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
Multiplying numbers with exponents

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

10 Use your calculator to evaluate the following.

a 3^6	**b** 5^7	**c** 4^5	**d** 8^3	**e** 9^8
f 10^3	**g** 7^4	**h** 2^8	**i** 6^4	**j** 11^3
k 1.6^4	**l** 3.8^3	**m** 4.5^4	**n** 7.4^2	**o** 6.2^3

B Multiplying numbers with the same base

EXAMPLE 1

a Write the following in expanded form.
i 3^2 **ii** 3^4 **iii** $3^2 \times 3^4$
b Write the answer for part **iii** in index form.
c Does $3^2 \times 3^4 = 3^{2+4}$?

a **i** $3^2 = 3 \times 3$
ii $3^4 = 3 \times 3 \times 3 \times 3$
iii $3^2 \times 3^4 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$
b $3^2 \times 3^4$ in index form $= 3^6$ The base, 3, is repeated 6 times.
c Yes, $3^2 \times 3^4 = 3^{2+4} = 3^6$

Discuss and then work in your books

Exercise 4B

1 **a** Write the following in expanded form.
i $5^2 =$ ___ × ___
ii $5^7 =$ ___ × ___ × ___ × ___ × ___ × ___ × ___
iii $5^2 \times 5^7 =$ ___ × ___ × ___ × ___ × ___ × ___ × ___ × ___ × ___
b Write the answer to part **iii** in index form.
$5^2 \times 5^7$ in index form = ___
c Does $5^2 \times 5^7 = 5^{2+7}$? Explain.

2 **a** Write the following in expanded form.
i 7^3 **ii** 7^4 **iii** $7^3 \times 7^4$
b Write the answer to part **iii** in index form.
c Does $7^3 \times 7^4 = 7^{3+4}$?

3 **a** Write the following in expanded form.
i 6^3 **ii** 6^5 **iii** $6^3 \times 6^5$
b Write the answer to part **iii** in index form.
c Does $6^3 \times 6^5 = 6^{3+5}$?

4 **a** Write the following in expanded form.
i 10^6 **ii** 10^5 **iii** $10^6 \times 10^5$
b Write the answer in part **iii** in index form.
c Does $10^6 \times 10^5 = 10^{6+5}$?

Check your answers

Exercise 4B

1 **a** **i** $5^2 = 5 \times 5$

ii $5^7 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$

iii $5^2 \times 5^7 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$

b $5^2 \times 5^7$ in index form $= 5^9$

c Yes, 5 is being multiplied 9 $(2 + 7)$ times.

2 **a** **i** $7 \times 7 \times 7$ **ii** $7 \times 7 \times 7 \times 7$

iii $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$

b 7^7 **c** Yes

3 **a** **i** $6 \times 6 \times 6$ **ii** $6 \times 6 \times 6 \times 6 \times 6$

iii $6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6$

b 6^8 **c** Yes

4 **a** **i** $10 \times 10 \times 10 \times 10 \times 10 \times 10$

ii $10 \times 10 \times 10 \times 10 \times 10$

iii $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$

b 10^{11} **c** Yes

EXAMPLE 2

Write the following in index form.

a $5^2 \times 5^4$ **b** $2^3 \times 2^7$

a $5^2 \times 5^4$

$5 \times 5 \times 5 \times 5 \times 5 \times 5 = 5^{2+4} = 5^6$

Count the number of 5s.

b $2^3 \times 2^7$

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^{3+7} = 2^{10}$

Count the number of 2s.

5 Simplify the following by writing in index form.

a $8^4 \times 8^{10} = 8^{\square + 10} = 8^{\square}$ **b** $7^7 \times 7^2 = 7^{7+\square} = 7^{\square}$

c $9^7 \times 9^3 = 9^{\square + \square} = 9^{\square}$ **d** $5^6 \times 5^{11} = 5^{\square + \square} = 5^{\square}$

6 Simplify the following by writing in index form.

a $3^5 \times 3^4$ **b** $2^7 \times 2^5$ **c** $7^2 \times 7^8$ **d** $5^7 \times 5^2$ **e** $4^{10} \times 4^6$

f $6^9 \times 6^4$ **g** $10^5 \times 10^4$ **h** $2^{10} \times 2^{10}$ **i** $5^{20} \times 5^{10}$ **j** $3^{11} \times 3^7$

k $3^4 \times 3^6$ **l** $7^5 \times 7^8$ **m** $2^4 \times 2^4$ **n** $8^9 \times 8^{12}$ **o** $3^{14} \times 3^3$

7 Can you see a rule emerging? Complete the following statement.
Choose from these words: base, add, indices, multiplying.
When _____ numbers with the same _____, _____ the _____.
Construct your own example to explain the rule.

Look at question **6** to determine the rule.

8 **a** Write 4^3 in expanded form.

b Write $4^3 \times 4$ in expanded form.

c Write your answer for part **b** in index form.

d Is $4^3 \times 4 = 4^3 \times 4^1$? Explain.

e Hence, is 4 the same as 4^1?

9 Simplify by writing the following in index form.

a $5^4 \times 5$ **b** $3^7 \times 3$ **c** $2^9 \times 2$ **d** 5×5^8 **e** 7×7^{11}

Check your answers

1 **a** **i** $5^2 = 5 \times 5$

ii $5^7 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$

iii $5^2 \times 5^7 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$

b $5^2 \times 5^7$ in index form $= 5^9$

c Yes, 5 is being multiplied 9 (2 + 7) times.

2 **a** **i** $7 \times 7 \times 7$ **ii** $7 \times 7 \times 7 \times 7$

iii $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$

b 7^7 **c** Yes

3 **a** **i** $6 \times 6 \times 6$ **ii** $6 \times 6 \times 6 \times 6 \times 6$

iii $6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6$

b 6^8 **c** Yes

4 **a** **i** $10 \times 10 \times 10 \times 10 \times 10 \times 10$

ii $10 \times 10 \times 10 \times 10 \times 10$

iii $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$

b 10^{11} **c** Yes

5 **a** $8^4 \times 8^{10} = 8^{4+10} = 8^{14}$

b $7^7 \times 7^2 = 7^{7+2} = 7^9$

c $9^7 \times 9^3 = 9^{7+3} = 9^{10}$

d $5^6 \times 5^{11} = 5^{6+11} = 5^{17}$

6 **a** 3^9 **b** 2^{12} **c** 7^{10} **d** 5^9

e 4^{16} **f** 6^{13} **g** 10^9 **h** 2^{20}

i 5^{30} **j** 3^{18} **k** 3^{10} **l** 7^{13}

m 2^8 **n** 8^{21} **o** 3^{17}

7 Rule: When multiplying numbers with the same base, add the indices.

8 **a** $4 \times 4 \times 4$

b $4 \times 4 \times 4 \times 4$

c 4^4

d Yes, 4 is being multiplied 4 times.

e Yes

9 **a** 5^5 **b** 3^8 **c** 2^{10} **d** 5^9 **e** 7^{12}