INDEX LAWS – PRACTICE QUESTIONS
NON-CALCULATOR

1.
Work out:

(a) $2^{-1} = \frac{1}{2}$

(b) $6^{-1} = \frac{1}{6}$

(c) $4^{-1} = \frac{1}{4}$

(d) $10^{-1} = \frac{1}{10}$

(e) $2^{-2} = \frac{1}{4}$

(f) $3^{-2} = \frac{1}{9}$

(g) $5^{-2} = \frac{1}{25}$

(h) $9^{-2} = \frac{1}{81}$

(i) $2^{-3} = \frac{1}{8}$

(j) $10^{-3} = \frac{1}{1000}$

(k) $25^{-1} = \frac{1}{25}$

(l) $2^{-4} = \frac{1}{16}$

2.
Work out:

(a) $\left(\frac{1}{3}\right)^{-1} = 3$

(b) $\left(\frac{1}{8}\right)^{-1} = 8$

(c) $\left(\frac{5}{2}\right)^{-1} = \frac{2}{5}$

(d) $\left(\frac{10}{7}\right)^{-1} = \frac{7}{10}$

(e) $\left(\frac{6}{5}\right)^{-2} = \frac{25}{36}$

(f) $\left(\frac{9}{7}\right)^{-2} = \frac{49}{81}$

(g) $\left(\frac{3}{2}\right)^{-3} = \frac{8}{27}$

(h) $\left(\frac{5}{4}\right)^{-3} = \frac{64}{125}$

(i) $\left(\frac{1}{2}\right)^{-4} = 16$

(j) $\left(\frac{1}{10}\right)^{-3} = 1000$

3.
Work out:

(a) $4^{\frac{1}{2}} = 2$

(b) $9^{\frac{1}{2}} = 3$

(c) $100^{\frac{1}{2}} = 10$

(d) $144^{\frac{1}{2}} = 12$

(e) $8^{\frac{1}{3}} = 2$

(f) $27^{\frac{1}{3}} = 3$

(g) $125^{\frac{1}{3}} = 5$

(h) $16^{\frac{1}{4}} = 2$

(i) $36^{\frac{1}{2}} = 6$

(j) $1000^{\frac{1}{3}} = 10$

4.
Work out:

(a) $\left(\frac{1}{25}\right)^{\frac{1}{2}} = \frac{1}{5}$

(b) $\left(\frac{1}{64}\right)^{\frac{1}{2}} = \frac{1}{8}$

(c) $\left(\frac{4}{9}\right)^{\frac{1}{2}} = \frac{2}{3}$

(d) $\left(\frac{49}{121}\right)^{\frac{1}{2}} = \frac{7}{11}$

(e) $\left(\frac{8}{27}\right)^{\frac{1}{3}} = \frac{2}{3}$

(f) $\left(\frac{64}{125}\right)^{\frac{1}{3}} = \frac{4}{5}$

(g) $\left(\frac{1}{32}\right)^{\frac{1}{5}} = \frac{1}{2}$

(h) $\left(\frac{16}{81}\right)^{\frac{1}{4}} = \frac{2}{3}$

5.
Work out:

(a) $25^{-\frac{1}{2}} = \frac{1}{5}$

(b) $49^{-\frac{1}{2}} = \frac{1}{7}$

(c) $81^{-\frac{1}{2}} = \frac{1}{9}$

(d) $121^{-\frac{1}{2}} = \frac{1}{11}$

(e) $8^{-\frac{1}{3}} = \frac{1}{2}$

(f) $64^{-\frac{1}{3}} = \frac{1}{4}$

(g) $1000^{-\frac{1}{3}} = \frac{1}{10}$

(h) $81^{-\frac{1}{4}} = \frac{1}{3}$

6.
Work out:

(a) $\left(\frac{1}{4}\right)^{-\frac{1}{2}} = 2$

(b) $\left(\frac{1}{36}\right)^{-\frac{1}{2}} = 6$

(c) $\left(\frac{1}{144}\right)^{-\frac{1}{2}} = 12$

(d) $\left(\frac{49}{4}\right)^{-\frac{1}{2}} = \frac{2}{7}$

(e) $\left(\frac{1}{125}\right)^{-\frac{1}{3}} = 5$

(f) $\left(\frac{1000}{27}\right)^{-\frac{1}{3}} = \frac{3}{10}$

(g) $\left(\frac{81}{16}\right)^{-\frac{1}{4}} = \frac{2}{3}$

(h) $\left(\frac{121}{400}\right)^{-\frac{1}{2}} = \frac{20}{11}$

7.
Work out:

(a) $4^{\frac{3}{2}} = (4^{1/2})^3 = 2^3 = 8$

(b) $9^{\frac{3}{2}} = (9^{1/2})^3 = 3^3 = 27$

(c) $100^{\frac{3}{2}} = (100^{1/2})^3 = 10^3 = 1000$

(d) $25^{\frac{3}{2}} = (25^{1/2})^3 = 5^3 = 125$

(e) $27^{\frac{2}{3}} = (27^{1/3})^2 = 3^2 = 9$

(f) $8^{\frac{2}{3}} = (8^{1/3})^2 = 2^2 = 4$

(g) $125^{\frac{2}{3}} = (125^{1/3})^2 = 5^2 = 25$

(h) $8^{\frac{4}{3}} = (8^{1/3})^4 = 2^4 = 16$

(i) $81^{\frac{3}{4}} = (81^{1/4})^3 = 3^3 = 27$

(j) $900^{\frac{3}{2}} = (900^{1/2})^3 = 30^3 = 27000$

(k) $32^{\frac{3}{5}} = (32^{1/5})^3 = 2^3 = 8$

(l) $\left(\frac{9}{400}\right)^{\frac{3}{2}} = \left(\frac{9}{400}^{1/2}\right)^3 = \left(\frac{3}{20}\right)^3 = \frac{27}{8000}$

(m) $\left(\frac{49}{100}\right)^{\frac{3}{2}} = \left(\frac{49}{100}^{1/2}\right)^3 = \left(\frac{7}{10}\right)^3 = \frac{343}{1000}$

(n) $\left(\frac{125}{216}\right)^{\frac{2}{3}} = \left(\frac{125}{216}^{1/3}\right)^2 = \left(\frac{5}{6}\right)^2 = \frac{25}{36}$

8.
Work out:

(a) $25^{-\frac{3}{2}} = \left(\frac{1}{25}\right)^{3/2} = \left(\frac{1}{25}^{1/2}\right)^3 = \left(\frac{1}{5}\right)^3 = \frac{1}{125}$

(b) $8^{-\frac{2}{3}} = \left(\frac{1}{8}\right)^{2/3} = \left(\frac{1}{8}^{1/3}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$

(c) $9^{-\frac{3}{2}} = \left(\frac{1}{9}\right)^{3/2} = \left(\frac{1}{9}^{1/2}\right)^3 = \left(\frac{1}{3}\right)^3 = \frac{1}{27}$

(d) $64^{-\frac{2}{3}} = \left(\frac{1}{64}\right)^{2/3} = \left(\frac{1}{64}^{1/3}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

(e) $16^{-\frac{3}{4}} = \left(\frac{1}{16}\right)^{3/4} = \left(\frac{1}{16}^{1/4}\right)^3 = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

(f) $8000^{-\frac{2}{3}} = \left(\frac{1}{8000}\right)^{2/3} = \left(\frac{1}{8000}^{1/3}\right)^2 = \left(\frac{1}{20}\right)^2 = \frac{1}{400}$

(g) $\left(\frac{1}{16}\right)^{-\frac{3}{2}} = 16^{3/2} = \left(16^{1/2}\right)^3 = 4^3 = 64$

(h) $\left(\frac{1}{4}\right)^{-\frac{5}{2}} = 4^{5/2} = \left(4^{1/2}\right)^5 = 2^5 = 32$

(i) $\left(\frac{16}{9}\right)^{-\frac{3}{2}} = \left(\frac{9}{16}\right)^{3/2} = \left(\frac{9}{16}^{1/2}\right)^3 = \left(\frac{3}{4}\right)^3 = \frac{27}{64}$

(j) $\left(\frac{27}{64}\right)^{-\frac{2}{3}} = \left(\frac{64}{27}\right)^{2/3} = \left(\frac{64}{27}^{1/3}\right)^2 = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$

(k) $\left(\frac{81}{1600}\right)^{-\frac{3}{2}} = \left(\frac{1600}{81}\right)^{3/2} = \left(\frac{1600}{81}^{1/2}\right)^3 = \left(\frac{40}{9}\right)^3 = \frac{64000}{729}$

8.

Work out, fully simplifying your answers where possible:

(a) $8^{\frac{2}{3}} \times 4^{\frac{3}{2}}$

$8^{2/3} = (8^{1/3})^2 = 2^2 = 4$

$4^{3/2} = (4^{1/2})^3 = 2^3 = 8$

$4 \times 8 = 32$

(b) $1000^{\frac{2}{3}} \div 25^{\frac{1}{2}}$

$1000^{2/3} = (1000^{1/3})^2 = 10^2 = 100$

$25^{1/2} = 5$

$100 \div 5 = 20$

(c) $\left(\frac{10}{3}\right)^{-1} - 3^{-2}$

$\frac{3}{10} - \frac{1}{9} = \frac{27}{90} - \frac{10}{90} = \frac{17}{90}$

(d) $\left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{25}\right)^{-\frac{1}{2}}$

$= 9 + 5 = 14$

(e) $\left(\frac{1}{125}\right)^{-\frac{2}{3}} + \left(\frac{1}{144}\right)^{-\frac{1}{2}}$

$125^{2/3} = (125^{1/3})^2 = 5^2 = 25$

$144^{1/2} = 12$

$25 + 12 = 37$

(f) $\left(\frac{64}{27}\right)^{-\frac{1}{3}} + \left(\frac{1}{16}\right)^{-\frac{1}{4}}$

$\frac{3}{4} + 2 = 2\frac{3}{4}$

(g) $32^{\frac{3}{5}} \times 1600^{-\frac{1}{2}}$

$32^{3/5} = (32^{1/5})^3 = 2^3 = 8$

$1600^{-1/2} = \frac{1}{40}$

$8 \times \frac{1}{40} = \frac{8}{40} = \frac{1}{5}$

9.
Work out:

(a) $9^{-1} = \frac{1}{9}$

(b) $16^{\frac{1}{2}} = 4$

(c) $36^{-\frac{1}{2}} = \frac{1}{6}$

(d) $5^{-2} = \frac{1}{25}$

(e) $9^{\frac{3}{2}} = (9^{1/2})^3 = 3^3 = 27$

(f) $\left(\frac{4}{3}\right)^{-2} = \frac{9}{16}$

(g) $729^{\frac{1}{3}} = 9$

(h) $1000^{-\frac{2}{3}} = \left(\frac{1}{1000}\right)^{2/3} = \left(\frac{1}{1000}^{1/3}\right)^2 = \left(\frac{1}{10}\right)^2 = \frac{1}{100}$

(i) $\left(\frac{81}{100}\right)^{-\frac{1}{2}} = \left(\frac{100}{81}\right)^{1/2} = \frac{10}{9}$

(j) $3^{-4} = \frac{1}{81}$

(k) $64^{-\frac{2}{3}} = \left(\frac{1}{64}\right)^{2/3} = \left(\frac{1}{64}^{1/3}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$

(l) $49^{\frac{3}{2}} = (49^{1/2})^3 = 7^3 = 343$

(m) $10000^{\frac{3}{4}} = (10000^{1/4})^3 = 10^3 = 1000$

(n) $\left(\frac{25}{16}\right)^{-\frac{3}{2}} = \left(\frac{16}{25}\right)^{3/2} = \left(\frac{16}{25}^{1/2}\right)^3 = \left(\frac{4}{5}\right)^3 = \frac{64}{125}$

(o) $625^{\frac{3}{4}} = (625^{1/4})^3 = 5^3 = 125$