Math 10

Lesson 1–6 Answers

Lesson Questions

Question 1

a) $\sqrt[3]{18} = 18^{\frac{1}{3}}$

b) $14^{\frac{1}{4}} = \sqrt[4]{14}$

c) $3\sqrt[4]{6} = 3\left(6\right)^{\frac{1}{4}}$

b) $5 \cdot 4^{\frac{1}{3}} = 5\sqrt[3]{4}$

e) $\sqrt[3]{3^2} = \left(3^2\right)^{\frac{1}{3}} = 3^{\frac{2}{3}}$

f) $5^{0.75} = 5^{\frac{3}{4}} = \sqrt[4]{5^3}$ *or* $\left(\sqrt[4]{5}\right)^3$

Question 2

$100^{\frac{1}{2}} = 10$

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

$$\left(\frac{4}{9}\right)^{\frac{1}{2}} = \frac{4^{\frac{1}{2}}}{9^{\frac{1}{2}}} = \frac{2}{3}$$

$$\left(\frac{9}{16}\right)^{\frac{3}{2}} = \left(\left(\frac{9}{16}\right)^{\frac{1}{2}}\right)^3 = \left(\frac{9^{\frac{1}{2}}}{16^{\frac{1}{2}}}\right)^3 = \left(\frac{3}{4}\right)^3 = \frac{3^3}{4^3} = \frac{27}{64}$$

Nasty question of the day

Consider $\sqrt[3]{343^4}$

$\left(\sqrt[3]{343}\right)^4$ $\quad$ $343^{\frac{4}{3}}$ $\quad$ $\left(343^{\frac{1}{3}}\right)^4$ $\quad$ $\left(343^4\right)^{\frac{1}{3}}$

Assignment

1. a) $16^{\frac{1}{2}} = \sqrt{16} = 4$

   c) $64^{\frac{1}{3}} = \sqrt[3]{64} = 4$

   d) $32^{\frac{1}{5}} = \sqrt[5]{64} = 2$

   f) $(-1000)^{\frac{1}{3}} = \sqrt[3]{-1000} = -10$

2. a) $100^{0.5} = 100^{\frac{1}{2}} = \sqrt{100} = 10$

   b) $81^{0.25} = 81^{\frac{1}{4}} = \sqrt[4]{81} = 3$

   c) $1024^{0.2} = 1024^{\frac{1}{5}} = \sqrt[5]{1024} = 4$

   d) $(-32)^{0.2} = (-32)^{\frac{1}{5}} = \sqrt[5]{-32} = -2$

3. a) $36^{\frac{1}{3}} = \sqrt[3]{36}$ b) $48^{\frac{1}{2}} = \sqrt{48}$ c) $(-30)^{\frac{1}{5}} = \sqrt[5]{-30}$

4. a) $\sqrt{39} = 39^{\frac{1}{2}}$ b) $\sqrt[4]{90} = 90^{\frac{1}{4}}$

   c) $29^{\frac{1}{3}}$ d) $100^{\frac{1}{5}}$

5. a) 1 b) 2 c) $8^{\frac{2}{3}} = \left(8^{\frac{1}{3}}\right)^2 = 2^2 = 4$

   d) $8^{\frac{3}{3}} = 8^1 = 8$ e) $8^{\frac{4}{3}} = \left(8^{\frac{1}{3}}\right)^4 = 2^4 = 16$ f) $8^{\frac{5}{3}} = \left(8^{\frac{1}{3}}\right)^5 = 2^5 = 32$

6. a) $\sqrt[3]{4^2}$ *or* $\sqrt[3]{4}^2$ b) $\sqrt[5]{-10^3}$ *or* $\sqrt[5]{-10}^3$ c) $\sqrt{2.3^3}$ *or* $\sqrt{2.3}^3$

7. $\sqrt[3]{350}$ $350^{\frac{1}{3}}$

8. d) $0.75^{0.75} = 0.75^{\frac{3}{4}} = \sqrt[4]{0.75^3}$ e) $\left(-\frac{5}{9}\right)^{\frac{2}{5}} = \sqrt[5]{-\frac{5}{9}}^2$ f) $1.25^{1.5} = 1.25^{\frac{3}{2}} = \sqrt{1.25^3}$

9. a) $3.8^{\frac{3}{2}}$ b) $-1.5^{\frac{2}{3}}$ c) $\left(\frac{9}{5}\right)^{\frac{5}{4}}$

10. Evaluate each power without using a calculator.

a) $9^{\frac{3}{2}} = \left(9^{\frac{1}{2}}\right)^3 = 3^3 = 27$

b) $\left(\frac{27}{8}\right)^{\frac{2}{3}} = \left(\left(\frac{27}{8}\right)^{\frac{1}{3}}\right)^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

c) $(-27)^{\frac{2}{3}} = \left((-27)^{\frac{1}{3}}\right)^2 = (-3)^2 = 9$

11. a) $2 = 4^{\frac{1}{2}} = \sqrt{4}$ b) $4 = 16^{\frac{1}{2}} = \sqrt{16}$ c) $100 = 100^{\frac{1}{2}} = \sqrt{100}$ d) $3 = 9^{\frac{1}{2}} = \sqrt{9}$

e) $5 = 25^{\frac{1}{2}} = \sqrt{25}$

12. a) $-1 = -1^{\frac{1}{3}} = \sqrt[3]{-1}$ b) $2 = 8^{\frac{1}{3}} = \sqrt[3]{8}$ c) $3 = 27^{\frac{1}{3}} = \sqrt[3]{27}$ d) $-4 = -64^{\frac{1}{3}} = \sqrt[3]{-64}$

e) $4\,4 = 64^{\frac{1}{3}} = \sqrt[3]{64}$

13. $\left(\frac{1}{4}\right)^{\frac{3}{2}}, \sqrt[3]{4}, 4^{\frac{3}{2}}, 4^2$

14.

$h = 35d^{\frac{2}{3}}$

$h = 35(3.2)^{\frac{2}{3}}$

$h = 76m$

15.

$1.96^{\frac{3}{2}} = \cancel{\left(\sqrt[3]{1.96}\right)^2} \rightarrow = \left(\sqrt{1.96}\right)^3$

$= (1.2514)^2 = 1.4^3$

$= 1.5661... = 2.744$

16.

$SA = 0.096m^{0.7}$

$SA = 0.096(40)^{0.7}$

$SA = 1.27$

17. Karen. You can multiply something by itself 4 times, but how do you multiply something by itself an extra .2 times?