Prealgebra
Chapter 3 Review

Objective [3.1a] Find some multiples of a number, and determine whether a number is divisible by another.

Brief Procedure	Example	Practice Exercises
To find some multiples of a number, multiply the number by an integer.	Multiply by 1, 2, 3, and so on to find ten multiples of 8. $1 \cdot 8 = 8$ $6 \cdot 8 = 48$ $2 \cdot 8 = 16$ $7 \cdot 8 = 56$ $3 \cdot 8 = 24$ $8 \cdot 8 = 64$ $4 \cdot 8 = 32$ $9 \cdot 8 = 72$ $5 \cdot 8 = 40$ $10 \cdot 8 = 80$	1. Multiply by 1, 2, 3, and so on to find ten multiples of 15. A. One of the multiples is 135. B. One of the multiples is 125. C. One of the multiples is 10. D. One of the multiples is 5.
To determine whether a number is divisible by another, determine whether division of the number by the other number results in a remainder of zero.	Determine whether 86 is divisible by 2 or by 4. $\begin{array}{r} 4\ 3 \\ 2\,\overline{)8\ 6} \\ \underline{8\ 0} \\ 6 \\ \underline{6} \\ 0 \end{array}$ $\begin{array}{r} 2\ 1 \\ 4\,\overline{)8\ 6} \\ \underline{8\ 0} \\ 6 \\ \underline{4} \\ 2 \end{array}$ Since the remainder is 0 when 86 is divided by 2, 86 is divisible by 2. When 86 is divided by 4, the remainder is not 0 so 86 is not divisible by 4.	2. Determine whether 188 is divisible by 8. A. Yes B. No

Objective [3.1b] Test to see if a number is divisible by 2, 3, 5, 6, 9, or 10.

Brief Procedure	Example	Practice Exercise
Use the following tests: A number is divisible by 2 if it has a ones digit of 0, 2, 4, 6, or 8. (That is, it has an even ones digit.) A number is divisible by 3 if the sum of its digits is divisible by 3. A number is divisible by 5 if its ones digit is 0 or 5. A number is divisible by 6 if it is even and the sum of its digits is divisible by 3. (That is, the number is divisible by both 2 and 3.) A number is divisible by 9 if the sum of its digits is divisible by 9. A number is divisible by 10 if its ones digit is 0.	Determine whether 56,340 is divisible by 2, 3, 5, 6, 9, or 10. The ones digit, 0, is even, so 56,340 is divisible by 2. $5+6+3+4+0 = 18$ and 18 is divisible by 3, so 56,340 is divisible by 3. The ones digit is 0, so 56,340 is divisible by 5. The ones digit is even and the sum of the digits, 18, is divisible by 3, so 56,340 is divisible by 6. The sum of the digits, 18, is divisible by 9, so 56,340 is divisible by 9. The ones digit is 0, so 56,340 is divisible by 10.	3. Select the true statement. A. 2630 is divisible by 2, 4, 5, and 10. B. 9166 is divisible by 2, 3, and 6. C. 18,225 is divisible by 3, 5, and 9. D. 42,616 is divisible by 2, 3, and 6.

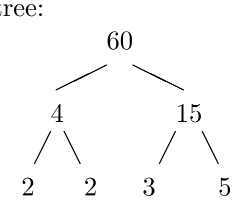
Objective [3.2a] Find the factors of a number.

Brief Procedure	Example	Practice Exercise
Find factorizations of the number.	Find all the factors of 36. $36 = 1 \cdot 36$ $36 = 4 \cdot 9$ $36 = 2 \cdot 18$ $36 = 6 \cdot 6$ $36 = 3 \cdot 12$ Factors: 1, 2, 3, 4, 6, 9, 12, 18, 36	4. Find all the factors of 20. A. 4, 5 B. 2, 10 C. 2, 4, 5, 10 D. 1, 2, 4, 5, 10, 20

Objective [3.2b] Given a number from 1 to 100, tell whether it is prime, composite, or neither.

Brief Procedure	Example	Practice Exercise
Determine exactly how many different factors the number has. A prime number has exactly two different factors, itself and 1. A natural number, other than 1, that is not prime is composite.	Tell whether each of the numbers 1, 17, and 24 is prime, composite, or neither. 1 does not have two *different* factors. It is neither prime nor composite. 17 has only the factors 1 and 17. It is prime. 24 has more than two different factors. It is composite.	5. Determine whether 57 is prime, composite,or neither. A. Prime B. Composite C. Neither

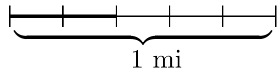
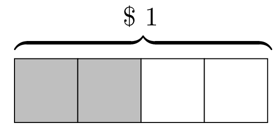
Objective [3.2c] Find the prime factorization of a composite number.

Brief Procedure	Example	Practice Exercise
Perform a string of successive divisions of the number by prime divisors or use a factor tree.	Find the prime factorization of 60. Successive divisions: 5 ← 5 is prime. $3\overline{)15}$ $2\overline{)30}$ $2\overline{)60}$ $60 = 2 \cdot 2 \cdot 3 \cdot 5$ Factor tree:  $60 = 2 \cdot 2 \cdot 3 \cdot 5$	6. Find the prime factorization of 63. A. $3 \cdot 21$ B. $9 \cdot 7$ C. $1 \cdot 3 \cdot 3 \cdot 7$ D. $3 \cdot 3 \cdot 7$

Objective [3.3a] Identify the numerator and the denominator of a fraction.

Brief Procedure	Example	Practice Exercise
The top number is the numerator; the bottom number is the denominator.	Identify the numerator and denominator: $\frac{7}{12}$. The top number, 7, is the numerator; the bottom number, 12, is the denominator.	7. Identify the denominator: $\frac{5}{6}$. A. 5 B. 6

Objective [3.3b] Write fractional notation for part of an object or part of a set of objects.

Brief Procedure	Example	Practice Exercise
Determine the number of parts into which the object is divided and then determine how many parts are taken or shaded.	What amount is shaded?  The object is divided into 5 parts of the same size and 2 of them are shaded. Thus, $2 \cdot \frac{1}{5}$, or $\frac{2}{5}$ of the object is shaded.	8. What amount is shaded?  A. $\frac{1}{4}$ B. $\frac{2}{4}$ C. $\frac{3}{4}$ D. $\frac{2}{2}$

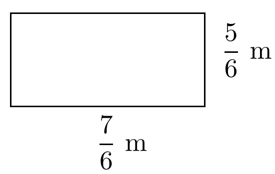
Objective [3.3c] Simplify fractional notation like n/n to 1, $0/n$ to 0, and $n/1$ to n.

Brief Procedure	Example	Practice Exercise
For any whole number n that is not 0, $\frac{n}{n} = 1$ and $\frac{0}{n} = 0$. For any whole number n, $\frac{n}{1} = n$.	Simplify $\frac{6}{6}$, $\frac{0}{10}$, and $\frac{3}{1}$. $\frac{6}{6} = 1$, $\frac{0}{10} = 0$, $\frac{3}{1} = 3$	9. Simplify (a) $\frac{5}{1}$, (b) $\frac{12}{12}$, and (c) $\frac{0}{2}$. A. (a) 5, (b) 1, (c) 0 B. (a) 1, (b) 12, (c) 0 C. (a) 5, (b) 1, (c) 2 D. (a) 5, (b) 12, (c) 2

Objective [3.4a] Multiply an integer and a fraction.

Brief Procedure	Example	Practice Exercise
Multiply the numerator by the whole number; keep the same denominator.	Multiply: $-4 \times \frac{2}{5}$. $-4 \times \frac{2}{5} = \frac{-4 \times 2}{5} = \frac{-8}{5}$, or $-\frac{8}{5}$	10. Multiply: $6 \times \frac{3}{7}$. A. $\frac{9}{7}$ B. $\frac{3}{42}$ C. $\frac{3}{13}$ D. $\frac{18}{7}$

Objective [3.4b] Multiply using fractional notation.		
Brief Procedure	**Example**	**Practice Exercise**
Multiply the numerators to get the new numerator; multiply the denominators to get the new denominator.	Multiply: $\frac{3}{4} \cdot \frac{5}{2}$. $\frac{3}{4} \cdot \frac{5}{2} = \frac{3 \cdot 5}{4 \cdot 2} = \frac{15}{8}$	11. Multiply: $\left(-\frac{5}{8}\right) \times \frac{7}{6}$. A. $\frac{12}{14}$ B. $-\frac{35}{14}$ C. $-\frac{35}{48}$ D. $\frac{30}{56}$

Objective [3.4c] Solve applied problems involving multiplication of fractions.		
Brief Procedure	**Example**	**Practice Exercise**
Use the five-step problem solving process.	A rectangular rug is $\frac{7}{6}$ m long and $\frac{5}{6}$ m wide. What is its area?. 1. *Familiarize.* We make a drawing.  Recall that the area of a rectangle is length times width. Let $A =$ the area of the rug. 2. *Translate.* $\underbrace{\text{Area}} \text{ is } \underbrace{\text{length}} \text{ times } \underbrace{\text{width}}$ $\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$ $A = \frac{7}{6} \times \frac{5}{6}$ 3. *Solve.* We multiply. $A = \frac{7}{6} \times \frac{5}{6} = \frac{7 \times 5}{6 \times 6} = \frac{35}{36}$ 4. *Check.* We can repeat the calculation. The answer checks. 5. *State.* The area of the rug is $\frac{35}{36}$ m^2.	12. A cookie recipe calls for $\frac{1}{2}$ cup of brown sugar. How much is needed to make $\frac{1}{2}$ of a recipe? A. $\frac{1}{4}$ cup B. $\frac{1}{2}$ cup C. 1 cup D. 2 cups

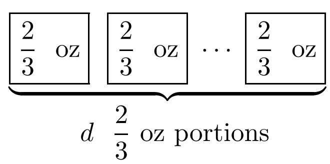
Objective [3.5a] Multiply by 1 to find an equivalent expression using a different denominator.		
Brief Procedure	Example	Practice Exercise
Ask: What number n should we multiply the denominator by in order to get the new denominator? Then multiply the fraction by 1 using n/n.	Find a number equivalent to $\frac{2}{3}$ with a denominator of 12. Since $3 \cdot 4 = 12$, we multiply by $\frac{4}{4}$: $\frac{2}{3} = \frac{2}{3} \cdot \frac{4}{4} = \frac{2 \cdot 4}{3 \cdot 4} = \frac{8}{12}$	13. Find a number equivalent to $\frac{3}{4}$ with a denominator of 20. A. $\frac{3}{20}$ B. $\frac{8}{20}$ C. $\frac{15}{20}$ D. $\frac{19}{20}$

Objective [3.5b] Simplify fractional notation.		
Brief Procedure	Example	Practice Exercise
Remove a factor of 1 to get the name for the fraction that has the smallest numerator and denominator.	Simplify: $-\frac{16}{36}$. $-\frac{16}{36} = -\frac{4 \cdot 4}{9 \cdot 4} = -\frac{4}{9} \cdot \frac{4}{4} = -\frac{4}{9} \cdot 1 = -\frac{4}{9}$	14. Simplify: $\frac{9}{24}$. A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{3}{8}$ D. $\frac{9}{8}$

Objective [3.6a] Multiply and simplify using fractional notation.		
Brief Procedure	Example	Practice Exercise
a) Write the products in the numerator and the denominator, but do not calculate the products. b) Identify any common factors of the numerator and the denominator. c) Factor the fraction to remove any factors that equal 1. d) Calculate the remaining products.	Multiply and simplify: $\frac{3}{4} \cdot \frac{2}{9}$. $\frac{3}{4} \cdot \frac{2}{9} = \frac{3 \cdot 2}{4 \cdot 9} = \frac{3 \cdot 2 \cdot 1}{2 \cdot 2 \cdot 3 \cdot 3} =$ $\frac{3 \cdot 2}{3 \cdot 2} \cdot \frac{1}{2 \cdot 3} = 1 \cdot \frac{1}{2 \cdot 3} = \frac{1}{2 \cdot 3} = \frac{1}{6}$	15. Multiply and simplify: $\frac{5}{6} \cdot \frac{-4}{15}$. A. $-\frac{2}{9}$ B. $\frac{3}{7}$ C. $\frac{4}{18}$ D. $-\frac{20}{90}$

Objective [3.6b] Solve applied problems involving multiplication.		
Brief Procedure	Example	Practice Exercise
Use the five-step problem solving process.	On a map, 1 in. represents 150 mi. How much does $\frac{3}{5}$ in. represent? 1. *Familiarize.* Let m = the number of miles represented by $\frac{3}{5}$ in. 2. *Translate.* The problem translates to the following equation: $m = \frac{3}{5} \cdot 150.$ 3. *Solve.* We carry out the multiplication. $m = \frac{3}{5} \cdot 150 = \frac{3 \cdot 150}{5} = \frac{3 \cdot 5 \cdot 30}{5 \cdot 1} = \frac{5}{5} \cdot \frac{3 \cdot 30}{1} = 90$ 4. *Check.* We can repeat the calculation. We can also do a partial check by thinking about the reasonableness of the answer. Since $\frac{3}{5}$ in. is less than 1 in., the distance should be less than 150. And 90 is less than 150, so the answer seems reasonable. 5. *State.* $\frac{3}{5}$ in. on the map represents 90 mi.	16. Kim earns \$56 for working a full day. How much does she earn for working $\frac{3}{4}$ of a day? A. \$14 B. \$28 C. \$42 D. \$49

Objective [3.7a] Find the reciprocal of a number.		
Brief Procedure	Example	Practice Exercise
Interchange the numerator and the denominator.	Find the reciprocals of $\frac{5}{9}$, 3, and $\frac{1}{6}$. Interchange the numerator and denominator of each fraction. The reciprocal of $\frac{5}{9}$ is $\frac{9}{5}$; the reciprocal of 3, or $\frac{3}{1}$, is $\frac{1}{3}$; the reciprocal of $\frac{1}{6}$ is $\frac{6}{1}$, or 6.	17. Find the reciprocal of 13. A. 0 B. $\frac{1}{13}$ C. $\frac{1}{3}$ D. 13

<table>
<tr><td colspan="3">Objective [3.7b] Divide and simplify using fractional notation.</td></tr>
<tr><td>Brief Procedure</td><td>Example</td><td>Practice Exercise</td></tr>
<tr><td>Multiply the dividend by the reciprocal of the divisor. Then simplify, if possible.</td><td>Divide and simplify: $\frac{5}{4} \div \frac{25}{-16}$.
$\frac{5}{4} \div \frac{25}{-16} = \frac{5}{4} \cdot \frac{-16}{25} = \frac{5(-16)}{4 \cdot 25} =$
$\frac{5 \cdot 4(-4)}{4 \cdot 5 \cdot 5} = \frac{5 \cdot 4}{5 \cdot 4} \cdot \frac{-4}{5} = \frac{-4}{5}$,
or $-\frac{4}{5}$</td><td>18. Divide and simplify: $\frac{2}{3} \div \frac{8}{9}$.
A. $\frac{3}{4}$
B. $\frac{5}{6}$
C. $\frac{4}{3}$
D. $\frac{16}{27}$</td></tr>
<tr><td colspan="3">Objective [3.7c] Solve problems involving division.</td></tr>
<tr><td>Brief Procedure</td><td>Example</td><td>Practice Exercise</td></tr>
<tr><td>Use the five-step problem solving process.</td><td>Jason uses $\frac{2}{3}$ oz of dishwashing liquid each time he washes dishes. If Jason buys a 24 oz bottle of dishwashing liquid, how many times will he be able to wash dishes?
1. Familiarize. Repeated addition applies here. Let d = the number of times Jason can wash dishes. We visualize the situation.


2. Translate. We translate to an equation.
$d \cdot \frac{2}{3} = 24$
3. Solve. We divide by $\frac{2}{3}$ on both sides of the equation.
$d = 24 \div \frac{2}{3} = 24 \cdot \frac{3}{2}$
$= \frac{24 \cdot 3}{2} = \frac{2 \cdot 12 \cdot 3}{2 \cdot 1}$
$= \frac{2}{2} \cdot \frac{12 \cdot 3}{1}$
$= 36$
4. Check. We repeat the calculation. The answer checks.
5. State. Jason can wash dishes 36 times.</td><td>19. How many $\frac{1}{4}$-cup salt shakers can be filled from 4 cups of salt?
A. 4
B. 8
C. 12
D. 16</td></tr>
</table>

Objective [3.8a] Use the multiplication principle to solve equations.		
Brief Procedure	Example	Practice Exercise
For any real numbers a, b, and c, $c \neq 0$, $a = b$ is equivalent to $a \cdot c = b \cdot c$. Multiply by the same number on both sides of the equation to get the variable alone.	Solve: $54 = -\frac{9}{2}y$. We multiply by the reciprocal of $-\frac{9}{2}$, or $-\frac{2}{9}$, on both sides of the equation to get y alone. $54 = -\frac{9}{2}y$ $-\frac{2}{9} \cdot 54 = -\frac{2}{9}\left(-\frac{9}{2}y\right)$ $-\frac{2 \cdot 6 \cdot 9}{9 \cdot 1} = y$ $-\frac{2 \cdot 6}{1} \cdot \frac{9}{9} = y$ $-12 = y$ The solution is -12.	20. Solve: $\frac{5}{6}x = -30$. A. 18 B. -25 C. -36 D. -48