (8 \times 8 \times 8) = 8^6$ $c(2\times2\times2\times2\times2)^{3}$ $= (2 \times 2 \times 2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2 \times 2) \times$ $(2\times2\times2\times2\times2)=2^{15}$ d (7 × 7 × 7)5 $= (7 \times 7 \times 7) \times (7 \times 7 \times 7) \times (7 \times 7 \times 7) \times$ $(7 \times 7 \times 7) \times (7 \times 7 \times 7) = 7^{15}$ 2 a $(4^4)^3 = 4^{12}$ $(8^3)^2 = 8^6$ $(2^5)^3 = 2^{15}$ $(7^3)^5 = 7^{15}$ b When raising a number to a higher power, multiply the indices. b 59 c 212 3 a 35 f 10¹⁰ g 4¹² j 2⁷⁰ k 3²⁰ e 720 h 621 1 324 1 320 m 5" n 58 0 930

4 a	a^6	b b54	c c*2	d d 55
e	e^{40}	f fis	g g 36	h h33
	120	1 /8	k kss	1 140
m	m36	n n ²⁷	0 063	

Dividing numbers with the same base

EXAMPLE 1

- a Write 68 ÷ 65 in expanded form.
- b Write your answer in index form.

a
$$6^8 \div 6^5 = \frac{6^8}{6^5} = \frac{6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6}{6 \times 6 \times 6 \times 6 \times 6}$$

= $6 \times 6 \times 6$

b Index form = 63

Exercise 4D

1 Complete the following to write each in expanded form. Express your answer in index form.

$$\mathbf{a} \quad \mathbf{4}^7 \div \mathbf{4}^3 = \frac{\mathbf{4} \times \mathbf{4} \times \mathbf{4} \times \square \times \square \times \square \times \square}{\mathbf{4} \times \mathbf{4} \times \mathbf{4}}$$

= 4

$$\begin{array}{ll} \textbf{b} & 9^6 \div 9^2 = \frac{9 \times 9 \times \square \times \square \times \square \times \square}{9 \times 9} \\ & = 9^{\square} \end{array}$$

c
$$5^8 \div 5^5 = \frac{5 \times 5 \times 5 \times 5 \times 5 \times \square \times \square \times \square}{5 \times 5 \times 5 \times 5 \times 5}$$

= _____

Simplify your answers by cancelling.