

5H Revision on Indices

Rules of Indices: $a^m \times a^n = a^{m+n}$ and $a^m \div a^n = a^{m-n}$ and $(a^m)^n = a^{mn}$

Negative and fractional indices: $a^{-n} = \frac{1}{a^n}$ and $a^{\frac{1}{n}} = \sqrt[n]{a}$ and $a^{\frac{m}{n}} = (\sqrt[n]{a})^m$ or $\sqrt[n]{a^m}$

Special indices: $a^1 = a$ and $a^0 = 1$

1. Simplify the following expressions:

a. $x^4 \times x^3$ b. $y^5 \times y^2$ c. $p^3 \times p$ d. $x^7 \times x^{-3}$

e. $x^5 \div x^2$ f. $\frac{y^7}{y^3}$ g. $n^{10} \div n^4$ h. $z^6 \div z^3$

i. $x^5 \div x^{-2}$ j. $\frac{w^5}{w^{-3}}$ k. $p^5 \div p^{-2}$ l. $x^3 \div x^{-3}$

m. $(x^3)^2$ n. $(y^3)^{-2}$ o. $(z^{-1})^{-3}$ p. $\left(\frac{1}{w^2}\right)^{-3}$

2. Simplify the following expressions:

a. $(ab)^4$ b. $(xy)^3$ c. $\frac{3}{(3a)^2}$ d. $(2a)^3$

e. $(3y)^4$ f. $(mn^2)^5$

3. Simplify the following expressions:

a. $2a^2 \times a^3$ b. $x^2 \times 3x^4$ c. $2y^2 \times 3y^2$ d. $8x^2 \div 2x$

e. $10y^3 \div 2y^2$ f. $6z^4 \div 3z^2$ g. $10y^2 \div 5y^3$ h. $12x^4 \div 3x^{-2}$

4. Multiply out the brackets:

a. $x^3(x^2 + x^4)$ b. $y^2(y^3 - y)$ c. $z^2(z^4 - 1)$

5. Simplify:

a. $\frac{x^3 \times x^4}{x^2}$ b. $\frac{t^3 \times t^6}{t^4}$ c. $\frac{w^2 \times w^{-3}}{w^{-4}}$

6. Solve the equation for n:

a. $2^n = 8$ b. $3^n = 81$ c. $4^n = 4$ d. $3^n = \frac{1}{3}$

7. Simplify and express with positive indices:

a. $3x^{-1}$ b. $5y^{-3}$ c. $\frac{1}{2}x^{-1}$ d. $\frac{3}{4}u^{-3}$

8. Write in root form:

a. $m^{\frac{3}{4}}$ b. $x^{\frac{4}{5}}$ c. $k^{\frac{2}{3}}$ d. $x^{\frac{1}{2}}$
e. $x^{\frac{1}{2}}$ f. $x^{\frac{2}{3}}$

9. Write in index form:

a. $\sqrt[3]{y^5}$ b. $\sqrt[3]{z^4}$ c. \sqrt{x} d. $\sqrt[3]{t}$

10. Evaluate:

a. $9^{\frac{1}{2}}$ b. $8^{\frac{1}{3}}$ c. $27^{\frac{1}{3}}$ d. $8^{\frac{2}{3}}$
e. $27^{\frac{2}{3}}$ f. $4^{\frac{3}{2}}$ g. $25^{\frac{3}{2}}$ h. $81^{\frac{3}{4}}$

11. Simplify the following expressions:

a. $u^{\frac{3}{2}} \times u^{\frac{1}{2}}$ b. $v^{\frac{4}{3}} \times v^{\frac{1}{3}}$ c. $x^{\frac{3}{2}} \div x^{\frac{1}{2}}$ d. $y^{\frac{3}{4}} \div y^{\frac{1}{4}}$
e. $\left(\frac{1}{t^2}\right)^2$ f. $\left(p^{\frac{1}{2}}\right)^2$ g. $\left(q^{\frac{1}{4}}\right)^0$ h. $(r^3)^{\frac{1}{3}}$

12. Simplify the following:

a. $x^{\frac{1}{2}}\left(x^{\frac{1}{2}} + x^{-\frac{1}{2}}\right)$ b. $m^{-\frac{3}{4}}\left(m^{\frac{7}{4}} - m^{-\frac{1}{4}}\right)$ c. $\frac{a^3 \times a^{-2}}{a}$ d. $\frac{c^2 \times c^{-2}}{c^{-1}}$
e. $\frac{x^{\frac{1}{2}} \times x^{\frac{3}{2}}}{x^2}$ f. $\frac{y^{\frac{1}{3}} \times y^{\frac{4}{3}}}{y}$ g. $(a^2 + 1)(a^{-2} + 1)$ h. $(b^{-1} + 1)(b^{-1} - 1)$
e. $\left(x^{\frac{1}{2}} + 1\right)\left(x^{\frac{1}{2}} + 1\right)$ f. $\left(u^{\frac{1}{2}} + 1\right)\left(u^{-\frac{1}{2}} + 1\right)$