SHARP

Worksheet 5: Exponents

Grade 9 Mathematics

1. Represent the following expressions in exponential form

a)	$ababaabaa$	b)	$5.5.5.5.xxx.yyyxyx$	c)	$abcadbdcab$
d)	$xxxyyyxyxyx2.2.2.3.3.3.2$	e)	$7.7.2.2.2.2.x.x.x.x.x$	f)	$11.11.\frac{aaaa}{bbb}$
g)	$cbc^2b^3c^4$	h)	$ccccbbbbbcbabaabcc$	i)	$\frac{xxxxxx}{yyyy}$
j)	$ggggghhhghghgh7.7.7$	k)	$\frac{mmmmmm}{5.5.5.5.5}$	l)	$nnpppqqqrr$

2. Expand these exponential numbers

a)	2^5x^3	b)	$5^2 \times 7^4 \times a^8$	c)	$3^3 \times x^2 \times y^4$
d)	$10^4xy^2z^3$	e)	$(3^2x^3y)^3$	f)	$\frac{1}{a^4}$
g)	$6^{-3}a^3b^4$	h)	$(2^4a^9b^7)^0$	i)	$4^3b^4x^3y^2$

3. Write the following numbers in scientific notation

a)	290 000	b)	0.00000931	c)	90 400
d)	7 180	e)	0.000000675	f)	0.00549
g)	0.0894	h)	0.00228	i)	681 000 000

4. Write these scientific notation numbers into normal format:

a)	1.95×10^4	b)	5.53×10^{-2}	c)	5.14×10^{-4}
d)	4.93×10^7	e)	5.26×10^{-6}	f)	6.97×10^3
g)	7.04×10^{-7}	h)	1.97×10^{10}	i)	4.08×10

5. Simplify the following, write the final answer with positive exponents

a) $(a^2b)^3 \times \frac{a^4b}{(ab^3)^{-1}}$

b) $(ab^3)^0$

c) $\frac{x^5y^{-3}}{(x^2y^2)^2} \times \left(\frac{1}{xy^2}\right)^{-1}$

d) $\frac{8m^2n}{9m^{-3}n^2} \div \frac{16m^3n^{-1}}{3m^4n}$

e) $\frac{ab^2c}{(abc^2)^2} \times \frac{(a^{-2}b^3c)^{-1}}{a^0b^4}$

f) $2^3a^3b^4 \times 3^2a^{-2}b^2$

g) $\frac{p^3q^2}{p^{-2}q^3} \times \frac{16p^3q^3}{(2p^{-1}q^2)^3}$

h) $\left(\frac{m^3n}{mn^2}\right)^{-1} + \frac{m^3n^2}{n}$

i) $\left(\frac{x}{y} + \frac{y^2}{x^2}\right)^{-1}$

6. Solve for x in the following equations

a) $3^x = 27$

b) $x^4 = 16$

c) $5^x = 125$

d) $4^{x-2} = 1$

e) $5^4 = x$

f) $x^3 = 729$

g) $3 \times 2^x = 96$

h) $10^x = 0.0001$

i) $8^3 = x$

j) $x^7 = 16\,384$

k) $\frac{3^x}{7} = 34\frac{5}{7}$

l) $8^x = 2^3$

m) $3^{x-3} = 9$

n) $8^x = \frac{1}{2}$

o) $7^{x+2} = \frac{1}{343}$

7. If your money doubles every 3 years, how long will it take for your money to grow to 16 times its current value?

8. A cube has a length of x cm.

a) If the area of the front face of the cube is 64cm^2, what is the value of x?

b) If the volume of the cube is 1 728cm^3, what is the value of x?

c) If half of the volume of the cube is 1 687.5 cm^3, what is the value of x?

9. You are trying to raise money through a pay-it-forward initiative. If you tell 3 friends about this initiative on the first day, and they each tell 3 friends on the second day, who each tell 3 friends on the third day, and so on, how long would it take for 19 683 people to hear about it?

10. The size of a virus is 400 nanometers. 1 nanometer is 1 x 10^{-9} m. How many viruses can you fit into 1km?