

review unit 4

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ___ 1. Identify the index of $\sqrt[3]{2^7}$.
a. 2^7 b. 3 c. 7 d. 2
- ___ 2. Evaluate $\sqrt[4]{16}$.
a. 2 b. 2.6 c. 16 d. 1.41
- ___ 3. Evaluate $\sqrt[3]{-64}$.
a. -4 b. impossible c. -12.8 d. 4
- ___ 4. Evaluate $\sqrt[3]{0.343}$.
a. 0.7 b. 0.007 c. 0.1143 d. 0.49
- ___ 5. Evaluate $\sqrt[4]{\frac{256}{625}}$.
a. $\frac{4}{5}$ b. $\frac{4}{25}$ c. $\frac{16}{25}$ d. $\frac{16}{5}$
- ___ 6. Write an equivalent form of 9 as a cube root.
a. $\sqrt[3]{6561}$ b. $\sqrt[3]{729}$ c. $\sqrt[3]{9\sqrt{81}}$ d. $\sqrt{81}$
- ___ 7. Which of these numbers is rational?
 $\sqrt{\frac{4}{169}}, \sqrt{48}, \sqrt[3]{-16}, \sqrt{8.1}$
a. $\sqrt{48}$ b. $\sqrt{8.1}$ c. $\sqrt[3]{-16}$ d. $\sqrt{\frac{4}{169}}$
- ___ 8. Which of these numbers is irrational?
 $\sqrt{48}, \sqrt[3]{216}, \sqrt{\frac{49}{16}}, -68$
a. -68 b. $\sqrt{48}$ c. $\sqrt[3]{216}$ d. $\sqrt{\frac{49}{16}}$
- ___ 9. Order these numbers from greatest to least: $\sqrt[3]{99}, \sqrt{170}, \sqrt[3]{3050}, \sqrt{18}, \sqrt[3]{51}$
a. $\sqrt{170}, \sqrt[3]{99}, \sqrt[3]{3050}, \sqrt{18}, \sqrt[3]{51}$ c. $\sqrt[3]{3050}, \sqrt{170}, \sqrt[3]{99}, \sqrt{18}, \sqrt[3]{51}$
b. $\sqrt[3]{3050}, \sqrt{18}, \sqrt[3]{51}, \sqrt{170}, \sqrt[3]{99}$ d. $\sqrt[3]{3050}, \sqrt{170}, \sqrt{18}, \sqrt[3]{51}, \sqrt[3]{99}$
- ___ 10. For which number will the fourth root be rational?
256, 27, -81, 40 000
a. 40 000 b. -81 c. 27 d. 256
- ___ 11. Which of these numbers is an integer, but not a whole number?

-9, 0, 1, $\sqrt{5}$

- a. 0 b. -9 c. $\sqrt{5}$ d. 1

___ 12. Which of these numbers is a natural number?

9, 0, -1, $1.\bar{8}$

- a. 9 b. 0 c. $1.\bar{8}$ d. -1

___ 13. The area of a square is 64 square inches. What do you know about the square?

- a. Both its side length and its perimeter are irrational.
b. Its side length is irrational and its perimeter is rational.
c. Its side length is rational and its perimeter is irrational.
d. Both its side length and its perimeter are rational.

___ 14. To which set(s) of numbers does $-\sqrt{25}$ belong?

I	Natural
II	Integer
III	Rational
IV	Irrational

- a. II and III only b. III only c. I, II and III only d. IV only

___ 15. Write $\sqrt{108}$ in simplest form.

- a. $3\sqrt{12}$ b. $6\sqrt{3}$ c. $36\sqrt{3}$ d. $3\sqrt{6}$

___ 16. Write $\sqrt[3]{80}$ in simplest form.

- a. $10\sqrt[3]{2}$ b. $2\sqrt[3]{10}$ c. $8\sqrt[3]{10}$ d. $4\sqrt[3]{5}$

___ 17. Write $\sqrt[4]{405}$ in simplest form.

- a. $3\sqrt[4]{5}$ b. $81\sqrt[4]{5}$ c. $9\sqrt[4]{5}$ d. $5\sqrt[4]{3}$

___ 18. Write $6\sqrt{5}$ as an entire radical.

- a. $\sqrt{30}$ b. $\sqrt{150}$ c. $\sqrt{180}$ d. $\sqrt{900}$

___ 19. Write $3\sqrt[3]{4}$ as an entire radical.

- a. $\sqrt[3]{108}$ b. $\sqrt[3]{144}$ c. $\sqrt[3]{36}$ d. $\sqrt[3]{192}$

___ 20. Write $3\sqrt[4]{2}$ as an entire radical.

- a. $\sqrt[4]{48}$ b. $\sqrt[4]{18}$ c. $\sqrt[4]{162}$ d. $\sqrt[4]{36}$

___ 21. Write $\sqrt{98}$ in simplest form.

- a. $7\sqrt{14}$ b. $7\sqrt{2}$ c. $2\sqrt{7}$ d. $49\sqrt{2}$

___ 22. Write $\sqrt[3]{1372}$ in simplest form.

- a. $7\sqrt[3]{28}$ b. $4\sqrt[3]{7}$ c. $14\sqrt[3]{7}$ d. $7\sqrt[3]{4}$

___ 23. Write $\sqrt[4]{160}$ in simplest form.

- a. $2^4\sqrt{10}$ b. $4^4\sqrt{10}$ c. $10^4\sqrt{2}$ d. $2^4\sqrt{20}$
- ___ 24. Write $4^5\sqrt{12}$ as an entire radical.
 a. $\sqrt[5]{192}$ b. $\sqrt[5]{2304}$ c. $\sqrt[5]{995\,328}$ d. $\sqrt[5]{12\,288}$
- ___ 25. Evaluate $64^{\frac{1}{3}}$ without using a calculator.
 a. 8 b. 4 c. -4 d. $21\frac{1}{3}$
- ___ 26. Evaluate $(-27)^{\frac{1}{3}}$ without using a calculator.
 a. -3 b. 3 c. -9 d. does not exist
- ___ 27. Evaluate $\left(\frac{256}{625}\right)^{\frac{1}{4}}$ without using a calculator.
 a. $\frac{64}{625}$ b. $\frac{4}{25}$ c. $\frac{4}{5}$ d. $\frac{16}{25}$
- ___ 28. Write $42^{\frac{5}{4}}$ as a radical.
 a. $\sqrt[5]{42^4}$ b. $\left(\sqrt[4]{42}\right)^5$ c. $\sqrt[125]{42}$ d. $\left(\sqrt[5]{42}\right)^4$
- ___ 29. Write $\sqrt{\left(\frac{3}{4}\right)^9}$ as a power.
 a. $\left(\frac{3}{4}\right)^{-\frac{9}{2}}$ b. $\left(\frac{3}{4}\right)^{\frac{9}{2}}$ c. $\left(\frac{4}{3}\right)^{-\frac{2}{9}}$ d. $\left(\frac{3}{4}\right)^{\frac{2}{9}}$
- ___ 30. Evaluate $0.16^{\frac{5}{2}}$.
 a. 0.4804 b. 0.1012 c. 0.0256 d. 0.010 24
- ___ 31. Evaluate $(-243)^{0.6}$.
 a. -27 b. does not exist c. 27 d. 9462.5994...
- ___ 32. Biologists use the formula $b = 0.01m^{\frac{2}{3}}$ to estimate the brain mass, b kilograms, of a mammal with body mass m kilograms. Estimate the brain mass of a mammal with body mass 276 kg.
 a. About 4.24 kg b. About 0.42 kg c. About 9.13 kg d. About 253.92 kg
- ___ 33. A cube has volume 1200 cubic inches. Write the edge length of the cube as a power.
 a. $\sqrt[3]{1200}$ in. b. $1200^{\frac{1}{3}}$ in. c. 1200^3 in. d. 1200^{-3} in.

- ___ 34. Evaluate $4^{2.5}$.
- a. 18
b. 32
c. 1.741 101...
d. 40
- ___ 35. Evaluate 3^{-2} without using a calculator.
- a. $\sqrt{3}$
b. $\frac{1}{6}$
c. $\frac{1}{9}$
d. 9
- ___ 36. Evaluate $\left(\frac{2}{3}\right)^{-3}$.
- a. $-\frac{27}{8}$
b. $-\frac{8}{27}$
c. $\frac{27}{8}$
d. $-\frac{1}{6}$
- ___ 37. Evaluate $64^{-\frac{4}{3}}$ without using a calculator.
- a. $\frac{1}{256}$
b. $\frac{3}{256}$
c. $-\frac{1}{256}$
d. -256
- ___ 38. Evaluate $\left(\frac{625}{256}\right)^{\frac{3}{4}}$ without using a calculator.
- a. $-\frac{64}{125}$
b. $\frac{125}{64}$
c. $-\frac{125}{64}$
d. $\frac{64}{125}$
- ___ 39. Evaluate $(-216)^{-\frac{1}{3}}$ without using a calculator.
- a. $\frac{1}{36}$
b. $\frac{1}{6}$
c. $-\frac{1}{36}$
d. $-\frac{1}{6}$
- ___ 40. Evaluate $(0.81)^{-\frac{3}{2}}$ without using a calculator.
- a. $\frac{81}{100}$
b. $\frac{729}{1000}$
c. $\frac{100}{81}$
d. $\frac{1000}{729}$
- ___ 41. Evaluate $(0.64)^{-\frac{1}{2}}$ without using a calculator.
- a. $\frac{4}{5}$
b. $-\frac{4}{5}$
c. $\frac{1}{4}$
d. $\frac{5}{4}$
- ___ 42. Evaluate $49^{-0.5}$ without using a calculator.
- a. $\frac{2}{49}$
b. $\frac{1}{49}$
c. $\frac{1}{7}$
d. 7
- ___ 43. Which power with a negative exponent is equivalent to $\frac{1}{125}$?
- a. 5^{-3}
b. -5^{-3}
c. 3^{-5}
d. $(-5)^3$
- ___ 44. Which power with a negative exponent is equivalent to $\frac{125}{512}$?

a. $\left(\frac{8}{5}\right)^{-3}$ b. $\left(\frac{5}{8}\right)^{-2}$ c. $\left(\frac{8}{5}\right)^{-2}$ d. $\left(\frac{5}{8}\right)^{-3}$

___ 45. Given that $6^{10} = 60\,466\,176$, what is 6^{-10} ?
 a. -6 b. $-\frac{1}{6}$ c. $\frac{1}{60\,466\,176}$ d. $\frac{1}{60\,466\,176}$

___ 46. Suppose you want \$2000 in 3 years. The interest rate for a savings account is 2.8% compounded annually. The money, P dollars, you must invest now is given by the formula $P = 2000(1.028)^{-3}$. How much must you invest now to have \$2000 in 3 years?
 a. \$1845.02 b. \$2172.75 c. \$1840.99 d. \$1836.58

___ 47. Simplify $\frac{(3.5^{-6})(3.5^5)}{3.5^{-1}}$ by writing as a single power.
 a. 3.5^0 b. 3.5^{-29} c. 3.5^0 d. 3.5^{-2}

___ 48. Simplify $m^{-2}n^6 \cdot m^3n^{-8}$. Write using powers with positive exponents.
 a. mn^2 b. $\frac{m}{n^2}$ c. $\frac{n^{14}}{m^5}$ d. $\frac{n^2}{m}$

___ 49. Simplify $\frac{12p^3q^{-7}}{15pq^6}$. Write using powers with positive exponents.
 a. $\frac{4p^3}{5q^{13}}$ b. $\frac{p^2}{3q^{13}}$ c. $\frac{4p^2}{5q}$ d. $\frac{4p^2}{5q^{13}}$

___ 50. Simplify $(64a^{12}b^{15})^{\frac{2}{3}}$.
 a. $16a^8b^{10}$ b. $16a^{18}b^{10}$ c. $64a^8b^{10}$ d. $16a^8b^{25}$

___ 51. Simplify $\left(\frac{36x^4y^3}{4x^8y^{-1}}\right)^{\frac{1}{2}}$.
 a. $3x^2y^2$ b. $\frac{3y^2}{x^2}$ c. $\frac{3y}{x^2}$ d. $\frac{3y^2}{x^6}$

___ 52. Simplify $\left(\frac{5}{2}a^{-4}b^7\right)^{-3}$.
 a. $\frac{125b^{21}}{8a^{12}}$ b. $\frac{8a^{12}}{125b^{21}}$ c. $\frac{125a^{12}}{8b^{21}}$ d. $\frac{8b^4}{125a^7}$

___ 53. Simplify $\frac{(m^3n^{-3})^{-1}}{(m^{-2}n)^4}$.

a. $\frac{m^5}{m^7}$

b. $\frac{m^5}{m}$

c. $\frac{m^{11}}{m}$

d. $\frac{m^{11}}{m^7}$

Short Answer

54. Evaluate $\sqrt[3]{-1728}$.

55. Estimate the value of $\sqrt{35}$ to one decimal place.

56. Between which 2 consecutive integers on a number line would you locate $\sqrt[4]{220}$?

57. Which of these numbers are irrational?

$\sqrt[5]{-1024}, \sqrt{72}, \sqrt[3]{125}, 6.3\bar{1}4, \sqrt[4]{64}, -12.8, \sqrt{196}, 8.121\ 121\ 112\ 111\dots$

58. Write $\sqrt{1694}$ in simplest form.

59. Write $8\sqrt{19}$ as an entire radical.

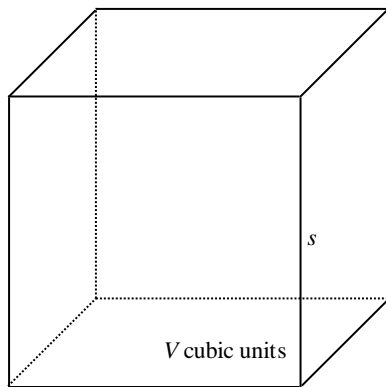
60. A cube has a volume of 1280 cubic feet. Determine the edge length of the cube as a radical in simplest form.

61. Evaluate $\left(\frac{8}{27}\right)^{-\frac{2}{3}}$ without using a calculator.

62. Evaluate $(0.027)^{-\frac{1}{3}}$ without using a calculator.

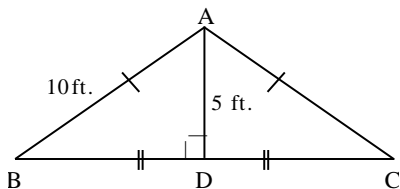
63. Evaluate $81^{-\frac{3}{4}}$ without using a calculator.

64. A sphere has volume 1417 cm^3 . What is the radius of the sphere to the nearest tenth of a centimetre?65. A sphere has volume 2245 cm^3 . What is the surface area of the sphere to the nearest tenth of a square centimetre?**Problem**66. Is the cube root of 250 rational or irrational?
Use 2 different strategies to justify your answer.67. This diagram shows a cube with volume V cubic units and edge length s units.



Provide a value of V for which s is rational.

68. In isosceles $\triangle ABC$, what is the length of BC ? Write your answer as a mixed radical.



69. The height, h metres, of a Douglas fir tree can be estimated from the formula $h = 35d^{\frac{2}{3}}$, where d metres is the diameter at the base. Use this formula to determine the approximate height of a Douglas fir tree with base diameter 4.1 m. Write the answer to the nearest metre.

70. A formula for the approximate surface area, SA square metres, of a person's body is

$$SA = 0.096m^{\frac{7}{10}}, \text{ where } m \text{ is the person's mass, in kilograms.}$$

Calculate the surface area of a person with mass 75 kg.

71. Here is Tanisha's solution for evaluating a power:

$$\begin{aligned} \left(\frac{5}{4}\right)^{\frac{2}{7}} &= \left(\sqrt{\frac{5}{4}}\right)^7 \\ &= (1.1180\dots)^7 \\ &= 2.1837\dots \end{aligned}$$

Identify the errors Tanisha made. Write a correct solution.

72. At a distance of 1 m from a light source, the intensity of the light is 2 mW/m^2 (milliwatts per square metre). The intensity, I , at a distance d metres from the source is given by the formula: $I = 2d^{-2}$. Determine the intensity of the light 2.5 m from the source.

73. Here is a student's solution for evaluating a power:

$$\begin{aligned} \left(\frac{8}{27}\right)^{-\frac{2}{3}} &= \left(-\frac{8}{27}\right)^{\frac{2}{3}} \\ &= \left(\sqrt{\frac{8}{27}}\right)^2 \\ &= \left(-\frac{2}{3}\right)^2 \\ &= \frac{4}{9} \end{aligned}$$

Identify any errors in the solution. Write a correct solution.

74. A cone with equal height and radius has volume 492 cm^3 . What is the height of the cone to the nearest tenth of a centimetre?
75. A tree farmer used the formula $V = 0.5d^2h$ to estimate the volume, V cubic metres, of a tree with height h metres and mean trunk diameter d metres. The height of a tree is 20 times its mean trunk diameter, and its volume is 230 m^3 . What is the mean trunk diameter of this tree to the nearest metre?
76. Identify any errors in each simplification. Write a correct solution.

$$\begin{aligned} \text{a) } (x^{-6}y^6) \left(x^{-\frac{1}{6}}y^5\right) &= x^{-6} \cdot x^{-\frac{1}{6}} \cdot y^6 \cdot y^5 \\ &= x^{-6\frac{1}{6}} \cdot y^{11} \\ &= xy^{30} \end{aligned}$$

$$\begin{aligned} \text{b) } \left(\frac{2m^{\frac{1}{4}}}{n^4}\right)^{-4} &= \frac{8m^{-1}}{n^0} \\ &= -8m^{-1} \\ &= \frac{1}{8m} \end{aligned}$$

77. Use exponent laws to simplify $\left(\sqrt[8]{x}\right)\left(\sqrt[5]{x^3}\right)$. Explain your strategy.

review unit 4
Answer Section

MULTIPLE CHOICE

- | | | | |
|---------------------------|-----------------------------------|---------------|---|
| 1. ANS: B
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.1 Estimating Roots
KEY: Procedural Knowledge |
| 2. ANS: A
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.1 Estimating Roots
KEY: Conceptual Understanding |
| 3. ANS: A
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.1 Estimating Roots
KEY: Conceptual Understanding |
| 4. ANS: A
LOC: 10.AN1 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.1 Estimating Roots
KEY: Conceptual Understanding |
| 5. ANS: A
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.1 Estimating Roots
KEY: Conceptual Understanding |
| 6. ANS: B
LOC: 10.AN1 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.1 Estimating Roots
KEY: Conceptual Understanding |
| 7. ANS: D
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.2 Irrational Numbers
KEY: Procedural Knowledge |
| 8. ANS: B
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.2 Irrational Numbers
KEY: Procedural Knowledge |
| 9. ANS: C
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Moderate | REF: 4.2 Irrational Numbers
KEY: Conceptual Understanding |
| 10. ANS: D
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Moderate | REF: 4.2 Irrational Numbers
KEY: Conceptual Understanding |
| 11. ANS: B
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.2 Irrational Numbers
KEY: Procedural Knowledge |
| 12. ANS: A
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.2 Irrational Numbers
KEY: Procedural Knowledge |
| 13. ANS: D
LOC: 10.AN1 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.2 Irrational Numbers
KEY: Conceptual Understanding |
| 14. ANS: A
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.2 Irrational Numbers
KEY: Conceptual Understanding |
| 15. ANS: B
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.3 Mixed and Entire Radicals
KEY: Conceptual Understanding |
| 16. ANS: B
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.3 Mixed and Entire Radicals
KEY: Conceptual Understanding |
| 17. ANS: A
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.3 Mixed and Entire Radicals
KEY: Conceptual Understanding |
| 18. ANS: C
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.3 Mixed and Entire Radicals
KEY: Conceptual Understanding |
| 19. ANS: A
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.3 Mixed and Entire Radicals
KEY: Conceptual Understanding |
| 20. ANS: C
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.3 Mixed and Entire Radicals
KEY: Conceptual Understanding |
| 21. ANS: B
LOC: 10.AN2 | PTS: 1
TOP: Algebra and Number | DIF: Easy | REF: 4.3 Mixed and Entire Radicals
KEY: Conceptual Understanding |

22. ANS: D PTS: 1 DIF: Moderate REF: 4.3 Mixed and Entire Radicals
 LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
23. ANS: A PTS: 1 DIF: Moderate REF: 4.3 Mixed and Entire Radicals
 LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
24. ANS: D PTS: 1 DIF: Easy REF: 4.3 Mixed and Entire Radicals
 LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
25. ANS: B PTS: 1 DIF: Easy
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
26. ANS: A PTS: 1 DIF: Easy
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
27. ANS: C PTS: 1 DIF: Easy
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
28. ANS: B PTS: 1 DIF: Easy
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
29. ANS: B PTS: 1 DIF: Easy
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
30. ANS: D PTS: 1 DIF: Moderate
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
31. ANS: A PTS: 1 DIF: Moderate
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
32. ANS: B PTS: 1 DIF: Moderate
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
33. ANS: B PTS: 1 DIF: Easy
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
34. ANS: B PTS: 1 DIF: Moderate
 REF: 4.4 Fractional Exponents and Radicals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
35. ANS: C PTS: 1 DIF: Easy
 REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
36. ANS: C PTS: 1 DIF: Moderate
 REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
37. ANS: A PTS: 1 DIF: Easy
 REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
38. ANS: D PTS: 1 DIF: Moderate
 REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
 TOP: Algebra and Number KEY: Conceptual Understanding
39. ANS: D PTS: 1 DIF: Easy

- REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
40. ANS: D PTS: 1 DIF: Moderate
REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
41. ANS: D PTS: 1 DIF: Easy
REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
42. ANS: C PTS: 1 DIF: Moderate
REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
43. ANS: A PTS: 1 DIF: Easy
REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
44. ANS: A PTS: 1 DIF: Easy
REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
45. ANS: D PTS: 1 DIF: Easy
REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
46. ANS: C PTS: 1 DIF: Moderate
REF: 4.5 Negative Exponents and Reciprocals LOC: 10.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
47. ANS: A PTS: 1 DIF: Easy REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
48. ANS: B PTS: 1 DIF: Easy REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
49. ANS: D PTS: 1 DIF: Easy REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
50. ANS: A PTS: 1 DIF: Easy REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
51. ANS: B PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
52. ANS: B PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
53. ANS: B PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding

SHORT ANSWER

54. ANS:
-12

PTS: 1 DIF: Easy REF: 4.1 Estimating Roots
LOC: 10.AN1 TOP: Algebra and Number KEY: Conceptual Understanding
55. ANS:
5.9

PTS: 1 DIF: Moderate REF: 4.1 Estimating Roots

56. LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
ANS:
3 and 4

PTS: 1 DIF: Moderate REF: 4.2 Irrational Numbers
LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
57. ANS:
 $\sqrt{72}$, $\sqrt[4]{64}$, and 8.121 121 112 111...

PTS: 1 DIF: Easy REF: 4.2 Irrational Numbers
LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
58. ANS:
 $11\sqrt{14}$

PTS: 1 DIF: Easy REF: 4.3 Mixed and Entire Radicals
LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
59. ANS:
 $\sqrt{1216}$

PTS: 1 DIF: Easy REF: 4.3 Mixed and Entire Radicals
LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
60. ANS:
 $4^3\sqrt{20}$ ft.

PTS: 1 DIF: Moderate REF: 4.3 Mixed and Entire Radicals
LOC: 10.AN2 TOP: Algebra and Number KEY: Conceptual Understanding
61. ANS:
9
4

PTS: 1 DIF: Moderate REF: 4.5 Negative Exponents and Reciprocals
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
62. ANS:
10
3

PTS: 1 DIF: Moderate REF: 4.5 Negative Exponents and Reciprocals
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
63. ANS:
1
27

PTS: 1 DIF: Moderate REF: 4.5 Negative Exponents and Reciprocals
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
64. ANS:
7.0 cm

PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws

- LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding
65. ANS:
829.1 cm²
- PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws
LOC: 10.AN3 TOP: Algebra and Number KEY: Conceptual Understanding

PROBLEM

66. ANS:
250 is not a perfect cube, so the cube root of 250 is irrational.

$\sqrt[3]{250} = 6.299\ 605\ 249\ 474\dots$
6.299 605 249 474... does not appear to terminate or repeat.
So, the cube root of 250 is likely irrational.

- PTS: 1 DIF: Moderate REF: 4.2 Irrational Numbers
LOC: 10.AN1 TOP: Algebra and Number KEY: Problem-Solving Skills
67. ANS:

The formula for the volume, V , of a cube with edge length s units is:

$$V = s^3$$

To determine the value of s , take the cube root of each side.

$$\sqrt[3]{V} = \sqrt[3]{s^3}$$

$$\sqrt[3]{V} = s$$

For s to be rational, V must be a positive number that is a perfect cube.

For example, $V = 125$

- PTS: 1 DIF: Moderate REF: 4.2 Irrational Numbers
LOC: 10.AN1 TOP: Algebra and Number
KEY: Problem-Solving Skills | Communication
68. ANS:

Use the Pythagorean Theorem in $\triangle ABD$ to determine BD .

$$10^2 = 5^2 + BD^2$$

$$BD^2 = 10^2 - 5^2$$

$$BD^2 = 75$$

$$BD = \sqrt{75}$$

$$BD = 5\sqrt{3}$$

$$BD = \frac{1}{2} BC$$

So, $BC = 2 \cdot BD$

$$BC = 2(5\sqrt{3})$$

$$= 10\sqrt{3}$$

The length of BC is $10\sqrt{3}$ ft.

PTS: 1 DIF: Moderate REF: 4.3 Mixed and Entire Radicals
LOC: 10.AN2 TOP: Algebra and Number KEY: Problem-Solving Skills

69. ANS:
Substitute $d = 4.1$ in the formula:

$$h = 35d^{\frac{2}{3}}$$
$$h = 35\left(4.1^{\frac{2}{3}}\right)$$
$$h = 35\left(\sqrt[3]{4.1^2}\right)$$
$$h = 35(2.5616\dots)$$
$$h = 89.6583\dots$$

So, the height of a Douglas fir with a base diameter of 4.1 m is approximately 90 m.

PTS: 1 DIF: Moderate REF: 4.4 Fractional Exponents and Radicals
LOC: 10.AN3 TOP: Algebra and Number KEY: Problem-Solving Skills

70. ANS:
Substitute $m = 75$ in the formula: $SA = 0.096m^{\frac{7}{10}}$

$$SA = 0.096(75)^{\frac{7}{10}}$$
$$SA = 0.096\sqrt[10]{75^7}$$
$$SA = 1.9715\dots$$

The surface area of a person with mass 75 kg is approximately 2.0 m^2 .

PTS: 1 DIF: Moderate REF: 4.4 Fractional Exponents and Radicals
LOC: 10.AN3 TOP: Algebra and Number KEY: Problem-Solving Skills

71. ANS:
Tanisha made an error in the first line when she wrote the square root symbol ($\sqrt{\quad}$) instead of the ($\sqrt[7]{\quad}$) symbol. Also, the exponent outside the bracket should have been 2, not 7. (The numerator of a fractional exponent represents the index of the radical and the denominator represents the exponent of the power.)

A correct solution:

$$\left(\frac{5}{4}\right)^{\frac{2}{7}} = \left(\sqrt[7]{\frac{5}{4}}\right)^2$$
$$= (1.0323\dots)^2$$
$$= 1.0658\dots$$

PTS: 1 DIF: Moderate REF: 4.4 Fractional Exponents and Radicals
LOC: 10.AN3 TOP: Algebra and Number
KEY: Problem-Solving Skills | Communication

72. ANS:

Use the formula $I = 2d^{-2}$. Substitute: $d = 2.5$

$$\begin{aligned} I &= 2(2.5)^{-2} \\ &= 2\left(\frac{1}{2.5^2}\right) \\ &= 2\left(\frac{1}{6.25}\right) \\ &= 0.32 \end{aligned}$$

At a distance of 2.5 m, the intensity of light is 0.32 mW/m².

PTS: 1 DIF: Moderate REF: 4.5 Negative Exponents and Reciprocals
LOC: 10.AN3 TOP: Algebra and Number KEY: Problem-Solving Skills

73. ANS:

In the first line of the solution, to write the power with a positive exponent, the student wrote the fraction inside the brackets as a negative fraction instead of taking the reciprocal of the original fraction.

In the second line, the student wrote the index of the radical as 2 instead of 3. The radicand should have been positive and should have been written as the reciprocal of the fraction.

A correct solution is:

$$\begin{aligned} \left(\frac{8}{27}\right)^{-\frac{2}{3}} &= \left(\frac{27}{8}\right)^{\frac{2}{3}} \\ &= \left(\sqrt[3]{\frac{27}{8}}\right)^2 \\ &= \left(\frac{3}{2}\right)^2 \\ &= \frac{9}{4} \end{aligned}$$

PTS: 1 DIF: Moderate REF: 4.5 Negative Exponents and Reciprocals
LOC: 10.AN3 TOP: Algebra and Number
KEY: Problem-Solving Skills | Communication

74. ANS:

The volume of a cone with base radius r and height h is given by the formula:

$$V = \frac{1}{3} \pi r^2 h$$

The cone has equal height and radius.

So, substitute: $r = h$

$$V = \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \pi h^2 h$$

$$V = \frac{1}{3} \pi h^3$$

Substitute $V = 492$, then solve for h .

$$492 = \frac{1}{3} \pi h^3 \quad \text{Multiply each side by 3.}$$

$$3(492) = 3 \left(\frac{1}{3} \pi h^3 \right)$$

$$1476 = \pi h^3 \quad \text{Divide each side by } \pi.$$

$$\frac{1476}{\pi} = \frac{\pi h^3}{\pi}$$

$$\frac{1476}{\pi} = h^3$$

To solve for h , take the cube root of each side by raising each side to the one-third power.

$$\left(\frac{1476}{\pi} \right)^{\frac{1}{3}} = \left(h^3 \right)^{\frac{1}{3}}$$

$$\left(\frac{1476}{\pi} \right)^{\frac{1}{3}} = h$$

Use a calculator.

$$h = 7.7740 \dots$$

The height of the cone is approximately 7.8 cm.

PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws

LOC: 10.AN3 TOP: Algebra and Number KEY: Problem-Solving Skills

75. ANS:

Use the formula.

Substitute: $V = 230$ and $h = 20d$

$$230 = 0.5d^2 \cdot 20d$$

$$d^3 = \frac{230}{10}$$

$$d = \sqrt[3]{23}$$

$$d = 2.8438 \dots$$

The mean trunk diameter is approximately 3 m.

PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws

LOC: 10.AN3 TOP: Algebra and Number KEY: Problem-Solving Skills

76. ANS:

a) There is an error in the second line. When multiplying powers with the same base, the exponents should have been added, not multiplied.

A correct solution:

$$\begin{aligned} \left(x^{-6} y^6 \right) \left(x^{-\frac{1}{6}} y^5 \right) &= x^{-6} \cdot x^{-\frac{1}{6}} \cdot y^6 \cdot y^5 \\ &= x^{-\frac{37}{6}} y^{11} \end{aligned}$$

$$= \frac{y^{11}}{x^6}$$

- b) There are two errors in the first line. The coefficient 2 was incorrectly multiplied by the exponent -4 . And, the exponent of the variable n was added to -4 instead of being multiplied by -4 .

A correct solution:

$$\left(\frac{2m^{\frac{1}{4}}}{n^4} \right)^{-4} = \frac{2^{-4} m^{-1}}{n^{-16}}$$

$$= \frac{n^{16}}{2^4 m^1}$$

$$= \frac{n^{16}}{16m}$$

PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws
 LOC: 10.AN3 TOP: Algebra and Number
 KEY: Problem-Solving Skills | Communication

77. ANS:

$$\left(\sqrt[8]{x} \right) \left(\sqrt[5]{x^3} \right)$$

Write each radical as a power.

$$\left(\sqrt[8]{x} \right) \left(\sqrt[5]{x^3} \right) = x^{\frac{1}{8}} \cdot x^{\frac{3}{5}}$$

Use the product of powers law:

$$x^{\frac{1}{8}} \cdot x^{\frac{3}{5}} = x^{\frac{1}{8} + \frac{3}{5}}$$

Write equivalent fractions with a common denominator, 40.

$$x^{\frac{1}{8} + \frac{3}{5}} = x^{\frac{5}{40} + \frac{24}{40}}$$

$$= x^{\frac{29}{40}}$$

I can write this power as a radical:

$$x^{\frac{29}{40}} = \sqrt[40]{x^{29}} \text{ or } \left(\sqrt[40]{x} \right)^{29}$$

PTS: 1 DIF: Moderate REF: 4.6 Applying the Exponent Laws
 LOC: 10.AN3 TOP: Algebra and Number
 KEY: Problem-Solving Skills | Communication