# Chhetri Academy

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GCSE MATHS

Algebra

**Edexcel 1MA1 | Subtopic collection Topic 15**

# Laws of indices in algebra

## Higher tier

Past paper question booklet

| 48 | 2003-2025 | Higher |
| --- | --- | --- |
| question groups | available papers | tier |

### Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

**Name** _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

**13.** Simplify fully

*Leave blank*

(i) $(p^3)^3$

.....

(ii) $\dfrac{3q^4 \times 2q^5}{q^3}$

.....

**(3)**

**4.** (a) Simplify

(i) $p^2 \times p^7$

.....

(ii) $x^8 \div x^3$

.....

(iii) $\dfrac{y^4 \times y^3}{y^5}$

.....

**(3)**

(b) Expand $t(3t^2 + 4)$

.....

**(2)**

**7.** (a) Simplify $k^5 \div k^2$

.....
**(1)**

(b) Expand and simplify

(i) $4(x+5)+3(x-7)$

.....
**(4)**

(ii) $(x+3y)(x+2y)$

.....
**(1)**

(c) Factorise $(p+q)^2+5(p+q)$

.....
**(1)**

(d) Simplify $(m^{-4})^{-2}$

.....
**(1)**

(e) Simplify $2t^2 \times 3r^3t^4$

.....
**(2)**

Do not write here

**6.** (a) Simplify $a^3 \times a^4$

.....
**(1)**

(b) Simplify $3x^2y \times 5xy^3$

.....
**(2)**

(c) Simplify $\dfrac{(x-1)^2}{x-1}$

.....
**(1)**

(d) Factorise $a^2 - 9b^2$

.....
**(2)**

**(Total 6 marks)**

**Q6**

**18.** Simplify fully

(a) $(3xy^2)^4$

.....

**(2)**

(b) $\dfrac{x^2-3x}{x^2-8x+15}$

.....

**(3)**

**(Total 5 marks)**

**Q18**

**5.** (a) Solve $3(x - 4) = x + 24$

$x =$ .....

**(3)**

(b) Simplify fully $(2x^3y)^4$

.....

**(2)**

**Q5**

**(Total 5 marks)**

**16.** (a) Simplify $(a^2)^4$

.....

**(1)**

$2^{30} \div 8^9 = 2^x$

(b) Work out the value of $x$.

$x =$ .....

**(2)**

**(Total 3 marks)**

Q16

Blank

**14.** (a) Simplify $a \times a \times a$

.....
**(1)**

(b) Expand $5(3x - 2)$

.....
**(1)**

(c) Expand $3y(y + 4)$

.....
**(2)**

(d) Expand and simplify $2(x - 4) + 3(x + 2)$

.....
**(2)**

(e) Expand and simplify $(x + 4)(x - 3)$

.....
**(2)**

**Q14**

**(Total 8 marks)**

**16.** (a) Simplify $t^6 \times t^2$

.....

**(1)**

(b) Simplify $\frac{m^8}{m^3}$

.....

**(1)**

(c) Simplify $(2x)^3$

.....

**(2)**

(d) Simplify $3a^2h \times 4a^5h^4$

.....

**(2)** **Q16**

**(Total 6 marks)**

**15.** (a) Simplify $m^3 \times m^4$

.....
**(1)**

(b) Simplify $p^7 \div p^3$

.....
**(1)**

(c) Simplify $4x^2y^3 \times 3xy^2$

.....
**(2)**

**(Total 4 marks)**

Q15

**22.** (a) Simplify $p^5 \times p^4$

.....

**(1)**

(b) Simplify $q^5 \div q^2$

.....

**(1)**

(c) Simplify $12tu^6 \div 6tu^5$

.....

**(2)**

(d) Simplify $(9w^2y^6)^{\frac{1}{2}}$

.....

**(2)**

(e) For $x > 1$, write the following expressions in order of size.
Start with the expression with the least value.

$x^0$ $x^2$ $x$ $x^{-2}$ $x^{\frac{1}{2}}$

.....

**(2)**

**Q22**

**(Total 8 marks)**

**6.** (a) Simplify $7x + 2y - x + 3y$

.....

**(2)**

(b) Solve $2x + 3 = 10$

$x =$ .....

**(2)**

(c) Simplify

(i) $c^5 \times c^6$

.....

(ii) $e^{12} \div e^4$

.....

**(2)** **Q6**

**(Total 6 marks)**

**25.** (a) Expand and simplify $(2x + 4y)(4x - 5y)$

.....

**(2)**

(b) Simplify fully $\dfrac{(x+10)^5}{(x+10)^4}$

.....

**(1)**

(c) Simplify fully $\dfrac{x^2-25}{x^2+7x+10}$

.....

**(3)**

For all values of $x$, $x^2 + 6x - 2 = (x + p)^2 + q$

(d) Find the value of $p$ and the value of $q$.

$p =$ ..... $q =$ .....

**(2)**

**Q25**

**(Total 8 marks)**

**12** (a) Simplify $m^0$

.....

**(1)**

(b) Simplify $(2x^6y^{-1})^3$

.....

**(2)**

**(Total for Question 12 is 3 marks)**

**11** (a) Expand $3(x + 2)$

.....

**(2)**

(b) Factorise completely $12\ x^3y - 18\ xy^2$

.....

**(2)**

(c) Expand and simplify $(2x - 3)(x + 4)$

.....

**(2)**

(d) Simplify $5x^4y^3 \times 2x^3y^2$

.....

**(2)**

**(Total for Question 11 is 8 marks)**

## Question 16

June 2011 | 1380/3H | Original Q12 | Legacy

**12.** (a) Simplify

(i) $w^6 \times w^4$

.....

(ii) $h^8 \div h^3$

.....

**(2)**

(b) Simplify completely $\dfrac{12xy^3}{3x^2y^3}$

.....

**(2)**

**Q12**

**(Total 4 marks)**

Blank

**18.** (a) Simplify $(c^2 k^5)^4$

.....

**(1)**

(b) Expand and simplify $(3x + 5)(4x - 1)$

.....

**(2)**

(c) Solve $x^2 - 3x - 10 = 0$

$x =$ .....

**(3)**

**Q18**

**(Total 6 marks)**

## Question 18



**8** (a) Simplify $p^3 \times p^5$

.....

**(1)**

(b) Simplify $\frac{h^7}{h^2}$

.....

**(1)**

(c) Simplify $(x^2)^3$

.....

**(1)**

**(Total for Question 8 is 3 marks)**

**2** (a) Simplify $5f \times 4g$

.....

**(1)**

(b) Expand and simplify $9a + 3(8 - 2a)$

.....

**(2)**

(c) Simplify $c^2 \times c^6$

.....

**(1)**

(d) Simplify $(x^5)^3$

.....

**(1)**

(e) Factorise $7y + 21$

.....

**(1)**

**(Total for Question 2 is 6 marks)**

**16** (a) Simplify $(m^{-2})^5$

.....

**(1)**

(b) Factorise $x^2 + 3x - 10$

.....

**(2)**

**(Total for Question 16 is 3 marks)**

**15** (a) Simplify $m^5 \div m^3$

.....

**(1)**

(b) Simplify $5x^4y^3 \times x^2y$

.....

**(2)**

**(Total for Question 15 is 3 marks)**

**9** (a) Simplify $a^4 \times a^5$

.....

**(1)**

(b) Simplify $\dfrac{45e^6f^8}{5ef^2}$

.....

**(2)**

(c) Write down the value of $9^{\frac{1}{2}}$

.....

**(1)**

**(Total for Question 9 is 4 marks)**

**5** (a) Simplify $4x + 3y - x - 4y$

.....

**(2)**

(b) Simplify $2 + 4x - 7x$

.....

**(1)**

(c) Simplify $t^4 \times t^7$

.....

**(1)**

(d) Simplify $y^6 \div y^2$

.....

**(1)**

(e) Simplify $(c^3)^4$

.....

**(1)**

**(Total for Question 5 is 6 marks)**

**2** (a) Simplify $2a + 4b + 3a - b$

.....

**(2)**

(b) Expand $5(m + 2)$

.....

**(1)**

(c) Simplify $a^5 \times a^4$

.....

**(1)**

**(Total for Question 2 is 4 marks)**

## Question 25



**11** (a) Simplify $x^7 \times x^3$

.....

**(1)**

(b) Simplify $(m^4)^3$

.....

**(1)**

(c) Simplify $\dfrac{36af^8}{12a^5f^2}$

.....

**(2)**

**(Total for Question 11 is 4 marks)**

**12** (a) Factorise fully $6ab + 10ac$

.....

**(2)**

(b) Expand and simplify $(x - 5)(x + 7)$

.....

**(2)**

(c) Simplify $\dfrac{2m^2t^6}{m^4t^2}$

Give your answer in its simplest form.

.....

**(2)**

(d) Factorise $y^2 - 16$

.....

**(1)**

(e) Simplify $(h^2)^{-3}$

.....

**(1)**

**(Total for Question 12 is 8 marks)**

**22** (a) Simplify $(3x^2y^4)^3$

.....

**(2)**

(b) Simplify $\dfrac{x^2 - 9}{2x^2 + 5x - 3}$

.....

**(3)**

**(Total for Question 22 is 5 marks)**

## Question 28



**5** (a) Simplify $x^2 \times x^4$

.....

**(1)**

(b) Simplify $y^8 \div y^6$

.....

**(1)**

(c) Simplify $(t^2)^3$

.....

**(1)**

**(Total for Question 5 is 3 marks)**

**22** (a) Simplify fully $(3e)^0$

.....

**(1)**

(b) Simplify fully $\left(\frac{64x^6}{25y^2}\right)^{-\frac{1}{2}}$

.....

**(2)**

(c) Write $\frac{5}{x-3} - \frac{4}{x+3}$ as a single fraction in its simplest form.

.....

**(3)**

**(Total for Question 22 is 6 marks)**

**11** (a) Simplify $2x^3y^5 \times 3x^2y^3$

.....

**(2)**

(b) Expand and simplify $(2x - 3)(3x - 1)$

.....

**(2)**

(c) Factorise completely $8x^3y^5 - 12x^4y^2$

.....

**(2)**

(d) Factorise $2e - 4f + ex - 2fx$

.....

**(2)**

**(Total for Question 11 is 8 marks)**

**7** (a) Expand and simplify $3(y - 2) + 2(y + 5)$

.....

**(2)**

(b) Simplify $\frac{w^5}{w^3}$

.....

**(1)**

(c) Factorise $5x + 20$

.....

**(1)**

**(Total for Question 7 is 4 marks)**

**11** (a) Solve $3x^2 = 147$

.....

**(2)**

(b) Work out the value of $2^{-3}$

.....

**(1)**

(c) Simplify $(3x^2)^3$

.....

**(2)**

$w = 4p - 16$

(d) Make $p$ the subject of this formula.

.....

**(2)**

**(Total for Question 11 is 7 marks)**

**8** (a) Factorise $12e + 4$

.....

**(1)**

(b) Expand $5(3c - 2d)$

.....

**(1)**

(c) Simplify $7a^3b^{-2} \times 4ab^5$

.....

**(2)**

(d) Factorise $x^2 - 49$

.....

**(1)**

(e) Expand and simplify $(2y + 7)(y - 3)$

.....

**(2)**

**(Total for Question 8 is 7 marks)**

**18** (a) Simplify $2a^3b \times 5a^2b^3$

.....

**(2)**

(b) Make $y$ the subject of the formula $p = \sqrt{\frac{x + y}{5}}$

.....

**(3)**

**(Total for Question 18 is 5 marks)**

**10** (a) Simplify $a^4 \times a^3$

.....

**(1)**

(b) Simplify $(b^2)^7$

.....

**(1)**

(c) Write down the value of $3^0$

.....

**(1)**

(d) Write down the value of $4^{-1}$

.....

**(1)**

**(Total for Question 10 is 4 marks)**

**8** (a) Simplify $ab - 5g + 5ab - 2g$

.....

**(2)**

(b) Factorise $6m - 9$

.....

**(1)**

(c) Simplify $t^8 \div t^3$

.....

**(1)**

(d) Factorise fully $2x^2y + 4xy^2$

.....

**(2)**

(e) Expand and simplify $(w - 5)^2$

.....

**(2)**

**(Total for Question 8 is 8 marks)**

**6** $p^3 \times p^x = p^9$

(a) Find the value of $x$.

$x =$ .....

**(1)**

$(7^2)^y = 7^{10}$

(b) Find the value of $y$.

$y =$ .....

**(1)**

$100^a \times 1000^b$ can be written in the form $10^w$

(c) Show that $w = 2a + 3b$

**(2)**

**(Total for Question 6 is 4 marks)**

## Question 38

June 2018 | 1MA1/2H | Original Q1

**1** (a) Simplify $m^3 \times m^4$

.....

**(1)**

(b) Simplify $(5np^3)^3$

.....

**(2)**

(c) Simplify $\dfrac{32q^9r^4}{4q^3r}$

.....

**(2)**

**(Total for Question 1 is 5 marks)**

## Question 39

November 2019 | 1MA1/1H | Original Q7

**7** (a) Simplify $(p^2)^5$

.....

**(1)**

(b) Simplify $12x^7y^3 \div 6x^3y$

.....

**(2)**

**(Total for Question 7 is 3 marks)**

## Question 40

November 2019 | 1MA1/1H | Original Q19

**19** Given that $9^{-\frac{1}{2}} = 27^{\frac{1}{4}} \div 3^{x+1}$
find the exact value of $x$.

$x =$ .....

**(Total for Question 19 is 3 marks)**

**10** (a) Simplify $\left(\frac{1}{m^2}\right)^0$

.....

**(1)**

(b) Simplify $\frac{8(x-4)}{(x-4)^2}$

.....

**(1)**

(c) Simplify $(3n^4w^2)^3$

.....

**(2)**

**(Total for Question 10 is 4 marks)**

## Question 42



**1** (a) Simplify $n^3 \times n^5$

.....

**(1)**

(b) Simplify $\dfrac{c^3d^4}{c^2d}$

.....

**(2)**

(c) Solve $\dfrac{5x}{2} > 7$

.....

**(2)**

**(Total for Question 1 is 5 marks)**

## Question 43

June 2022 | 1MA1/2H | Original Q1

**1** (a) Simplify $(x^3)^5$

.....

**(1)**

(b) Expand and simplify $4(x + 3) + 7(4 - 2x)$

.....

**(2)**

(c) Factorise fully $15x^3 + 3x^2y$

.....

**(2)**

**(Total for Question 1 is 5 marks)**

**14** (a) Simplify fully $(3x^5y^6)^4$

.....

**(2)**

(b) Expand and simplify $(x + 2)(x - 3)(x + 4)$

.....

**(3)**

**(Total for Question 14 is 5 marks)**

## Question 45



**11** Write $\dfrac{(6x^5y^3)^2}{3x^2y^7 \times 4xy^{-3}}$ in the form $ax^by^c$ where $a$, $b$ and $c$ are integers.

.....

**(Total for Question 11 is 3 marks)**

## Question 46

June 2024 | 1MA1/3H | Original Q15

**15** (a) Simplify fully $\dfrac{(a-3)^2}{5(a-3)}$

.....

**(1)**

(b) Factorise $3k^2 + 11k - 4$

.....

**(2)**

(c) Simplify fully $\dfrac{4-x^2}{x^2+3x} \div \dfrac{x+2}{x+3}$

.....

**(3)**

**(Total for Question 15 is 6 marks)**

**9** (a) Simplify fully $2x^3y^5 \times 7x^2y$

.....

**(2)**

(b) Simplify $(m^2)^{-3}$

.....

**(1)**

**(Total for Question 9 is 3 marks)**

## Question 48



**11** $\dfrac{3^n \times 3^{20}}{3^8} = 3^{14}$

(a) Find the value of $n$.

$n =$ .....

**(2)**

(b) Write $\left(64m^{12}\right)^{\frac{2}{3}}$ in the form $am^b$ where $a$ and $b$ are integers.

.....

**(2)**

**(Total for Question 11 is 4 marks)**