**POWERS AND ROOTS - EXERCISES AND PROBLEMS**

1) Write the name of the following powers and work out their value

a) $9^2$ _____

b) $3^4$ _____

c) $10^5$ _____

d) $12^0$ _____

e) $1^{279}$ _____

f) $5^3$ _____

g) $9^7$ _____

2) Find the value of these powers. Express the answer with words.

a) Five cubed equals _____

b) Three to the fourth power equals _____

c) Seven squared equals _____

d) Ten to the power five equals _____

e) Thirty-two to the power one equals _____

f) Eighty to the power zero equals _____

g) Two to the power of six equals _____

3) Find the value of these roots. Express the answer with words.

a) The square root of 36 is _____

b) The cube root of 125 is _____

c) The square root of 10000 is _____

d) The square root of 400 is _____

e) The cube root of 8 is _____

4) Find a perfect square between 450 and 500

5) Write the squares of all numbers between 1 and 15

6) Write these numbers with two significant figures using scientific notation:

a) 42 million b) 63200074892 c) 507831000000

7) Without a calculator, write the integer square root of:

a) $\sqrt{50}$ b) $\sqrt{157}$ c) $\sqrt{67}$

8) Work out the value of the following expressions:

a) $3^2+\sqrt{20+5}=$

b) $3\cdot 2+\sqrt{16}:\sqrt{4}=$

c) $2+30:15-1^{20}+\sqrt{25}+2\cdot\sqrt{9}=$

d) $(4+1)\cdot\sqrt{36}-(2-1)^3=$

e) $2\cdot 3^2+3\cdot\sqrt{64}+7\cdot 0+1-4=$

f) $2+5\cdot 2^3-(\sqrt{25}-\sqrt{9})^2=$

g) $(5-\sqrt{4})^2+2^2\cdot 5+(\sqrt{12+4})^2=$

h) $(\sqrt{121}-5)^2+(\sqrt{25}-\sqrt{16})^7=$

9) Write the value of the following numbers:

a) $4\cdot10^5+2\cdot10^4+7\cdot10^3+5\cdot10^2+6\cdot10+1=$

b) $10^7+9\cdot10^5+5\cdot10^2+3=$

10) A cell divides in half every hour to form two new cells. How many cells do we have ten hours later?

11) In a warehouse we have placed 12 rows of squared boxes making a square. How many boxes do we have?

12) Find the length of the side of a square with an area of 81 $cm^2$.

13) I have 196 small cubes of the same size and I want to form a square with them. How many cubes do I have to place in each side?

14) If I have 425 cubes instead, how many cubes do I need now to form each side? How many cubes are left? Could I construct another square with them?

15) A square field has a surface of 900 $m^2$. How many meters of wire mesh do we need in order to fence it? If every meter costs €1.5, how much money will it cost?

16) An old legend tells us about the invention of chess. It is said that the sultan was so happy with the new game that he told the inventor that he could ask for anything he wanted in return. So the inventor answered that he wanted a grain of wheat on the first square, two grains on the second, four grains on the third.... doubling the number of grains on each square. How many grains of wheat will we have on the last square? Round the number to two significant figures and use scientific notation.
Note: a chessboard has 64 squares.

17) Work out:

a) $x^7\cdot x^{-2}=$

b) $y^{-3}\cdot y^{-6}=$

c) $z^{-5}\cdot z=$

d) $3^9:3^{-2}=$

e) $y^{-4}:y^{-7}=$

f) $w^5:w^{11}=$

g) $(z^3)^{-5}=$

h) $((-7)^2)^{-3}=$

18) Work out:

a) $(z^{-2}\cdot z^{-5}):(z^7:z^{-4})=$

b) $(x^3\cdot x^{-7}):(x^8\cdot x^{-12})=$

c) $(x^{-5}\cdot x):(x^{-2}:x^5)=$

d) $(a^2:a^{-3})\cdot(a^4:a^{-7})=$

e) $(y^7:y^{-5})\cdot(y^2:y^{15})=$

f) $(x^5\cdot x^{-2}\cdot x):(x^4:x^8)=$

19) Work out:

a) $3+4\cdot\sqrt{25}-1^{72}+\sqrt{85-4}=$

b) $7+2\cdot\left(\sqrt{64}-\sqrt{25}\right)^2-12:\sqrt{9}+7=$

c) $-5-2\cdot3^2+5\cdot\sqrt{36}-(\sqrt{64}-\sqrt{81})^2=$

d) $(5-\sqrt{49})^3-(-2)^5-(\sqrt{4})^3-(-1)^{127}=$

e) $(-4)^3:(\sqrt{25}-3)+7\cdot[8\cdot(-3)^2+(-2)^3+1]=$

f) $4\cdot(6-5\cdot 2)^2+32:2^3=$

g) $8:(-1-3)+\sqrt{4+5}-3^2\cdot(-6+12)=$

h) $216:(-2)^3-4\cdot[5\cdot(-3^2)-4\cdot(5-\sqrt{25})=$

i) $-2\cdot(6+2)^2+(-5)^3:(2\cdot 3-1)+\sqrt{100}\cdot(-3)^3=$

j) $(6-15:3)\cdot(\sqrt{9-5}\cdot 6:3-7)=$

k) $5+3\sqrt{30-5}+(\sqrt{64}-\sqrt{36})^3-\sqrt{100}:\sqrt{25}=$

20) Work out:

a) $\dfrac{5^2\cdot 7^9\cdot 5^4}{7^3\cdot 5}=$

b) $\dfrac{a^2\cdot b^5\cdot c\cdot d^{10}}{a^7\cdot b\cdot c^4\cdot d^{15}}=$

c) $\dfrac{x^4\cdot y^3\cdot x^{-7}\cdot y}{x^{-2}\cdot y^8}=$

d) $\dfrac{4^7\cdot 6^2}{2^6\cdot 3^3}=$

e) $\dfrac{(2^3)^4\cdot 5^{10}\cdot 10}{2^5\cdot(5^2)^3}=$

f) $\dfrac{7^4\cdot(2^5)^3\cdot 28}{4^3\cdot(7^4)^2}=$

g) $\dfrac{2^7\cdot 3^5\cdot 6^4}{2^{10}\cdot 3^2\cdot 2^{15}}=$

h) $\dfrac{5^4\cdot 20^3}{5^2\cdot 4^7}=$

i) $\dfrac{x^3\cdot y^6\cdot z^2\cdot x^6\cdot z^3}{y^9\cdot x^6\cdot z^5\cdot y}=$

k) $\dfrac{x^7\cdot y^2\cdot x^5\cdot y^6}{x\cdot y^2\cdot x^3\cdot y}=$

21) Work out:

a) $\dfrac{2^{-4}\cdot 20^3\cdot 5}{10^{-2}\cdot 5^4}=$

b) $\dfrac{27^{-4}\cdot 3^5\cdot 12^2}{18^{-5}}=$

c) $\dfrac{25^4\cdot 10^{-2}}{20^3\cdot 5^3\cdot 2^{-8}}=$

d) $\dfrac{15^2\cdot 5^3\cdot 3^4}{(3^3)^{-2}\cdot 5}=$

e) $\dfrac{(3^2)^7\cdot 15^3\cdot 5^4}{(5^{-2})^3\cdot 3^7}=$

f) $\dfrac{2^{-7}\cdot 5^{-2}\cdot 10^{-4}}{5^{-3}\cdot 2^9}=$

22) Yesterday I was bored and I bought one hundred and thirty pumpkins. I don't know why, but I want to form the largest possible square with them.

a) How many pumpkins do I need?

b) Now I want to make a stew with the remaining pumpkins. How many pumpkins do I have?

23) Work out:

a) $\dfrac{100^3\cdot 75}{16\cdot 2\cdot 5^2}=$

b) $\dfrac{10\cdot 5^3\cdot 2^4}{20}=$

c) $\dfrac{3^4\cdot 18\cdot 2^5}{12\cdot 2^2}=$

d) $\dfrac{25^4\cdot 20\cdot 2^5}{4\cdot 5^3}=$

e) $\dfrac{16^3\cdot 3^{15}\cdot 2^4}{2^2\cdot 3\cdot 27^2}=$

f) $\dfrac{8^3\cdot 75}{10\cdot 27^2}=$