

Section 6.3 Investigate Rational Exponents

1. Evaluate, without using a calculator.

- a) $49^{\frac{1}{2}}$ b) $(-64)^{\frac{1}{3}}$
c) $0.16^{\frac{1}{2}}$ d) $\sqrt[5]{-32}$

2. Evaluate, without using a calculator.

- a) $\left(\frac{64}{100}\right)^{\frac{1}{2}}$ b) $\sqrt[3]{-\frac{8}{125}}$
c) $\sqrt[3]{0.216}$ d) $\sqrt[4]{0.0016}$

3. Evaluate, without using a calculator.

- a) $81^{\frac{3}{4}}$ b) $81^{\frac{3}{2}}$
c) $(-1000)^{\frac{2}{3}}$ d) $0.064^{\frac{2}{3}}$

4. Evaluate, without using a calculator.

- a) $\left(\frac{16}{25}\right)^{\frac{3}{2}}$ b) $\left(\frac{8}{216}\right)^{-\frac{2}{3}}$
c) $\left(-\frac{1000}{27}\right)^{-\frac{4}{3}}$ d) $0.0256^{\frac{3}{4}}$

5. Use a calculator to evaluate each of the following. Round answers to 3 decimal places.

- a) $54^{\frac{1}{3}}$ b) $(-15)^{-\frac{1}{5}}$

6. Write each expression as a power. Do not evaluate.

- a) $(\sqrt{5})^3$ b) $\sqrt[3]{5}$

7. The number of Internet users, n , who visited the Super Online Dictionary website during any given month in its first year of operation is modelled by the relation $n = 20\,000(2)^{(t-4)}$, where t represents the month, with January = 1, February = 2, and so on.

- a) How many visitors did the website have in March?

b) In which month did the website have 160 000 visitors?

c) In which month was the number of visitors to the website at its highest level? How many visitors did the website have in this month?

8. Film and digital cameras take photos by allowing light to pass through an opening with a variable size in a lens, called an aperture. In photography, f -stops are special numbers assigned to the different sizes of apertures.

a) The f -stop numbers can be generated using

the relation $f = 2^{\frac{x}{2}}$, where f is the f -stop number and x is the counting number. Using a calculator, substitute the numbers 1 to 5 for x to generate the first 5 f -stop numbers. Round the numbers to one decimal place.

b) The diameter, d , of the aperture for each f -stop number can be generated using the relation $d = lf^{-1}$, where l is the focal length of the lens used by the camera and f is the f -stop number. Determine the diameters of the aperture in a camera with a lens that has a focal length of 80 mm for the first 5 f -stop numbers. Round your answers to the nearest tenth of a millimetre.

9. Nasir stated that the radius, r , of a sphere in terms of its volume, V , is given by the

$$\text{equation } r = \left(\frac{4\pi}{3V}\right)^{-\frac{1}{3}}.$$

a) Determine the radius of a sphere with a volume of 500 cm^3 , to the nearest tenth of a centimetre.

b) Solve this equation for V .

c) Is there a simpler formula Nasir could have used? Explain.