

## MA 201

1. Which of the following are true?

- (a) The rational numbers are commutative under addition.
- (b) The rational numbers are commutative under subtraction.
- (c) The rational numbers are commutative under multiplication.
- (d) The rational numbers are commutative under division.
- (e) The rational numbers are associative under addition.
- (f) The rational numbers are associative under subtraction.
- (g) The rational numbers are associative under multiplication.
- (h) The rational numbers are associative under division.
- (i) The rational numbers are closed under addition.
- (j) The rational numbers are closed under subtraction.
- (k) The rational numbers are closed under multiplication.
- (l) The rational numbers are closed under division.
- (m) Every rational number has an additive inverse.
- (n) Every rational number has an multiplicative inverse.
- (o) Every rational number has a unique additive inverse.
- (p) Every nonzero rational number has a unique multiplicative inverse.
- (q) One is the multiplicative identity for the set of rational numbers.
- (r) Zero is the additive identity for the set of rational numbers.
- (s) If  $\frac{a}{b}$  and  $\frac{c}{d}$  are distinct rational numbers with  $\frac{a}{b} < \frac{c}{d}$ , then there is a rational number  $\frac{e}{f}$  such that  $\frac{a}{b} < \frac{e}{f} < \frac{c}{d}$ .
- (t) (problem 21 from section 6.1) There are infinitely many rational numbers between 0 and 1.
- (u) (problem 21 from section 6.1) There are infinitely many ways to replace two fractions with two equivalent fractions that have a common denominator.
- (v) (problem 21 from section 6.1) There is a unique least common denominator for a given pair of fractions.
- (w) (problem 21 from section 6.1) There is a least common fraction.

2. Find the additive inverse.

- (a)  $\frac{3}{5}$

- (b)  $2\frac{1}{3}$
- (c)  $-\frac{3}{5}$
- (d) 0

3. Find the multiplicative inverse, if possible.

- (a)  $\frac{3}{5}$
- (b)  $2\frac{1}{3}$
- (c)  $-\frac{3}{5}$
- (d) 0

4. Find a rational number that is between the two rational numbers you are given.

- (a) 0; 1
- (b)  $\frac{2}{3}$ ;  $\frac{4}{5}$
- (c)  $2\frac{1}{3}$ ;  $\frac{5}{7}$
- (d)  $2\frac{1}{3}$ ;  $3\frac{5}{7}$

5. Explain why we define  $a^0 = 1$  and  $a^{-n} = \frac{1}{a^n}$  when  $a \neq 0$  and  $n$  is a positive integer. (See the discussion on pages 415–416.)

6. Write each decimals in expanded form.

- (a) 456.6787
- (b) 0.7856
- (c) 123.6712143

7. Quickly multiply.

- (a) 10, 123.67  $\times$  100
- (b) 10, 123.67  $\times$  1000
- (c) 10, 123.67  $\times$  10000
- (d) 10, 123.67  $\times$  10
- (e) 10, 123.67  $\times$   $10^6$
- (f) 10, 123.67  $\times$   $10^7$
- (g) 10, 123.67  $\times$   $10^2$
- (h) 10, 123.67  $\times$   $10^3$
- (i) 10, 123.67  $\times$   $10^{12}$
- (j) 10, 123.67  $\times$   $\frac{1}{100}$
- (k) 10, 123.67  $\times$   $\frac{1}{10}$
- (l) 10, 123.67  $\times$   $\frac{1}{10000}$

- (m)  $10,123.67 \times 10^{-6}$
- (n)  $10,123.67 \times 10^{-10}$
- (o)  $10,123.67 \times 10^{-2}$
- (p)  $10,123.67 \times 10^{-1}$

8. Quickly multiply.

- (a)  $10,123.67 \div 100$
- (b)  $10,123.67 \div 1000$
- (c)  $10,123.67 \div 10000$
- (d)  $10,123.67 \div 10$
- (e)  $10,123.67 \div 10^6$
- (f)  $10,123.67 \div 10^7$
- (g)  $10,123.67 \div 10^2$
- (h)  $10,123.67 \div 10^3$
- (i)  $10,123.67 \div 10^{12}$
- (j)  $10,123.67 \div \frac{1}{100}$
- (k)  $10,123.67 \div \frac{1}{10}$
- (l)  $10,123.67 \div \frac{1}{10000}$
- (m)  $10,123.67 \div 10^{-6}$
- (n)  $10,123.67 \div 10^{-10}$
- (o)  $10,123.67 \div 10^{-2}$
- (p)  $10,123.67 \div 10^{-1}$