

Answer sheet.

1. a) $2^3 \cdot 2^2 = 2^5$
 $8 \cdot 4 = 32$

b) $\frac{2^3}{2^2} = 2^1$
 $\frac{8}{4} = 2$

c) $(2^3)^2 = 2^6$
 $(8)^2 = 64$

d) $(4)^2 = 2^2 \cdot 2^2$
 $16 = 4 \cdot 4$
 $16 = 16$

e) $\left(\frac{4}{2}\right)^2 = \frac{4^2}{2^2}$
 $2^2 = \frac{16}{4}$
 $4 = 4$

2. a) 10^{11} b) 10^{12} c) $\frac{10^{10}}{10^4} = 10^6$ d) $-\frac{10^6}{10^3} = 10^3$

e) $\frac{(-10)^8}{10^4} = -10^4$ f) $\frac{-10^5}{10^3} = -10^2$ j) $-10^8 \left[\frac{1}{10^4} \right]$ h) $\left(\frac{10^5}{-10} \right)^3$
 $\frac{-10^8}{10^4} = -10^4$ $\frac{-10^5}{10^3} = -10^2$ $\frac{-10^8}{10^4} = -10^4$ $(-10^4)^3 = -10^{12}$

3. a) x^3 b) k^9 c) $a^5 b^5$ d) $\frac{k^3}{m^3}$ e) m^{10} f) a^6

g) m^{11} h) $\frac{5^3}{x^3} = \frac{125}{x^3}$ i) $\frac{3^4 a^4}{81 a^4}$ j) x^{12} k) $\frac{2^3 x^3 y^3}{8 x^3 y^3}$ l) y^{10}

m) x^{12} n) $\frac{3^3}{2^3} = \frac{27}{8}$ o) 2^7 p) m^9 q) $x^4 y^4$

r) 0 s) $x^3 y^3$

$$4. a) \frac{x^3 y^3}{xy} = x^2 y^2$$

$$b) \frac{2a^5 b^5}{-a^4} = -2ab^5$$

$$c) \frac{(a^6 b^3)}{\left(\frac{a^2}{-b^2}\right)} = \frac{a^6 b^3}{-b^2} = -a^6 b$$

$$d) -y^6 \left(\frac{x^2}{y^2}\right)$$

$$= -x^2 y^4$$

$$e) \left(\frac{-1}{x^3}\right) (x^8 y^4)$$

$$= \frac{-x^8 y^4}{x^3}$$

$$= -x^5 y^4$$

$$f) \frac{a^{12} b^8}{a^2 b^4} \left(\frac{a^2}{b^2}\right)$$

$$= \frac{a^{14} b^8}{a^2 b^6}$$

$$= a^{12} b^2$$

$$g) \frac{x^3 y^3}{y^3} (x^4 y^2)$$

$$= x^7 y^2$$

$$h) \left(\frac{x^5}{-y^5}\right) (-x^3 y^3)$$

$$= \frac{-x^8 y^3}{-y^5}$$

$$= \frac{x^8}{y^2}$$

$$5. a) \frac{a^3 b^3}{b^2}$$

$$= a^3 b$$

$$= (-1)^3 (1)$$

$$= -1$$

$$b) \frac{a^4 b^2 c^2}{abc}$$

$$= a^3 bc$$

$$= (-1)^3 (1) (2)$$

$$= -2$$

$$c) \frac{a^8 b^2}{ab^2}$$

$$= a^7$$

$$= (-1)^7$$

$$= -1$$

$$d) \frac{a^9 b^6}{a^3 b^3}$$

$$= a^6 b^3$$

$$= (-1)^6 (1)^3$$

$$= 1$$

$$e) \left(\frac{a^2}{b^2}\right) \left(\frac{b^4}{c^4}\right) \left(\frac{c^2}{a^2}\right)$$

$$= \frac{b^2}{c^2}$$

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

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

$$= a^4 b^2$$

$$= (-1)^4 (1)$$

$$= 1$$