

ANSWERS

Introductory Lesson

$$\begin{array}{ll} 6'8'' = 80'' & \$4.98, 27\text{¢}, \$0.11 \\ 27 - 31 < 31 - 27 & 6:2 :: 12:4 \\ 49 \div 7 > 1 \times 5 & 10 \cdot 10 \cdot 10 = 1,000 \\ -.5 < .5 & \end{array}$$

Lesson 1

1. Show with cubes that $8 + 3 = 3 + 8$.
2. Fill in the missing numbers. $-7 \quad -5 \quad \underline{\quad} \quad -1 \quad 1 \quad \underline{\quad} \quad 5 \quad \underline{\quad}$
3. I scored 100% on the "Counting By 8s" quiz!
4. Craig bought a bunch of bananas at \$.48 per pound. He spent \$1.68. How many pounds of bananas did he buy? *Answer:* 3.5 pounds.
5. The test scores ranged from 26.5-98.9.

Lesson 2

- 1) On a number line, the distance from 0 to -3 is its absolute value—that is, $|-3| = 3$.
- 2) What is $|-13|$? $-(-13) = +13$ because two $-$'s make a $+$.
- 3) $[(3 + 2) \times (6 - 4) + 2] \times 4 = [(5 \times 2) + 2] \times 4 = 48$
- 4) Complete the number series: .25, .5, .75, , .

Lesson 3

Since 1 yr = 52 weeks, how many weeks are there in 2 yrs?

This is the set of children wearing red socks today: {Chloe, Oliver, Charlie}.

Ava counted 7 drops in 1.5 sec. How many drops will fall in 1.5 min?

Here are the commutative properties of addition and multiplication expressed using a and b : $a + b = b + a$ and $a \cdot b = b \cdot a$ or $ab = ba$.

The area of rectangle PQRS is 4.5 sq. m. If side PQ is 3 cm, how long is side QR?

Lesson 4

- i) The area of an ellipse, expressed as "A": $A = \pi ab$.
- ii) Point (5, 7) is on ray ST.
- iii) Power set notation may use the "Weierstrass P" as in $P(S)$. If $S = \{ \}$ then $P(S) = \{ \{ \}$ is returned.
- iv) The hexadecimal system uses symbols 0-9 and A-F. For example, 45,997 in base 10 is B3AD in base 16.

TN Letters representing hexadecimal digits are capitalized in print. TN

Lesson 5

$\sim p \vee q$ is spoken: "not p or q (or both)".

Integer division is sometimes denoted \backslash , as illustrated here: $10/3 = 3 + 1/3$, so $10 \backslash 3 = 3$. The remainder is not noted.

Graph this inequality. $y \leq x + 2$

Use a number line to explain why $-6 - -6 = 0$. Is this the same as $-6 - +6$?

$1 \# (2 \& 3) = (1 \# 2) \& (1 \# 3)$

Lesson 6

Isotopes

Hydrogen ${}^1_1\text{H}$

Uranium ${}^{238}_{92}\text{U}$

Cations

Sodium Na^+ ${}^{23}_{11}\text{Na}^+$

Aluminum Al^{3+} ${}^{27}_{13}\text{Al}^{3+}$

Anions

Iodine I^- ${}^{127}_{53}\text{I}^-$

Oxygen O^{2-} ${}^{16}_8\text{O}^{2-}$

Lesson 7

1. Several parallel β -sheets form a left-handed β -helix.
2. In the study of logic, use of the boldface equality sign **=** avoids unintended mixups with the standard equals sign.
3. Which symbol denotes the set of natural numbers?
 - a. \mathbb{Z}
 - b. \mathbb{N}
 - c. \mathbb{R}
4. Is there a vector \mathbf{s} such that $\mathbf{r} + \mathbf{s} = \mathbf{t}$?

Lesson 8

To simplify a radical expression, use the product and quotient properties of radicals,

$$\sqrt{xy} = \sqrt{x} \cdot \sqrt{y} \text{ and } \sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$$

as demonstrated below.

$$\sqrt{16x} = \sqrt{16} \cdot \sqrt{x} = \sqrt{4^2} \cdot \sqrt{x} = 4\sqrt{x}$$

$$\sqrt{\frac{25}{16} x^2} = \frac{\sqrt{25}}{\sqrt{16}} \cdot \sqrt{x^2} = \frac{5}{4} x$$

$$\sqrt{\frac{15}{16}} = \frac{\sqrt{15}}{\sqrt{16}} = \frac{\sqrt{15}}{4}$$

Lesson 9

Prove that S is a subspace of V if and only if:

- (1) $v, w \in S \Rightarrow v + w \in S$
- (2) $\lambda \in K, v \in S \rightarrow \lambda \cdot v \in S$

Find the mistake:

$$\begin{array}{r} 4 \ 13 \\ \cancel{5} \cancel{3} 5 \\ -4 \ 9 2 5 \\ \hline 1410 \end{array}$$

Lesson 10

The division problem $4.2 \overline{)3313.8}$ is demonstrated below.

$$\begin{array}{r} 789.0 \\ 4.2 \overline{)3313.8} \\ \underline{294} \\ 373 \\ \underline{336} \\ 378 \\ \underline{378} \\ 0 \end{array}$$

Fill in the missing digits.

$$\begin{array}{r} 197 \\ \times 76 \\ \hline 11\Box2 \\ 1\Box79 \\ \hline 1\Box9\Box2 \end{array}$$

Note: Since the braille general omission symbol doesn't specify what is used in print, your translation may show a different omission sign.

Lesson 11

1. Calculate the total cost of an item selling for \$8.79 with 5.5% tax added.

$$8 \Box . 79 \Box + 5 \Box . 5 \Box \% \Box =$$

2. $\angle ABD + \angle DBE = ?$
3. $[a, b] \oplus [c, d]$
4. $\{\triangle, \diamond, \circ\} \cup \{\square\}$
5. Add $\angle 30^\circ$ and $\angle 20^\circ$.

Lesson 12

(i) Rewrite as a simplified fraction.

$$0.\overline{3}$$

$$3.1\overline{6}$$

$$2.\overline{18}$$

(ii) Versor $\hat{\mathbf{u}}$ of a nonzero vector \mathbf{u} is $\hat{\mathbf{u}} = \frac{\mathbf{u}}{|\mathbf{u}|}$ where $|\mathbf{u}|$ is the length of \mathbf{u} .

Lesson 13

Compute the numbers indicated by the factorial notation.

1. $\frac{6!}{3!2!}$

2. $7!$

3. $\frac{10!}{5!5!}$

Here is a partial integration solution, using ψ ¹. $f(x, y) = \int M(x, y)\partial x$
 $= \int (2xy^2 + x^2 - y)\partial x$, therefore $f(x, y) = x^2y^2 + \frac{1}{3}x^3 - xy + \psi(y)$.

¹ Greek letter psi.

Lesson 14

Find the square root of 484.

$$\begin{array}{r} 22 \\ \sqrt{484} \\ 4 \\ 42 \overline{)084} \\ \times 2 \overline{)84} \\ 0 \end{array}$$

Since the remainder is 0, $\sqrt{484} = 22$.

Provide your answers to the following problems on a separate sheet of paper.

1. Find the value of $\sin \frac{5\pi}{12}$.
2. What is $\text{Arc csc}(-\sqrt{2})$?
3. Simplify: $e^{\log_e e}$
4. Prove this reduction formula : $\tan(90^\circ + \theta) = -\cot \theta$.
5. Is the following identity true? $\cot 2\theta = \frac{\cot^2 \theta - 1}{2 \cot \theta}$

Lesson 16

$$\begin{array}{r} 8\frac{12}{8} \\ 8) \quad 9\frac{1}{2} = \cancel{9\frac{4}{8}} \\ \underline{-4\frac{7}{8}} \quad = \quad 4\frac{7}{8} \\ 4\frac{5}{8} \end{array}$$

9) If $\frac{1}{2} \div \frac{1}{3} = \frac{1/2}{1/3}$, express $\frac{1/2}{1/3}$ using \div symbols.

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Lesson 17

Scalar Multiplication Multiply the matrix by the scalar "2", like this:

$$2 \times \begin{bmatrix} 4 & 0 \\ 1 & -9 \end{bmatrix} = \begin{bmatrix} 8 & 0 \\ 2 & -18 \end{bmatrix}.$$

The second matrix above is the result of four calculations: $2 \times 4 = \mathbf{8}$, $2 \times 0 = \mathbf{0}$, $2 \times 1 = \mathbf{2}$, and $2 \times -9 = \mathbf{-18}$.

The system $\begin{pmatrix} x + 2y = 8 \\ 2x - 3y = 2 \end{pmatrix}$ has the solution set $\{(4, 2)\}$.