

# Additional review exercises 1

Maths 3c

Square roots, powers and logarithms.

The square root of a number  $a$  is that number  $b$  which, when squared, gives  $a$ .

The root of any degree  $n$  of a number  $a$  is that number  $b$  which, when exponentialized to the power of  $n$ , gives  $a$ .

The logarithm in base  $b$  of a number  $a$  is the number to which  $b$  must be exponentialized in order to obtain  $a$ .

1. Examples.

$$\sqrt{4} = 2$$

$$\sqrt{9} = 3$$

$$\sqrt{20} = \sqrt{5 \cdot 4} = \sqrt{5} \cdot \sqrt{4} = \sqrt{5} \cdot 2 = 2\sqrt{5}$$

$$\sqrt{32} = \sqrt{16 \cdot 2} = \sqrt{16} \cdot \sqrt{2} = 4\sqrt{2}$$

$$\sqrt{\frac{1}{4}} = \frac{\sqrt{1}}{\sqrt{4}} = \frac{1}{2}$$

$$\sqrt{144} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3} = \sqrt{16 \cdot 9} = \sqrt{16} \cdot \sqrt{9} = 4 \cdot 3 = 12$$

$$\frac{4}{\sqrt{3}+2} = \frac{4}{\sqrt{3}+2} \cdot \frac{\sqrt{3}-2}{\sqrt{3}-2} = \frac{4 \cdot (\sqrt{3}-2)}{(\sqrt{3}+2) \cdot (\sqrt{3}-2)} = \frac{4 \cdot \sqrt{3} - 4 \cdot 2}{3 \cdot 4} = \frac{4 \cdot \sqrt{3} - 12}{12}$$

$$3^2 = 3 \cdot 3 = 9$$

$$2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$$

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

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

$$a^3 \cdot a^2 = a^{3+2} = a^5$$

$$\sqrt{3} = 3^{\frac{1}{2}}$$

$$\sqrt[3]{5} = 5^{\frac{1}{3}}$$

$$\sqrt{7^3} = 7^{\frac{3}{2}}$$

$$2^{-\frac{1}{3}} = \frac{1}{2^{\frac{1}{3}}} = \frac{1}{\sqrt[3]{2}}$$

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

$$\left(\frac{4}{3}\right)^{-1} = \frac{3}{4}$$

$$\log_2 4 = 2$$

$$\log_2 16 = 4$$

$$\log_2 \sqrt{2} = \frac{1}{2}$$

$$\log_1 \frac{1}{2} = -1$$

$$\log_2 \frac{1}{4} = -2$$

$$\log_2 \sqrt[3]{16} = \frac{4}{3}$$

$$\log_{10} \sqrt{10} = 1/2$$

$$\log_{10} 0,0001 = -4$$

$$\log_3 \frac{1}{27} = -3$$

2. Square root exercises.

Extract factors out of the square root.

$$\sqrt{\frac{4}{3}}$$

$$\sqrt{27}$$

$$\sqrt{\frac{1}{4}}$$

$$\sqrt{\frac{1}{9}}$$

$$\sqrt{32}$$

$$\sqrt{0,01}$$

$$\sqrt{\frac{9}{12}}$$

$$\sqrt{\frac{5}{100}}$$

$$\sqrt[3]{16}$$

$$\sqrt{0,0001}$$

Express without square roots in the denominator.

$$\frac{2}{\sqrt{3}}$$

$$\frac{6}{\sqrt{2}}$$

$$\frac{2}{\sqrt{2}+4}$$

$$\sqrt{\frac{1}{8}}$$

$$\sqrt{\frac{1}{12}}$$

$$\frac{9}{\sqrt{3}}$$

$$\frac{5}{\sqrt{5}}$$

$$\frac{2}{\sqrt{6}}$$

$$\frac{4}{1-\sqrt{3}}$$

$$\frac{12}{2+\sqrt{3}}$$

3. Calculate.

$$3^3 \cdot 3^2$$

$$2^{-3}$$

$$4^{-2}$$

$$6 \cdot 2^{-1}$$

$$\sqrt{0,01}$$

$$\log_3 \frac{1}{27}$$

$$\log_{10} \frac{1}{10}$$

$$\log_5 25$$

$$\log_4 1024$$

$$5^{\log_4 5}$$

Express as power and, if possible, simplify.

$$\sqrt{5}$$

$$\frac{\sqrt{2}}{3}$$

$$\sqrt{3} \cdot \frac{1}{3}$$

$$\frac{4}{\sqrt{2}}$$

$$\sqrt{5} \cdot \sqrt[3]{5}$$

$$\sqrt[3]{16} \cdot \sqrt[6]{16}$$

$$\frac{4}{\sqrt{3}}$$

$$\frac{\sqrt[3]{9}}{3}$$

$$\frac{3^{-1}}{4} \cdot \frac{\sqrt{3}}{2}$$

$$\frac{5^{-2}}{3} \cdot \sqrt{\frac{25}{9}}$$

Express as root and, if possible, simplify.

$$6^{1/2}$$

$$2^{1/3}$$

$$5^{2/3}$$

$$4^{3/2}$$

$$\frac{1}{2}^{\frac{1}{3}}$$

$$\frac{1}{8}^{\frac{1}{3}}$$

$$\frac{4}{9}^{\frac{1}{2}}$$

$$1000^{1/3}$$

4. Answers. 2:

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