

Starter

1) Factorise $x^2 + 5x + 6 = (x + 2)(x + 3)$

2) Simplify $\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \sqrt{3}$
 $= 5\sqrt{3}$

3) Expand $(x - 3)(2x + 1) = 2x^2 + x - 6x - 3$
 $= 2x^2 - 5x - 3$

Indices

Today we are learning...

The 3 Laws of Indices.

I will know if I have been successful if...

I can recall the 3 Laws of Indices.

I can apply the 3 Laws of Indices.

I can answer exam style questions.



Multiplication

$$y^a \times y^b = y^{a+b}$$

$$1) 3^2 \times 3^6 = 3^8$$

$$2) t^4 \times t^3 = t^7$$

$$3) p^7 \times p^{-1} = p^6$$

Division

$$y^a \div y^b = y^{a-b}$$

$$1) 5^{10} \div 5^7 = 5^3$$

$$2) z^4 \div z^3 = z^1 = z$$

$$3) b^7 \div b^{-1} = b^{7 - (-1)} = b^8$$

Work Books

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Questions 1 and 2

$$7^6 \times 7$$
$$= 7^6 \times 7^1$$

Power

$$\frac{\text{Power}}{(x^a)^b}$$

$$x^{ab}$$

$$(3^2)^{10} = 3^{20}$$

$$(p^8)^6 = p^{48}$$

Fractional Powers

Today we are learning...

How to evaluate fractional powers.

I will know if I have been successful if...

I can find roots and powers of numbers.

I can rewrite fractional powers.

I can evaluate fractional powers.



Fractional Powers

$$1) 9^{\frac{1}{2}} = \sqrt[2]{9} = 3 \quad 9^2, 8^3$$

$$2) 8^{\frac{1}{3}} = \sqrt[3]{8} = 2. \quad \underline{2} \times \underline{2} \times \underline{2} = 8$$

$$3) 81^{\frac{1}{4}} = \sqrt[4]{81} = 3.$$

$$\underline{3} \times \underline{3} \times \underline{3} \times \underline{3} = 81$$

Q10

Page 10 Booklets or...

Find the value of

- (a) $16^{\frac{1}{4}}$ (b) $8^{\frac{1}{3}}$ (c) $36^{\frac{1}{2}}$ (d) $27^{\frac{2}{3}}$ (e) $64^{\frac{1}{3}}$ (f) $1000^{\frac{1}{3}}$
 (g) $25^{\frac{1}{2}}$ (h) $81^{\frac{3}{4}}$ (i) $125^{\frac{2}{3}}$ (j) $64^{\frac{1}{2}}$ (k) $216^{\frac{1}{3}}$ (l) $16^{-\frac{1}{4}}$

Further Fractional Powers

$$1) 9^{\frac{3}{2}} = \left(\sqrt[2]{9} \right)^3 = 3^3 = 27$$

$$2) 27^{\frac{2}{3}} = \left(\sqrt[3]{27} \right)^2 = 3^2 = 9$$

$$3) 81^{\frac{3}{4}} = \left(\sqrt[4]{81} \right)^3 = 3^3 = 27$$

Practice

= 10 000

$$(g) 8^{\frac{2}{3}} = 4$$

$$(h) 125^{\frac{2}{3}} = 25$$

$$(i) 1000^{\frac{4}{3}}$$

$$(j) 1^{\frac{4}{5}} = 1$$

$$(k) 16^{\frac{3}{4}} = 8$$

$$(l) 32^{\frac{3}{5}} = 8$$

Challenge...

$$27^{\frac{5}{3}} = 243?$$

Negative Indices

$$1) 9^{-\frac{1}{2}}$$

$$2) 8^{-\frac{4}{3}}$$

Booklets - Carry on with Page 10

Question 10 - Parts L to Q

Starter

1) Evaluate $16^{\frac{3}{2}}$

2) Simplify $y^2 \times y^7$

3) Simplify $\sqrt{200}$

Negative Indices

Today we are learning...

How to evaluate negative indices.

I will know if I have been successful if...

I can evaluate positive indices.

I know to create a fraction.

I can evaluate negative indices.



Negative Indices

Simplify by removing the negative indices.

1) 5^{-2}

2) $8^{\frac{-2}{3}}$

3) $9^{\frac{-3}{2}}$

Practice

m) $4^{\frac{1}{2}}$ **(n)** $16^{\frac{1}{2}}$ **(o)** $9^{\frac{1}{2}}$ **(p)** $27^{\frac{2}{3}}$ **(q)** $256^{\frac{3}{4}}$ **(r)** $1000^{\frac{2}{3}}$
s) $16^{\frac{3}{2}}$ **(t)** $8^{\frac{4}{3}}$ **(u)** $8^{\frac{4}{3}}$ **(v)** $(-8)^{\frac{1}{3}}$ **(w)** $64^{\frac{2}{3}}$ **(x)** $100^{\frac{3}{2}}$

Answers

(m)	$\frac{1}{2}$	(n)	$\frac{1}{4}$	(o)	$\frac{1}{3}$	(p)	$\frac{1}{9}$	(q)	$\frac{1}{64}$	(r)	$\frac{1}{100}$
(s)	$\frac{1}{64}$	(t)	$\frac{1}{16}$	(u)	16	(v)	-2	(w)	16	(x)	$\frac{1}{1000}$

Code Breaker!

Simplifying Indices

Today we are learning...

How to simplify algebraic expressions involving indices.

I will know if I have been successful if...

I can apply the 3 laws of indices.

I can simplify expressions involving fractions confidently.

I can simplify expressions involving brackets confidently.



Coefficients

1) $6b^4 \times 7b^5$

2) $(4p)^3 \times 3p^2$

3) $45y^7 \div 9y^3$

Page 9 Question 5

5. Simplify these expressions.

- (a) $2a^3 \times 5a^5$ (b) $7x \times 9x^8$ (c) $12p^7 \div 4p^4$ (d) $50b^{12} \div 10b^6$
(e) $3y \times (2y^2)^3$ (f) $(4q^3)^2 \times 5q^4$ (g) $(4c^3)^3 \div 8c^2$ (h) $72z^{12} \div (3z^4)^2$

Solutions

5. (a) $10a^8$ (b) $63x^9$ (c) $3p^3$ (d) $5b^6$
 (e) $24y^7$ (f) $80q^{10}$ (g) $8c^7$ (h) $8z^4$

Brackets

1) $4x(3 + x)$

2) $w^3(2w^3 + 7w^2)$

3) $3h^7(h^{-2} - 6h)$

Page 9 Question 5

(i) $k^2(k^3 + k^5)$ (j) $m^5(m^2 - m^3)$ (k) $2x^4(x^3 + 3x^2)$ (l) $5a^5(2a^2 - 3a^3)$

Solutions

(i) $k^5 + k^7$ (j) $m^7 - m^8$ (k) $2x^7 + 6x^6$ (l) $10a^7 - 15a^8$

Fractions

$$1) \frac{m^3 \times m^4}{m}$$

$$2) \frac{(2a)^4}{(4a)^2}$$

Page 9 Question 5

(m)	$\frac{x^5 \times x^4}{x^6}$	(n)	$\frac{(m^5)^4}{m^6}$	(o)	$\frac{5c^3 \times 4c^7}{2c^6}$	(p)	$\frac{(3q^3)^2 \times 4q^4}{6q^7}$
(q)	$\frac{(3xy^5)^3}{9x^2y}$	(r)	$\frac{(2a^2b^5)^6}{(4ab)^2}$	(s)	$\frac{(4p^4)^3}{2p^3 \times 8p^6}$	(t)	$\frac{(2ab^3)^5}{3a^2b \times 4ab^2}$

Solutions

(m) x^3

(n) m^{14}

(o) $10c^4$

(p) $6q^3$

(q) $3xy^{14}$

(r) $4a^{10}b^{28}$

(s) $4p^3$

(t) $\frac{8}{3}a^2b^{12}$

Exam Question

2013 N5 Specimen P1, Q7

4. (a) Multiply out the brackets and simplify:

$$x^{\frac{1}{2}} \left(x^{\frac{-3}{2}} + x^{\frac{-1}{2}} \right) \quad (2 \text{ marks})$$

N5 Practice Paper B, P1, Q12

7. Express in its simplest form $y^8 \times (y^3)^{-2}$ (2 marks)