Try your best on these exponent law questions. Full solutions are posted online for you to check. Use exponent laws. You should not need a calculator, except possibly for the very last step of the question.

1.   Use exponent laws to simplify the following. Express each as a single power then evaluate. Your answer should be either a whole number or fraction (i.e. no decimals in answers).

a) $2^3 \times 2^2 \times 2$ b) $(2^4)^2$ c) $\dfrac{(4^3)^4 \times 4^{-2}}{4^8}$ d) $\dfrac{6^2}{6^3}$ e) $(4^{-1})^3$

f) $\dfrac{5^{-2} \times 5^4}{5^2}$ g) $\left(\frac{4}{5}\right)^{-2}$

2. Simplify each of the following. Your final answer should contain no negative exponents.

a) $a^{-3} \times a^5 \times a^{10}$ b) $(x^2 y)(2x^3 y^3)$ c) $(3a^2 b)^3$ d) $\dfrac{(x^3)^{-2} x^{-2}}{x^8}$

3.   Write the following in *radical form.* Then evaluate (find the 'number' answer).

a) $5^{\frac{1}{2}}$ b) $36^{\frac{3}{2}}$ c) $14^{\frac{2}{5}}$ d) $81^{\frac{-3}{4}}$

4.   Use exponent laws to simplify the following, then evaluate. (Use fractions where appropriate – no decimals)

a) $3^3 \times 3^2$ b) $27^{\frac{-2}{3}}$ c) $\dfrac{9^{\frac{3}{2}}}{9^{\frac{1}{2}}}$

d) $\left(\dfrac{1}{2}\right)^{-3} \times \left(\dfrac{1}{2}\right)^6$ e) $8^{\frac{2}{3}} \times 8^{\frac{-1}{3}}$ f) $\left(\dfrac{9}{16}\right)^{\frac{-3}{2}}$

5.   Simplify each of the following. **[8 marks]**

a) $\dfrac{(x^3)^6 x^2}{x^8}$ b) $\dfrac{a^7 b^2}{a^5 b}$ c) $\dfrac{(4x^2 y^3)^3}{4xy^5}$