

Show all necessary working and set your work out in a neat and logical manner.

1. Simplify these expressions.

(a) $3x^2 \times 5x^3$

(d) $(-3ab^2)^3$

(b) $15a^3b^5 \div 3ab$

(e) $\frac{(2w^3)^3 \times 6w^2}{3w^4 \times 4w^5}$

(c) $\frac{3a \times 3a \times 3a}{3a + 3a + 3a}$

(f) $(6x^2y^3)^2 \div 3x^2y^3$

2. Express the following terms in their simplest form without negative indices:

(a) a^{-2}

(e) $3^m \div 3^{-m}$

(b) $\left(\frac{3}{4}\right)^{-1}$

(f) $x^{-\frac{3}{4}} \times x^{\frac{1}{4}}$

(c) $\left(\frac{a}{b}\right)^{-2}$

(g) $\frac{a^{-1}}{a^{-3}}$

(d) $(5m^{-1})^2$

(h) $5^{2x+1} \div 5^{x-1}$

3. Evaluate:

(a) $9^{\frac{1}{2}}$

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

(b) $27^{\frac{2}{3}}$

(e) $\left(\frac{25}{4}\right)^{-\frac{3}{2}}$

(c) $\left(\frac{8}{125}\right)^{-\frac{2}{3}}$

(f) $\left(-\frac{27}{8}\right)^{-\frac{4}{3}}$

4. (a) Find the value of x^2y^{-1} given $x = 3$ and $y = \frac{3}{4}$.

(b) Evaluate $a^{-2} \div bc^{-1}$ when $a = -2$, $b = -1$ and $c = \frac{1}{2}$.

5. Use the index laws to simplify the following expressions, giving your answer in terms of positive indices.

(a) $\frac{15b^3c^4}{3bc^{-4}}$

(c) $\frac{7a^{-5}b^2}{(-2a^3b)^2} \div \frac{21a^{-3}b^2}{4a^{-1}b}$

(b) $\left(\frac{2a^2b^3}{b^{-3}}\right)^{-2}$

(d) $\sqrt{\frac{b^{4m} \times b^{2n}}{b^{4m+2n}}}$

Form III INDICES

40

QUESTION 1

(a) $3x^2 \times 5x^3 = 15x^5$ ✓
 (b) $15a^3b^5 \div 3ab = 5a^2b^4$ ✓

(c) $\frac{3a \times 3a \times 3a}{3a + 3a + 3a} = \frac{27a^3}{9a} = 3a^2$ ✓

(d) $(-3ab^2)^3 = -27a^3b^6$ ✓

(e) $\frac{(2w^3)^3 \times 6w^2}{3w^4 \times 4w^5} = \frac{48w^9}{12w^9} = 4w^2$ ✓

(f) $(6x^2y^3)^2 \div 3x^2y^3 = \frac{36x^4y^6}{3x^2y^3} = 12x^2y^3$ ✓ (9)

QUESTION 2

(a) $a^{-2} = \frac{1}{a^2}$ ✓
 (b) $(\frac{3}{4})^{-1} = \frac{4}{3}$ ✓
 (c) $(\frac{a}{b})^{-2} = \frac{b^2}{a^2}$ ✓
 (d) $(5m^{-1})^2 = \frac{25}{m^2}$ ✓
 (e) $3^m \div 3^{-m} = 3^{2m}$ ✓
 (f) $x^{-\frac{3}{4}} \times x^{\frac{1}{4}} = x^{-\frac{1}{2}} = \frac{1}{\sqrt{x}}$ ✓

(g) $\frac{a^{-1}}{a^{-3}} = a^2$ ✓
 (h) $5^{2x+1} \div 5^{x-1} = 5^{2x+1-(x-1)} = 5^{x+2}$ ✓ (9)

QUESTION 3

(a) $9^{\frac{1}{2}} = 3$ ✓
 (b) $27^{\frac{1}{3}} = 9$ ✓
 (c) $(\frac{8}{125})^{-\frac{1}{3}} = \frac{25}{4}$ ✓
 (d) $8^{-\frac{2}{3}} = \frac{1}{4}$ ✓
 (e) $(\frac{25}{4})^{-\frac{3}{2}} = \frac{8}{125}$ ✓
 (f) $(-\frac{27}{8})^{-\frac{4}{3}} = \frac{16}{81}$ ✓ (10)

QUESTION 4

(a) $x^2y^{-1} = 3^2 \times (\frac{3}{27})^{-1} = 9 \times \frac{4}{3} = 12$ ✓
 (b) $a^{-2} \div bc^{-1} = (-2) \div (-1)(\frac{1}{c})^{-1} = \frac{1}{c} \div -1 \times 2 = -\frac{2}{c}$ ✓ (4)

QUESTION 5

(a) $\frac{15b^3c^4}{3bc^{-4}} = 5b^2c^8$ ✓
 (b) $(\frac{2a^2b^3}{b^{-2}})^{-2} = (2a^2b^5)^{-2} = \frac{1}{4a^4b^{10}}$ ✓

cont.

Form III indices ... Q5 cont.

(c) $\frac{7a^{-5}b^2}{(-2a^3b^4)^2} \div \frac{21a^{-3}b^2}{4a^{-1}b} = \frac{7a^{-5}b^2}{4a^6b^8} \times \frac{4a^{-1}b}{21a^{-3}b^2} = \frac{a^{-6}b^3}{3a^3b^6} = \frac{1}{3a^9b^3}$ ✓

(d) $\sqrt{\frac{b^{4m} \times b^{2n}}{b^{4m+2n}}} = \sqrt{\frac{b^{4m+2n}}{b^{4m+2n}}} = \sqrt{1} = 1$ ✓ (8)