Solution Manual for Developmental Math 3rd Edition by Lial Hornsby Ginnis Salzman and Hestwood ISBN 0321854462 9780321854469

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16. Four of the □ coins are pennies: □/□

Three of the □ coins are nickels: □/□

Two of the □ coins are dimes: □/□

17. There are □□ students, and □ are hearing impaired.

□/□ □ hearing impaired students (numerator)
□□ □ total students (denominator)

18. There are □□□ shopping carts of which □□ are in the parking lot (□□□ □ □□ □ □□□ are *not* in the parking lot, but are in the store).

Fraction of carts in store: □□□/□□

19. There are □□□ rooms. □□□ are for nonsmokers, and

□□□ □ □□□ □ □□□ are for smokers.

□□/□

20. There are □□ employees. □□ □ □□ □ □□ are part- time.

□/□

21. Proper fractions: numerator *smaller* than denominator.

□ □, □/□, □/□

Improper fractions: numerator *greater than or equal to* denominator.

□ □, □/□, □/□

22. Proper fractions: numerator *smaller* than denominator.

□ □, □/□, □/□

24. Proper fractions: numerator *smaller* than denominator.

none

Improper fractions: numerator *greater than or equal to* denominator.

□□/□□, □□/□□, □□/□□, □□/□□

25. Answers will vary. One possibility is

□ □ Numerator
□ □ Denominator

The denominator shows the number of equal parts in the whole and the numerator shows how many of the parts are being considered.

26. An example is □/□ as a proper fraction and □/□ as an

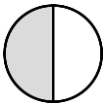
□ □ □

Improper fractions: numerator *greater than or equal to* denominator.

improper fraction.

A proper fraction has a numerator *smaller* than the denominator.

An improper fraction has a numerator that is *greater than or equal to* the denominator.



23. Proper fractions: numerator *smaller* than denominator.

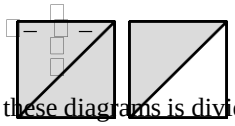
Improper fractions: numerator *greater than or equal to* denominator.

Proper fraction Improper fraction

2.2 Mixed Numbers

2.2 Margin Exercises

1. **(a)** The figure shows whole object with equal parts, all shaded, and a second whole with parts shaded, so parts are shaded in all.



(b) Since each of these diagrams is divided into pieces, the denominator will be . The number of pieces shaded is .

2. **(a)** Multiply and .

Add .

(b) Multiply and .

Add .

(c) Multiply and .

Add .

(d) Multiply and . Add .

3. (a) Divide by .

Whole number part

Remainder

5.

(b) Divide by .

Whole number part

Remainder

(c) Divide by .

Whole number part

2. is a proper fraction since the numerator is *smaller than* the denominator. The statement is *true*.

3. Multiply and .

Add .

The mixed number can be changed to the improper fraction , not . The statement is *false.*

4. The statement "Some mixed number cannot be changed to an improper fraction" is *false* since any mixed number *can* be changed to an improper fraction.

Multiply and .

Add .

The mixed number can be changed to the improper fraction , not . The statement is *false.*

6. Multiply and .

Add .

The statement is *true.*

Remainder

7.

(d) Divide by .

Whole number part

Remainder

Multiply and

Add .

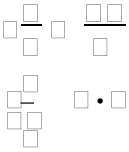
8. Multiply and . Add .

9. Multiply and .

Add .

2.2 Section Exercises

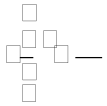
1.  is an improper fraction since the numerator is *greater than or equal to* the denominator. The statement is *true*.

10. 

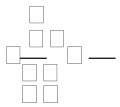
Multiply and .

Add .

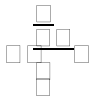
11. Multiply □ and □. Add □.



12. Multiply □ and □□. Add □.

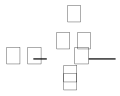


13. Multiply □□ and □. Add □.

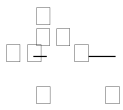


14. Multiply □□ and □.

Add □.

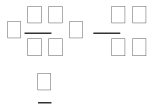


15. Multiply □□ and □. Add □.

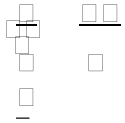


16. Multiply □ and □. Add □.

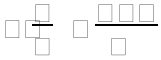
21. Multiply □ and □□. Add □□.



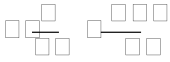
22. Multiply □□ and □. Add □.



23. Multiply □□ and □. Add □.



24. Multiply □□ and □□. Add □.



25. Multiply □□ and □□. Add □.

26. Multiply □□ and □□. Add □.

27.

17. Multiply and .

Add .

28.

18. Multiply and .

Add .

Multiply and .

19.

Add .

20. Multiply and .

Add .

false.

Multiply and .

Add .

29. Multiply and . Add .

30. Multiply and . Add .

31. The improper fraction can be changed to the mixed number , not . The statement is

32. The statement "An improper fraction cannot always be written as a whole number or a mixed number" is *false* since a mixed number always has a value equal to or greater than a whole number.

33. The statement "Some improper fractions can be written as a whole number with no fraction part" is *true*. For example, $\frac{\square}{\square} = \square$.

34. The statement "The improper fraction $\frac{\square\square}{\square}$ can be written as the whole number $\square$" is *true*.

35. $\frac{\square}{\square}$

$\square$ Whole number part

$\square$ Remainder

36. $\frac{\square\square}{\square}$

$\square$ Whole number part

$\square$ Remainder

37. $\square\frac{\square}{\square}$

38. $\square\frac{\square}{\square}$

40. $\frac{\square\square}{\square}$

$\square$ Whole number part

$\square$ Remainder

41. $\frac{\square\square}{\square}$

$\square$ Whole number part

$\square$ Remainder

42. $\frac{\square\square}{\square}$

$\square$ Whole number part

$\square$ Remainder

43. $\frac{\square\square}{\square}$

$\square$ Whole number part

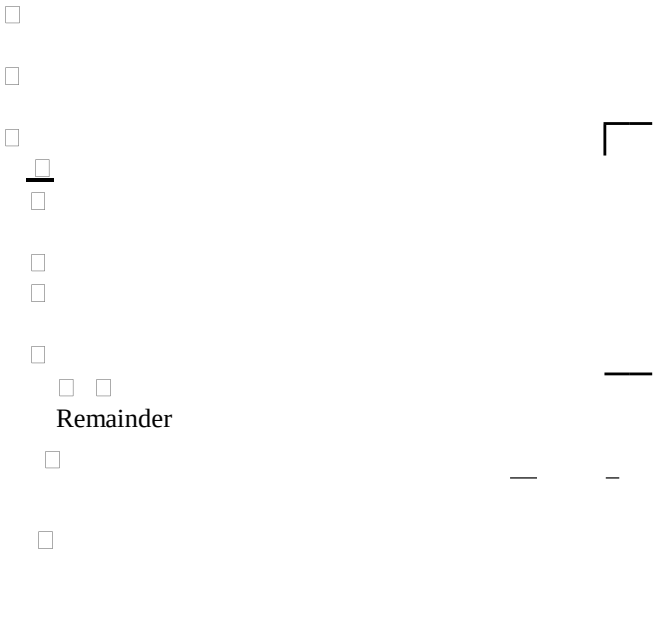
$\square$ Whole number part

$\square$ Remainder

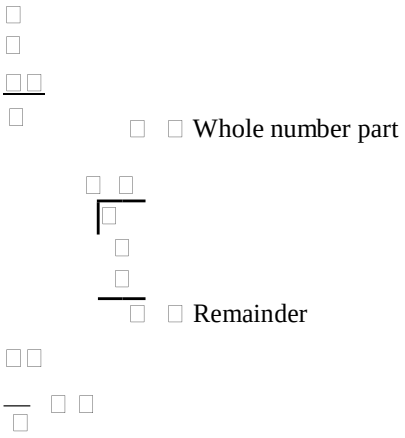
$\square$ Whole number part

$\square$ Remainder

44.



39.



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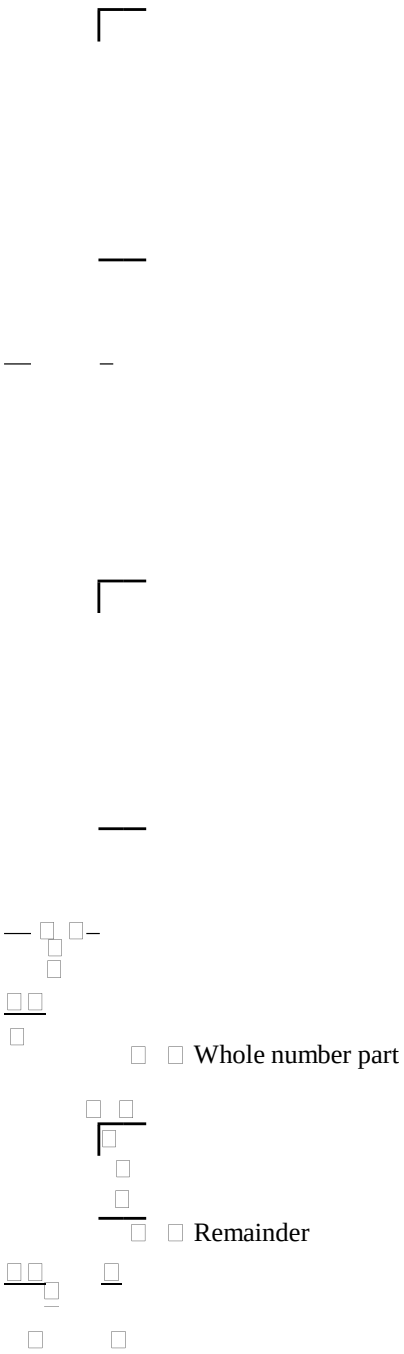

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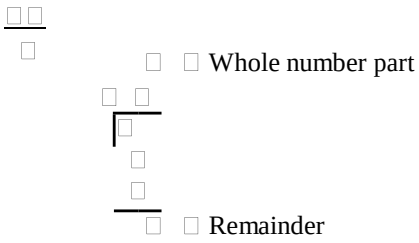

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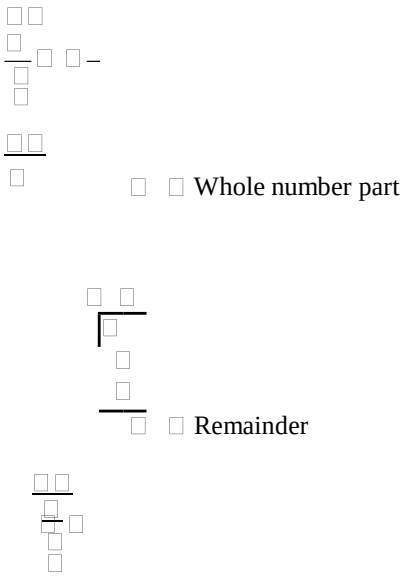

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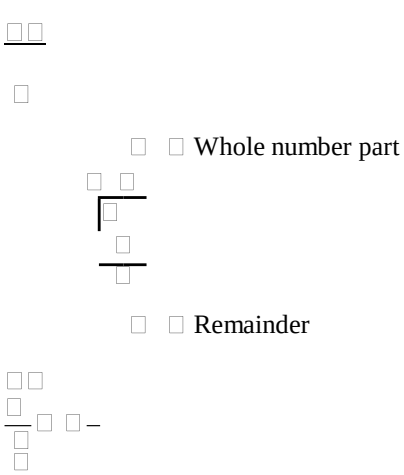

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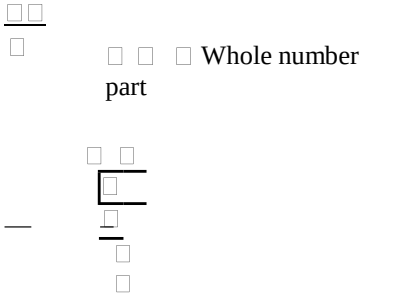

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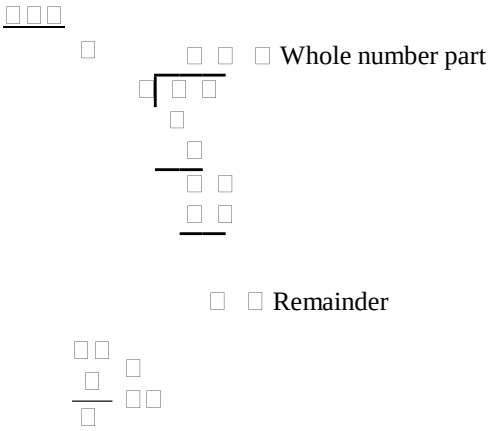
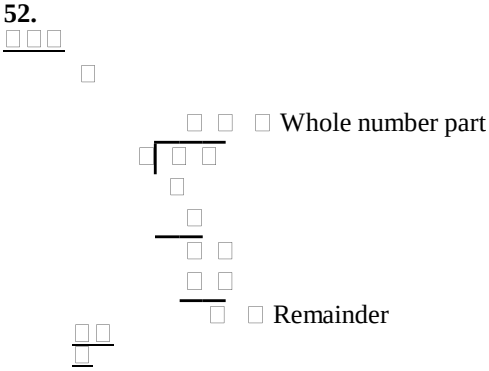
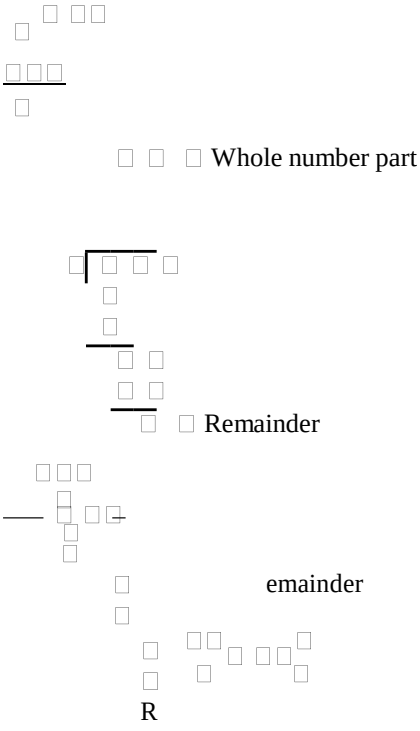


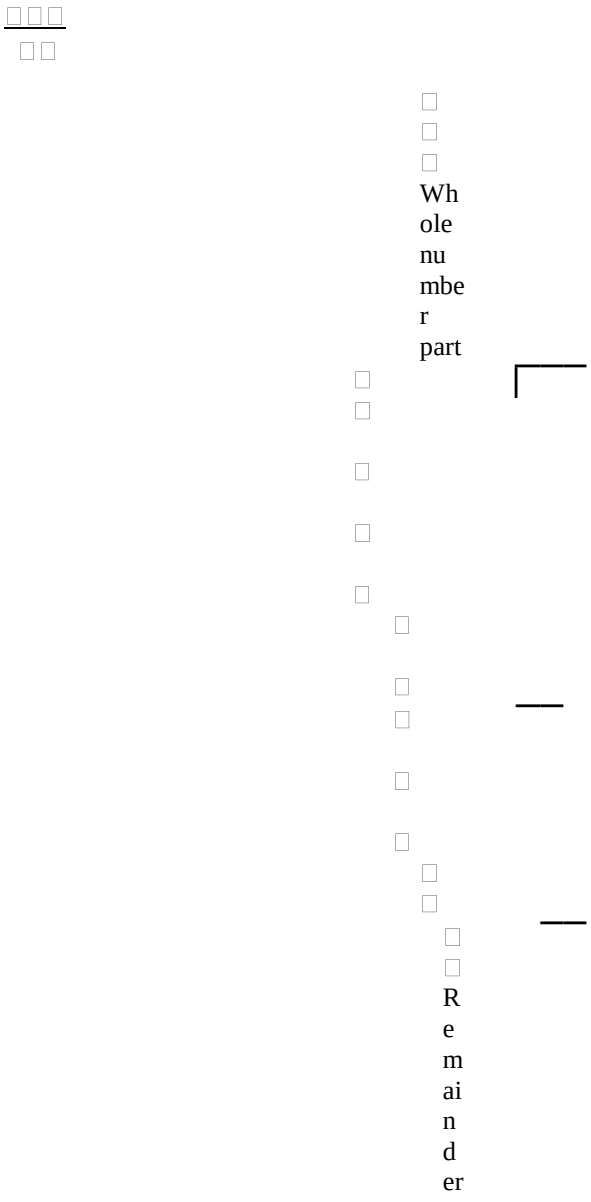
52.



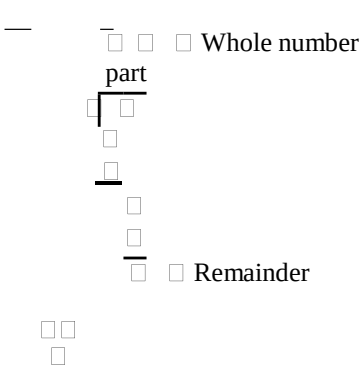
53.



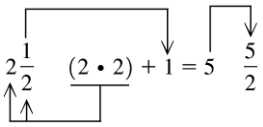
54.



50.



55. Multiply the denominator by the whole number and add the numerator. The result becomes the new numerator, which is placed over the original denominator.



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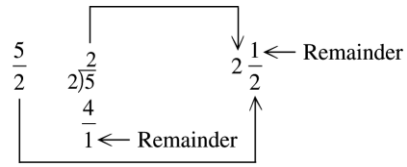
56. Divide the numerator by the denominator. The quotient is the whole number of the mixed number and the remainder is the numerator of the fraction part. The denominator is unchanged.



57.

58.

59.

60.

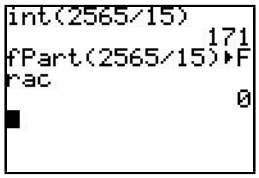
61.

64.

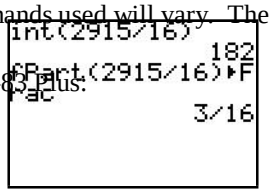
Whole number part

Remainder

65. The commands used will vary. The following is from a TI-83 Plus:



66. The commands used will vary. The following is from a TI-83 Plus:



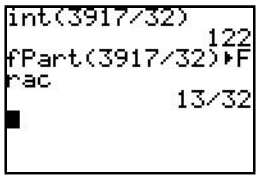
62.

63.

Whole number part

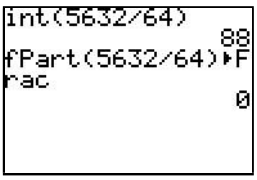
Remainder

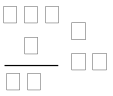
67. The commands used will vary. The following is from a TI-83 Plus:



Note: You can use the following procedure on any calculator. Divide by to get .
Subtract . Multiply by to get . The mixed number is .

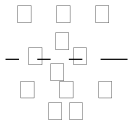
68. The commands used will vary. The following is from a TI-83 Plus:



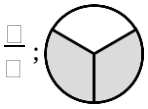


Relating Concepts (Exercises 69–74)

69. The following fractions are proper fractions.



70. **(a)** The proper fractions in Exercise 69 are the ones where the numerator is less than the denominator.

(b)  ;

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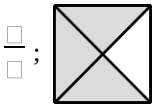
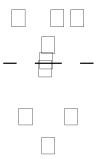
 ;

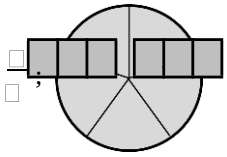
 ;

(c) The proper fractions in Exercise 69 are all less than .

71. The following fractions are improper fractions.

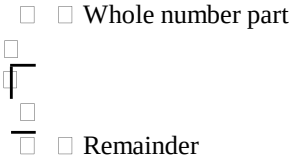


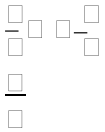
72. **(a)** The improper fractions in Exercise 71 are the ones where the numerator is equal to or greater than the denominator.

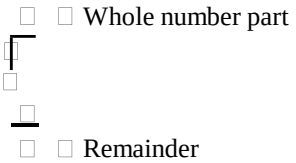
(b)  ;

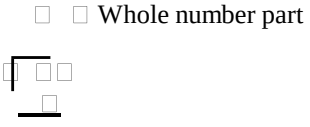
(c) The improper fractions in Exercise 71 are all equal to or greater than .

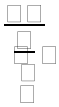
73. The following fractions can be written as whole or mixed numbers.



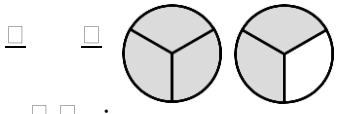




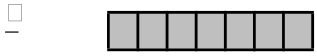




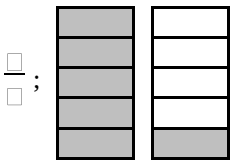
74. **(a)** The fractions that can be written as whole or mixed numbers in Exercise 73 are improper fractions, and their value is always greater than or equal to .

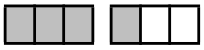


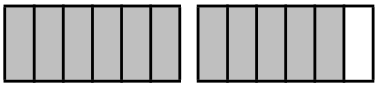
(b)  ;



 ;







2.3 Factors

2.3 Margin Exercises

1. **(a)** Factorizations of □□:

□ • □□ □ □□ □ • □ □ □□ □ • □ □ □□

The factors of □□ are □, □, □, □, □, and □□.

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(b) Factorizations of □□:

□•□□ □ □□ □•□ □ □□ □•
□ □ □□

The factors of □□ are □, □, □, □, and □□.

(c) Factorizations of □□:

□•□□ □ □□ □•□□ □ □□ □•□□ □ □□
□•□ □ □□
□•□ □ □□

The factors of □□ are □, □, □, □, □, □, □□,
□□, and

□□.

(d) Factorizations of □□:

□•□□ □ □□ □•□□ □ □□ □•□□ □ □□
□•□□ □ □□
□•□□ □ □□

The factors of □□ are □, □, □, □, □, □□, □□,
□□, □□, and □□.

2. □, □, □, □□, □□, □□, □□, □□

□, □□, □□, □□, and □□ are prime because they are divisible only by themselves and □.

3. □, □, □, □, □, □□, □□, □□, □□, □□, □□,
□□, □□, □□, □□

□, □, □□, □□, and □□ each have no factor other than

themselves or □; □, □, □, □□, □□, □□, and □□ each
have a factor of □; □□, □□, and □□ have a factor of
□. So □, □, □, □□, □□, □□, □□, □□, □□,
and □□ are composite.

4. **(a)** □ □ □ □ □

□ □ □ □ □
□ □ □•□•
□

(b)

This division is done from the "top-down."

□□
┌
□ Divide □□ by
□□
□ □. Divide □□
┌
□
□□ by □. Divide □
□
┌
□ by □.
□
□
┌ Divide □ by
□ □.
□

Quotient is 1.

Either method is correct and yields the prime factorization as follows:

□□ □ □•□•□•□ □ □□•□□

(b) □□
┌
□ Divide □□ by
□□
□ □. Divide □□
┌
□
□□ by □. Divide □
□
┌
□ by □.
□
□
┌ Divide □ by
□ □.
□

Quotient is 1.
□□ □ □•□•□•□ □ □•□□

(c) □□
┌

)
□
□

□ □ □ □□
□□ □ □ □ □ □
□□ □ □•□•□

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(c) □□ □ □ □ □

prime

prime

□ □ □ □ □ *prime*

□□ □ □ • □

• □

(d) □□ □ □ □

□□

□□ □ □ □ *prime*

□□

□□ □ □ □ □

□□ □ □ • □ • □

• □

5. **(a)** This division is done from the "bottom-up."

□ *Quotient is 1.*

□ Divide □ by □.

□ Divide □ by □.

□□ Divide □□ by □.

□ Divide □□ by □.

Divide □□ by □.

□ Divide □ by □.

□ Divide □ by □.

□ Divide □ by □.

Quotient is 1.

□□ □ □ • □ • □ □ □

(d)

□□ Divide □□ by □.

□ □□

□

□ Divide □□ by □.

□□

□

□□ Divide □ by □.

□□ Divide □ by □.

Quotient is 1.

□□ □ □ • □ • □ □ □

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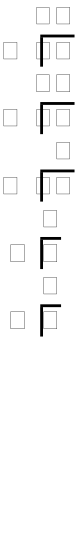
6. **(a)**



Divide □□ by □. Divide □□ by □. Divide □□ by □. Divide □ by □. Divide □ by □.

Quotient is 1.

□□.□ □•□•□•□•□ □
□ •□

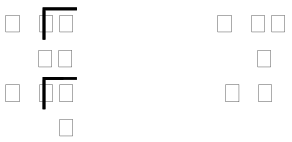
(b)

Divide □□ by □. Divide □□ by □. Divide □□ by □□.

Quotient is 1.

□□ □ □•□•□□ □
□□•□□

(c)



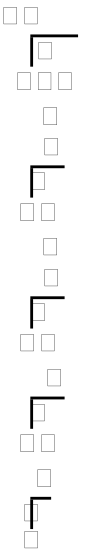
(d)

Divide □□ by □. Divide □□ by □. Divide □□ by □. Divide □ by □.

Quotient is 1.

□□□ □ □ □ □ □ □ □ □ □
□

(e)



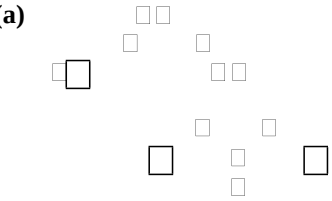
Divide □□□ by □. Divide □□ by □. Divide □□ by □. Divide □ by □.

Quotient is 1.

□□□ □ □ □ □ □ □ □ □ □
□

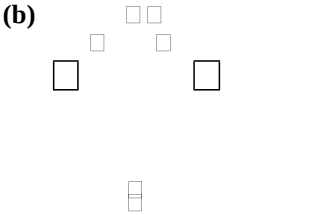
. . . . □•□•

7. **(a)**



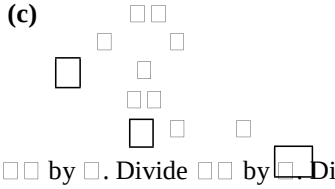
□□ □ □•□•□ □ □□•□

(b)



□□ □ □•□

(c)



Divide □□ by □. Divide □□ by □. Divide □□ by □. Divide □ by □.

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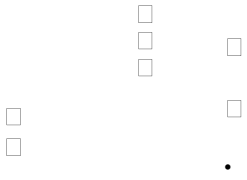
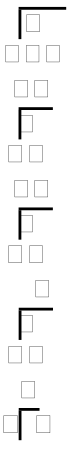


Quotient is 1.

(d) 



Divide  by . Divide by . Divide by . Divide by . Divide by .

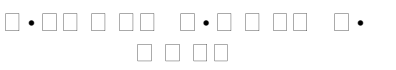
Quotient is 1.

2.3 Section Exercises

1. Factorizations of :

The factors of are , , , and . The statement is *false* (missing).

2. Factorizations of :



The factors of are , , , , , and . The statement is *true*.

3. Factorizations of :

The factors of are , , , and . The statement is *true*.

4. Factorizations of :

The factors of are , , , , , and . The statement is *false* (missing and).

5. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□
□ • □□ □ □□
□ • □ □ □□

The factors of □□ are □, □, □, □, □, □, □□, □□, □□, and □□.

6. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□
□ • □ □ □□

The factors of □□ are □, □, □, □, □, □□, □□, and □□.

7. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□
□ • □ □ □□

The factors of □□ are □, □, □, □, □, □□, □□, and □□.

8. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□
□ • □□ □ □□
□ • □□ □ □□ □ • □ □ □□

The factors of □□ are □, □, □, □, □, □, □, □□, □□, □□, □□, and □□.

9. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□
□ • □ □ □□
□ • □ □ □□

The factors of □□ are □, □, □, □, □, □, □□, □□, and □□.

10. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □ □ □□

The factors of □□ are □, □, □, □, □□, and □□.

11. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□
□ • □ □ □□

12. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□

The factors of □□ are □, □, □, □, □, □□, □□, and □□.

13. Factorizations of □□:

□ • □□ □ □□
□ • □□ □
□□

The factors of □□ are □, □, □□, and □□.

14. Factorizations of □□:

□ • □□ □ □□
□ • □□ □
□□

The factors of □□ are □, □, □□, and □□.

15. Factorizations of □□:

□ • □□ □ □□
□ • □□ □
□□

The factors of □□ are □, □, □□, and □□.

16. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□
□□

The factors of □□ are □, □, □□, and □□.

17. □ is divisible by □ and □, so □ is composite.

18. □ is divisible by □, so □ is composite.

19. □ is only divisible by itself and □, so it is prime.

20. □□ is divisible by □, so □□ is composite.

21. □□ is divisible by □ and □, so □□ is composite.

22. □□ is only divisible by itself and □, so it is prime.

23. □□ is only divisible by itself and □, so it is prime.

24. □□ is only divisible by itself and □, so it is prime.

25. □□ is divisible by □, so □□ is composite.

26. □□ is divisible by □ and □, so □□ is composite.

27. □□ is only divisible by itself and □, so it is prime.

28. □□ is divisible by □ and □, so □□ is composite.

29. □□

□□

The factors of □□ are □, □, □, □, □, □□, □□, and □□.

D by . Divide

i by .

v Divide by .

i

d

e

b

y

.

D

i

v

i

d

e

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□ • □□ □ □□ □ • □□ □ □□

The factors of □□ are □, □, □, □, □, □, 1□, □□, □□, □□, □□, and □□.

13. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□ □ • □ □ □□

The factors of □□ are □, □, □, □, □□, □□, and □□.

14. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□

The factors of □□ are □, □, □, □, □, □, □□, □□, □□, □□, □□, and □□.

Quotient is 1.

□□ □ □ • □ • □ • □ □ □ □ • □

The correct choice is **B**.

30. □□

□ □

□ □□

□ □

□□ □ □ • □ • □ • □ □ □ □ • □

The correct choice is **C**.

31.

Divide by .

Divide by .

. Divide

by . Divide

by .

Quotient is 1.

The correct choice is **A**.

32.

Divide by .

Divide by .

Divide by .

Quotient is 1.

33.

Divide by .

Divide by .

Quotient is 1.

34. We can also use a factor tree.

37.

38.

Divide by .

Divide by

. Divide by

.

Quotient is 1.

39.

Divide by

. Divide

by .

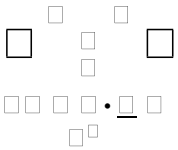
Divide by .

Divide by .

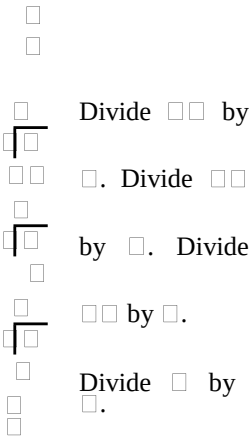
Divide by .

Quotient is 1.

35.

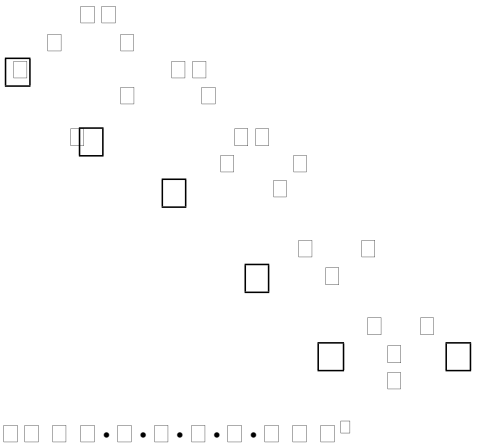


36.

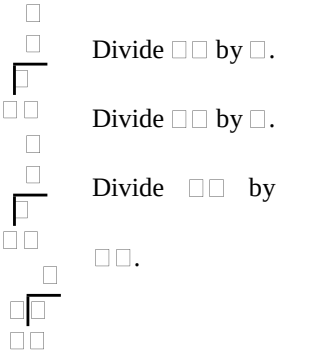


Quotient is 1.

40.

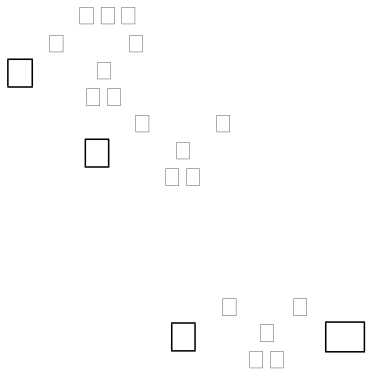


41.

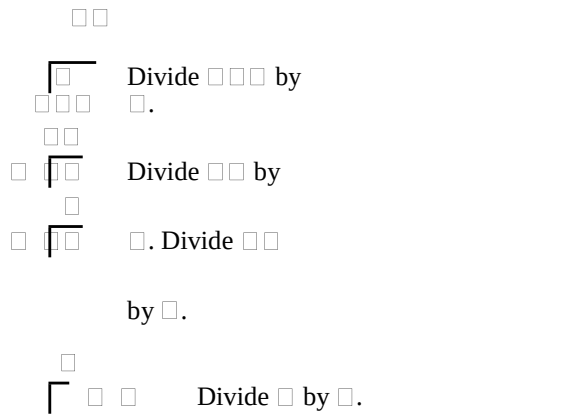


Quotient is 1.

42.

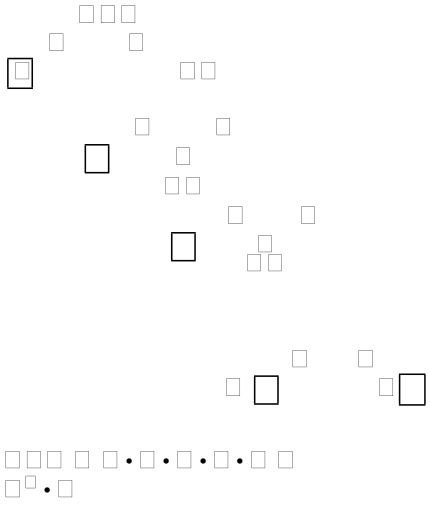


43.

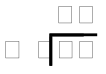


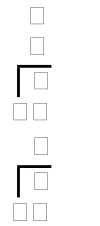
Quotient is 1.

44.



45.





Divide by .

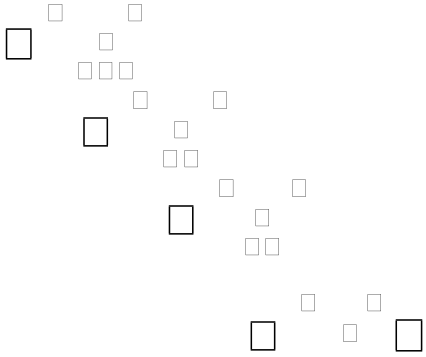
. Divide

by .

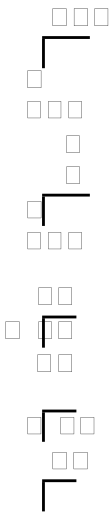
Divide by .

Quotient is 1.

48.



49.



Divide by .

Divide by .

Divide by .

Divide by .

Divide by . Divide by .

D

i

v

i

d

e

b

y

.

Divide by .

Quotient is 1.

46.

47.

Divide by

. Divide

by .

Divide by .

Quotient is 1.

50.

51. □□□

□□□

□ | □□□ Divide □□□ by □.

□□

□ | □□□ Divide □□□ by □.

□□

□ | □□ Divide □□ by □.

□□

□ | □□ Divide □□ by

□

□ | □□ □. Divide □□

□

□ by □.

□

Divide □ by □.

Quotient is 1.

□□□ □ □ • □ • □ • □ • □ • □ □ □□ • □□ • □

52.

□□

□

□ □

□□□

□ □ □□

□ □

□ □

□ □

□ □

□□

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□□

□ □

□ □

□□□ □ □ • □ • □ • □ • □ • □ □ □□ • □□

53. Answers will vary. A sample answer follows. A prime number is a whole number that has exactly two *different* factors, itself and □. Examples include □, □, □, □, and □□□. A composite number

57. □□□

□□□

□ | □□ Divide □□□ by

□□

□ | □□ Divide □□□ by

□

□ | □□ Divide □□ by

□

□ | □□ Divide □ by □.

Quotient is 1.

□□□ □ □ • □ • □ • □ □ □ • □□ • □

58. □□□

□□□

□ | □□□ Divide □□□ by

□□□

□ | □□□ Divide □□□ by

□

□ Divide □□□ by □.

□

□□□

□

□

□ Divide □□ by

□□

□ □. Divide □□

□

□ by □. Divide

□□

□ □□ by □.

□

□ | □□ Divide □□ by

□□

□

□ | □ □.

□□

□ Divide □ by

□ | □.

□

Quotient is 1.

has a factor(s) other than itself or □. Examples include □, □, □, □, and □□. The numbers □ and □ are neither prime nor composite.

54. No even number other than □ is prime because all even numbers have □ as a factor. Many odd numbers are multiples of prime numbers and are not prime. For example, □, □□, □□, and □□ are all multiples of □.

55. All the possible factors of □□ are □, □, □, □, □, □, □□, and □□. This list includes both prime numbers and composite numbers. The prime factors of □□ include only prime numbers. The prime factorization of □□ is

□□ □ □ • □ • □ • □ □
□□ • □□

56. Yes, you can divide by □s before you divide by □.
No, the order of division does not matter. As long as you use only prime numbers, your answers will be correct. However, it does seem easier to always start with □ and then use progressively greater prime numbers. The prime factorization of □□ is

□□ □ □ • □ • □ • □ □
□□ • □□.

□□□ □ □ • □ • □ • □ • □ • □ • □ □ □□ • □

59. □□□

□□□
□ | □□□ Divide □□□ by □.
□□□
□□ Divide □□□ by
□
□ | □□□ □. Divide □□□
□□□
□□ by □. Divide
□
□ | □□□ □□□ by □.
□□□
□ Divide □□ by
□
□ | □□□ □. Divide □□
□□□
□ by □. Divide
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□□ □□ by □.
□
□ Divide □ by □.
□
□□
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□□
□ | □

Quotient is 1.

□□□ □ □ • □ • □ • □ • □ • □ • □ • □ □ □□ • □ • □

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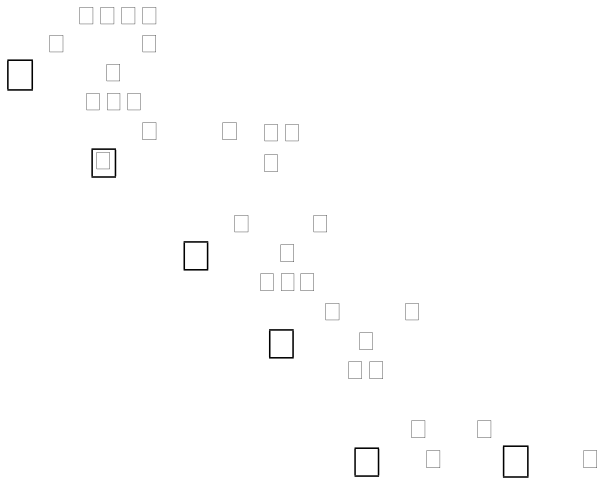
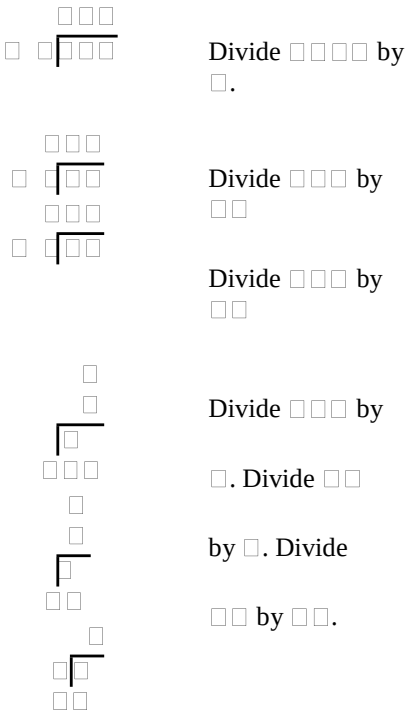
60. 

61. 

Divide by .

Divide by

Divide by

Divide by

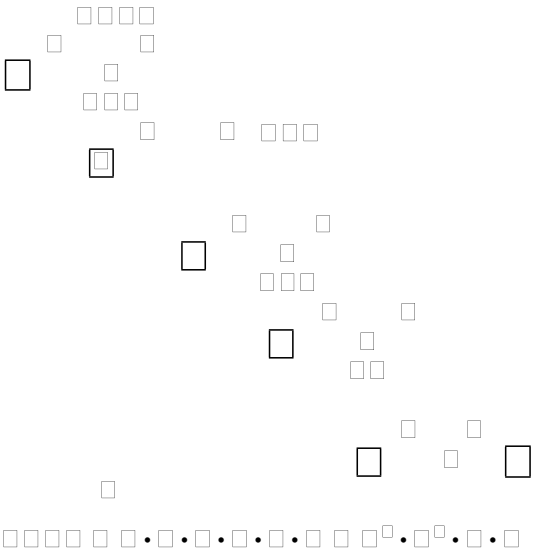
. Divide

by . Divide

by .

Quotient is 1.

62.

63. 

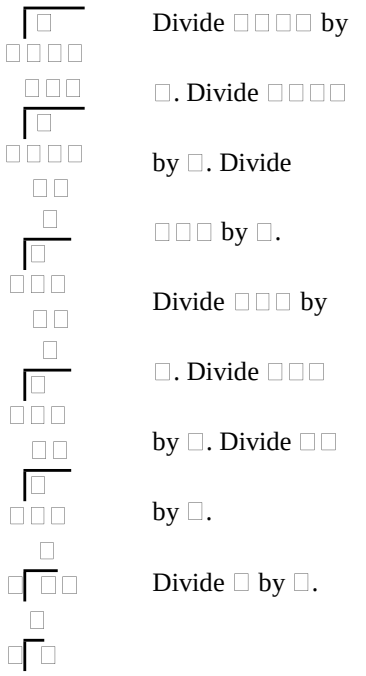
64.

Relating Concepts (Exercises 65–70)

65. The prime numbers less than are , and .

66. A prime number is a whole number that is evenly divisible by itself and only.

67. No. Every other even number is divisible by □ in addition to being divisible by itself and □.



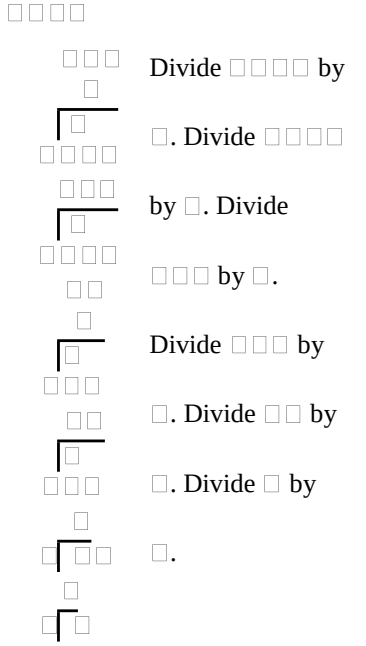
Divide □□□□ by □. Divide □□□□ by □. Divide □□□ by □. Divide □□□ by □. Divide □□□ by □. Divide □ by □.

Quotient is 1.

□□□□ □ □ • □ • □ • □ • □ • □ • □ □ □□ • □□

68. No. A multiple of a prime number can never be prime because it will always be divisible by the prime number.

69.



Divide □□□□ by □. Divide □□□□ by □. Divide □□□ by □. Divide □□□ by □. Divide □□ by □. Divide □ by □.

Quotient is 1.

□□□□ □ □ • □ • □ • □ • □ • □

70. □□□□ □ □ • □ • □ • □ • □ • □ □ □□ • □ • □□ • □

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2.4 Writing a Fraction in Lowest Terms

2.4 Margin Exercises

1. **(a)** □, □□;
□

□ □ □•□ □□ □ □•□

Yes, □ is a common factor of □ and □□.

(b) □□, □□; □
□□ □ □•□ □□ □ □•□

Yes, □ is a common factor of □□ and □□.

(c) □□, □□; □□
□□ □ □□•□, but □□ is not a factor of □□.

No.

(d) □□, □□; □

□□ □ □□•□ □□ □
□□•□

Yes, □ is a common factor of □□ and □□.

2. **(a)** □/□

□

□ and □ have no common factor other than □.

Yes, it is in lowest terms.

(b) □/□

□ and □□ have a common factor of □. No, it is not in lowest terms.

(c) □/□

□□

□ and □□ have a common factor of □.

No, it is not in lowest terms.

(b) □□/□ □ □•□•□•□•□
□□ □•□•□
•□
□ □
□
• • •□• □•□•□•□•□
□ □ □ □ –
• • •□ □•□•□•□
□
□ □
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□ □
□□ □• □•□ □
□• □□

(c) □ □ □
□□□ □•□□ □•□ □
□
□
□

(d) □□□/□□ □ □•□•□□/□•□•□□ □
□□□ • •□• □•□•□•□□ □□
□ □□
□
□

5. **(a)** □□/□□ and □□/□□

□ □ □ □

□□ • • □•□•□•□ □
•□
□□ □ □ –
• • •□ □•□•□•□•□ □
□ □ □
□
□ □ □
□
□□ • • • □•□•□•□ □
□□ □ □ –
• • •□• □•□•□•□•□ □
□ □ □ □

The fractions are *equivalent* □□ □□

(b) □□/□□ and □□/□□

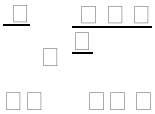
□ □
□□/□ □• □ □•□•□/□ □/□
□□ □• • □•□•□•□ □
□• □
□
□

□□

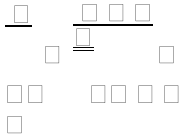
(d)

and have no common factor other than . Yes, it is in lowest terms.

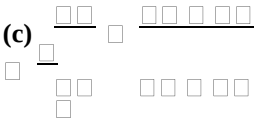
3. (a)



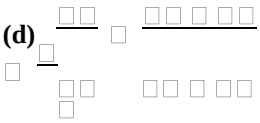
(b)



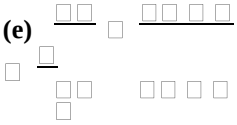
(c)



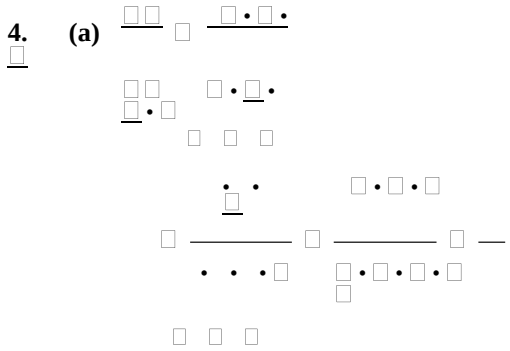
(d)

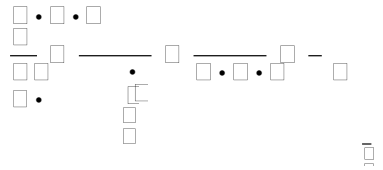


(e)



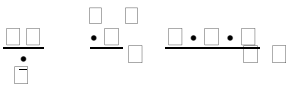
4. (a)

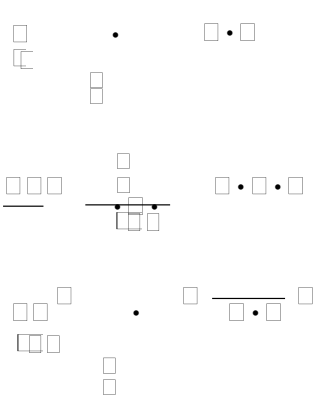




The fractions are *not equivalent* .

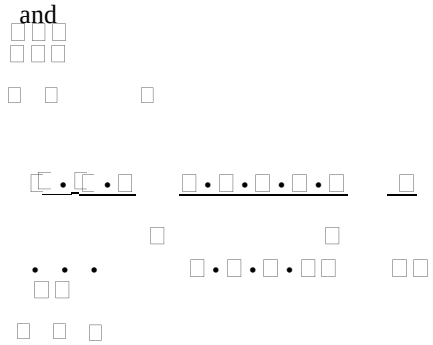
(c) and

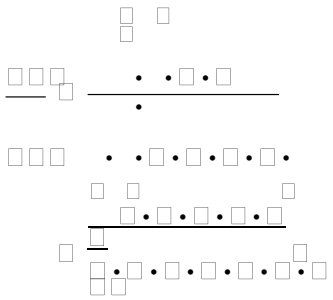




The fractions are *equivalent* ( ).

(d) and





The fractions are *not equivalent*

2.4 Section Exercises

1. A number can be divided by if the number is an even number.

2. A number can be divided by if the number ends in or .

3. Any number can be divided by if the number ends in 0.

4. If the sum of a number's digits is divisible by , the number is divisible by .

5. ✓ ✓ ✓ ✓

6. ✓ ✓ ✓ ✓

7. ✓ ✓ X X

8. ✓ ✓ X X

9. ✓ X ✓ ✓

10. X X ✓ X

11. ✓ ✓ X X

12. ✓ ✓ ✓ ✓

13. , *true*

24.

25.

26.

27.

28.

29.

30.

31.

32.

33.

34.

35.

14. $\frac{\square}{\square}$ is in lowest terms, so the fractions and $\frac{\square}{\square}$

are not equivalent. *false*

15. $\frac{\square}{\square}$ is in lowest terms, so the fractions and $\frac{\square}{\square}$

are not equivalent. *false*

16. $\frac{\square}{\square}$, *true*

17. $\frac{\square}{\square}$

18. $\frac{\square}{\square}$

19. $\frac{\square}{\square}$

20. $\frac{\square}{\square}$

21. $\frac{\square}{\square}$

22. $\frac{\square}{\square}$

23. $\frac{\square}{\square}$

36.

37.

38.

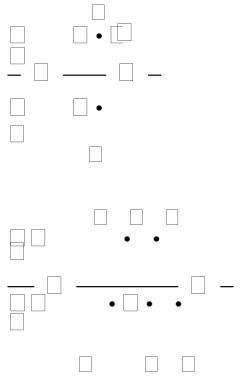
39.

40.

41.

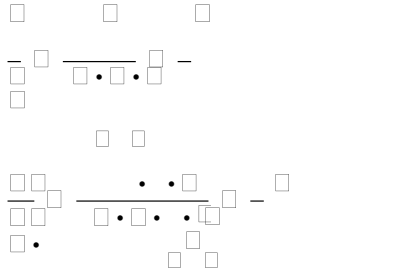
42.

43. $\frac{}{}$ and $\frac{}{}$



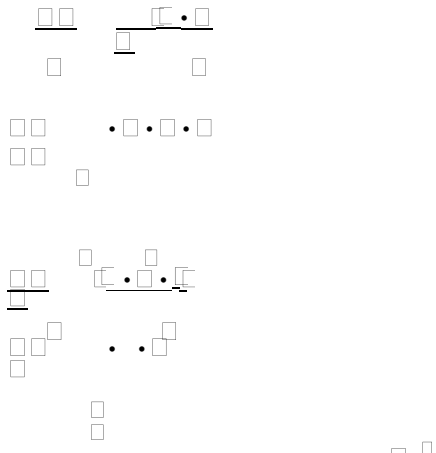
The fractions are *equivalent*

44. $\frac{}{}$ and $\frac{}{}$



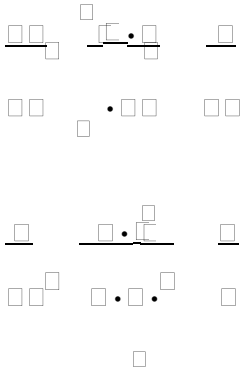
The fractions are *equivalent*

45. $\frac{}{}$ and $\frac{}{}$



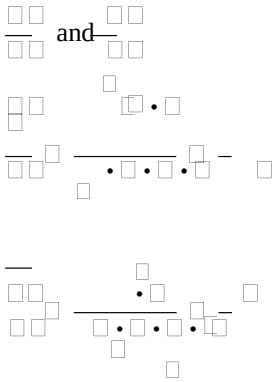
The fractions are *not equivalent*

48. $\frac{}{}$ and $\frac{}{}$



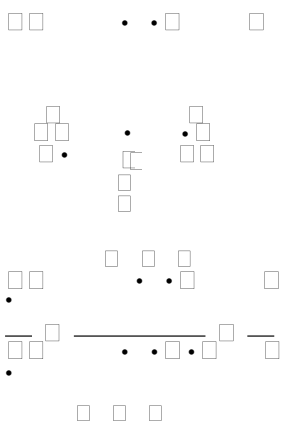
The fractions are *not equivalent*

49. $\frac{}{}$ and $\frac{}{}$



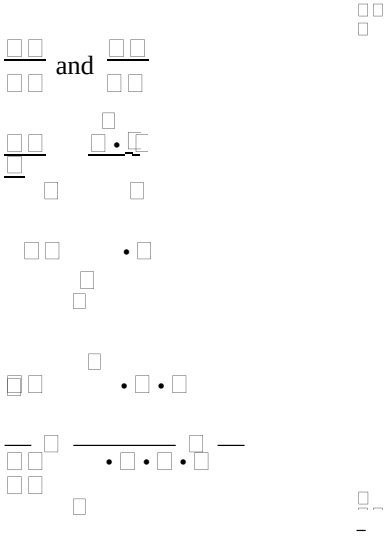
The fractions are *equivalent*

50. $\frac{}{}$ and $\frac{}{}$



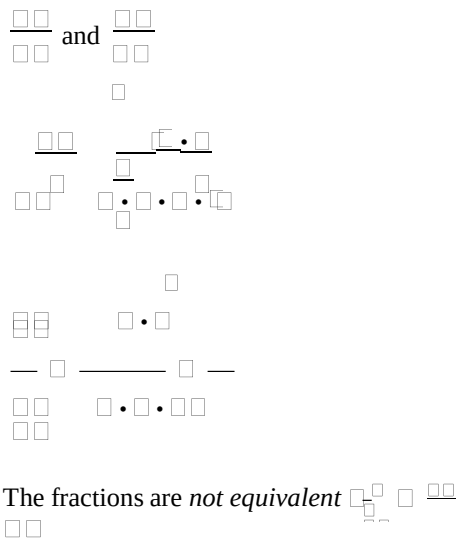
The fractions are *equivalent*

46. $\frac{\square}{\square}$ and $\frac{\square}{\square}$



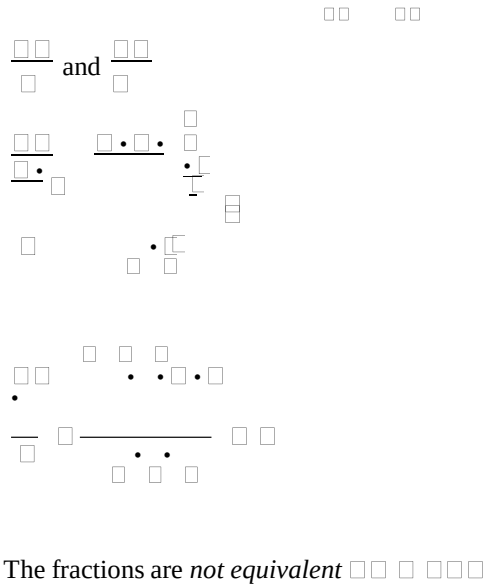
The fractions are *not equivalent*

47. $\frac{\square}{\square}$ and $\frac{\square}{\square}$



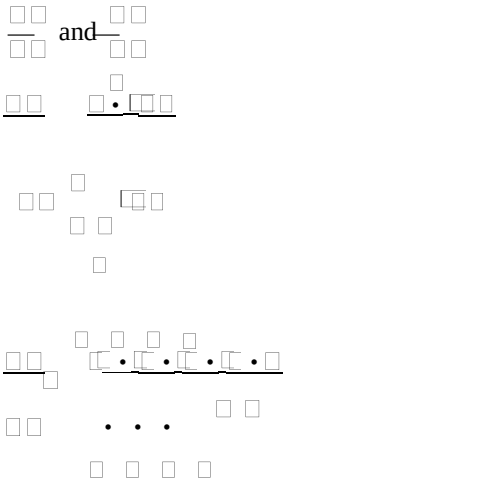
The fractions are *not equivalent*

51. $\frac{\square}{\square}$ and $\frac{\square}{\square}$



The fractions are *not equivalent*

52. $\frac{\square}{\square}$ and $\frac{\square}{\square}$



The fractions are *equivalent*

53. and

The fractions are *equivalent*

54. and

The fractions are *equivalent*

55. A fraction is in lowest terms when the numerator and the denominator have no common factors other than . Some examples are , , and .

56. Two fractions are equivalent when they represent the same portion of a whole. For example, the

2.5 Multiplying Fractions

2.5 Margin Exercises

1. of as read from the figure is the darker shaded part of the second figure. One of eight equal parts is shaded, or .

2. **(a)**

(b)

(c)

(d)

3. **(a)**

(b)

(c)

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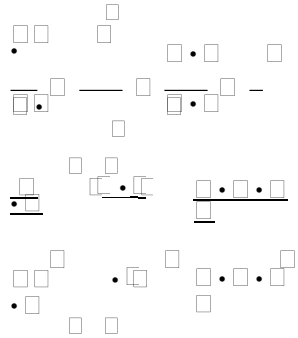
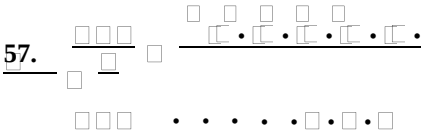
fractions and are equivalent.

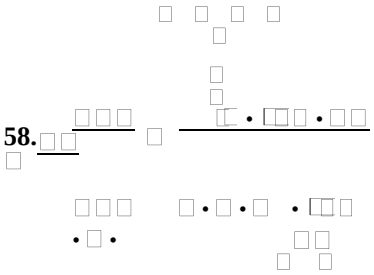


The fractions are *equivalent*

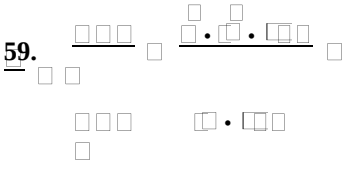
57.



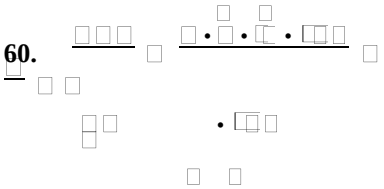
58.



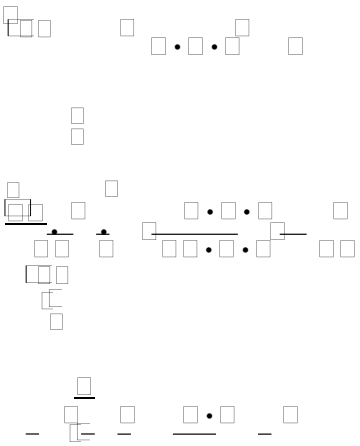
59.



60.

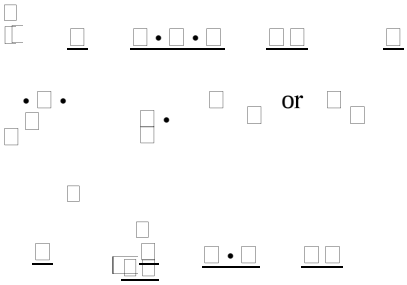


(d)

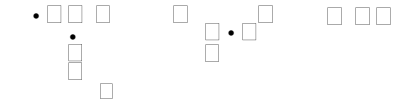


4. (a)

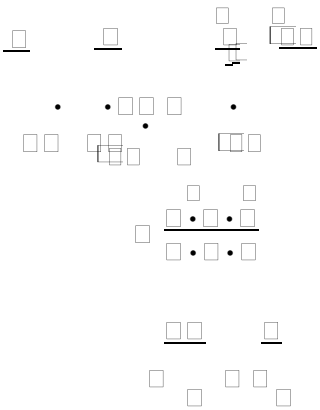
(b) or



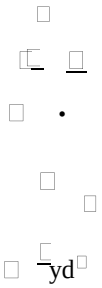
(c)



(d)



5. **(a)** Area □ length • width

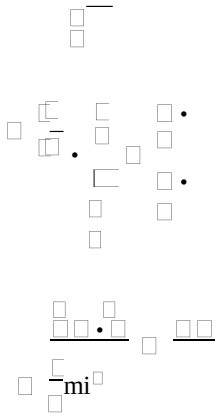


yd

(b) Area □ length • width

mi

(c) Area □ length • width

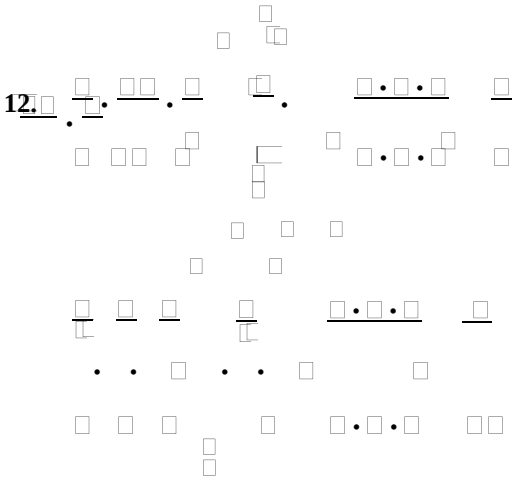


mi

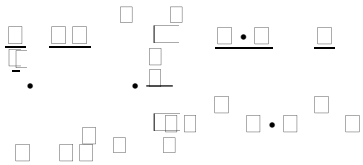
2.5 Section Exercises

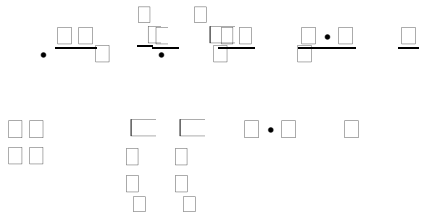
1. To multiply two or more fractions, you multiply the numerators and you multiply the denominators.

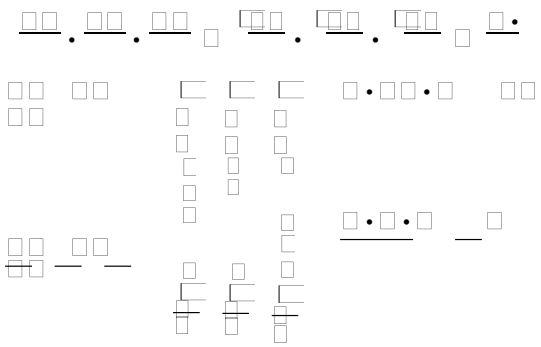
2. To write a fraction in lowest terms, you must divide both the numerator and denominator by a common factor.

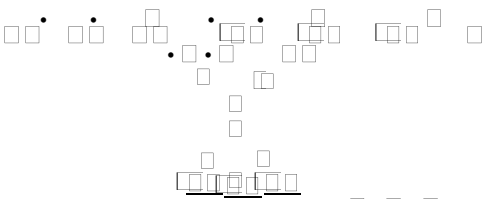
12. 

13.

14. 

15. 

16. 

17. 

18. 

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3. A shortcut when multiplying fractions is to divide both a numerator and a denominator by the same number.

4. Using the shortcut when multiplying fractions should result in an answer that is in lowest terms.

5.

6.

7.

8.

9.

10.

11.

19.

20. The statement "When multiplying a fraction by a whole number, the whole number should be rewritten as the number over 1." is *true*.

21. is *false*.

The correct method is as follows:

22.

23.

24.

25.

26.

27.

28.

29.

30.

31.

36.

37. Area = length • width

mi

38. Area = length • width

ft

39. Area = length • width

meters

40. Area = length • width

in.

41. Area = length • width

mi

32.

33.

34.

35.

42. Area = length • width

mi

43. Multiply the numerators and multiply the denominators. An example is

44. You must divide a numerator and a denominator by the same number. If you do all possible divisions, your answer will be in lowest terms. One example is

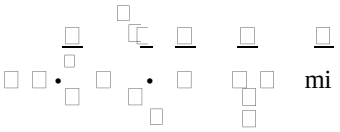
45. Area = length • width

yd

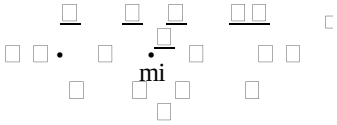
46. Area = width • height

yd

47. Area □ length • width

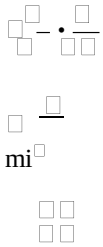


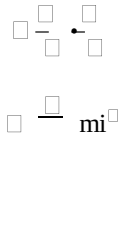
48. Area □ length • width



49. **Sunny Side Soccer Park** **Creekside Soc. Park**

Area □ length • width Area □ length • width

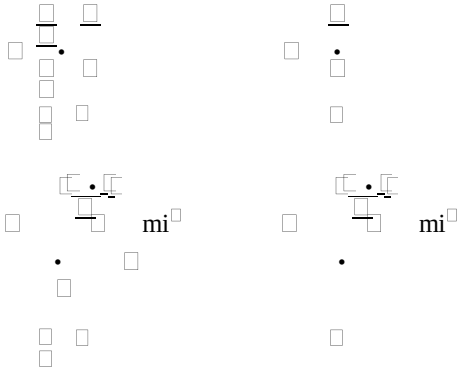




They are both the same size.

50. **Rocking Horse Ranch** **Silver Spur Ranch**

Area □ length • width Area □ length • width



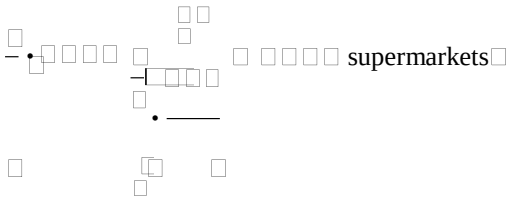
Neither ranch is larger in area. They are both the same size.

Relating Concepts (Exercises 51–56)

51. □□□□ □ □□□□ □ □□□□ □ □□□□ □ □□□□ □ □□□□

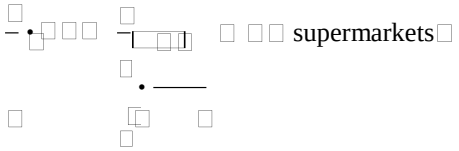
□ □□□ □ □□ □ □□□□ supermarkets

55. We need a multiple of □ with *two* nonzero digits that is close to □□□□. A reasonable choice is □□□□ and an estimate is



This value is closer to the exact value because using □□□□ as a rounded guess is closer to □□□□ than using □□□□ as a rounded guess.

56. We need a multiple of □ with *two* nonzero digits that is close to □□□. A reasonable choice is □□□ and an estimate is □□



This value is closer to the exact value because using □□□ as a rounded guess is closer to □□□ than using □□□ as a rounded guess.

2.6 Applications of Multiplication

2.6 Margin Exercises

1. **(a)** ***Step 1*** The problem asks us to find the amount of money they can save in a year.

Step 2 Find the amount they can save by multiplying □ and □□,□□□.

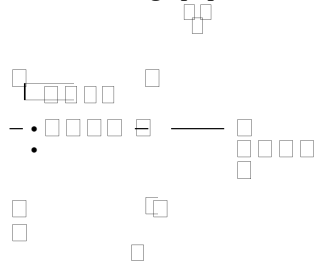
The estimate of the total number of supermarkets in these states is □□□□.

Step 3

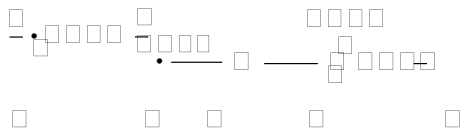
52.

supermarkets, which is the exact total number of supermarkets in these states.

53. An estimate of the number of supermarkets in medium to large population areas in New York is

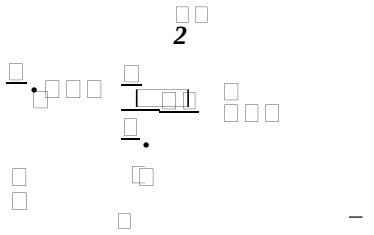


The exact value is



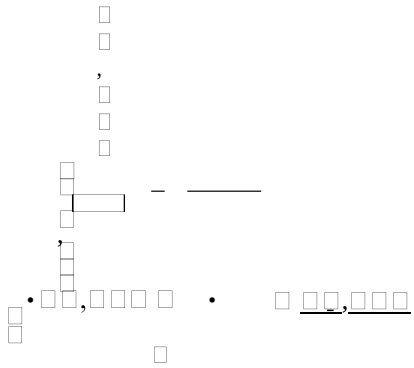
Rounding gives us supermarkets.

54. An estimate of the number of supermarkets in New Hampshire which are in shopping centers, is

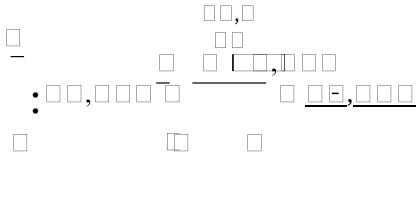


The exact value is

We can estimate this amount using and



Step 4 Now solve the problem using the original values.



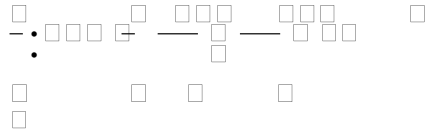
Step 5 They can save $ in a year.

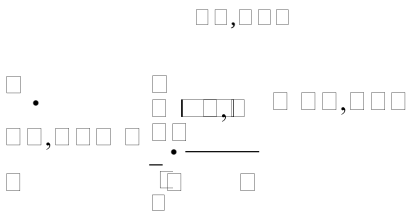
Step 6 The answer is reasonably close to our estimate.

(b) ***Step 1*** The problem asks us to find the amount of money she will receive as retirement income.

Step To find her retirement income, multiply and $.

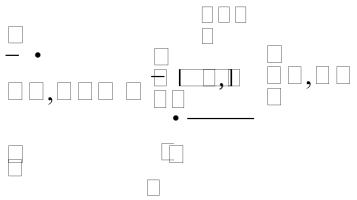
Step 3 We can estimate this amount using and .





Rounding gives us □□
supermarkets.

Step 4 Now solve the problem using the original values.



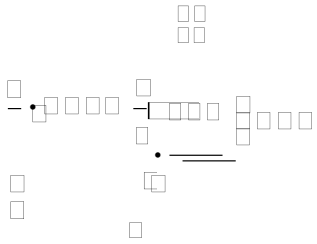
Step 5 She will receive $□□,□□□ as income. retirement

Step 6 The answer is reasonably close to our estimate.

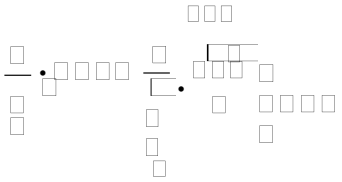
2. ***Step 1*** The problem asks for the number of prescriptions paid for by a third party.

Step 2 A third party pays for □/□ of the total number of prescriptions, □□□□.

Step 3 An estimate is



Step 4 The exact value is



Step 5 A third party pays for □□□□ prescriptions.

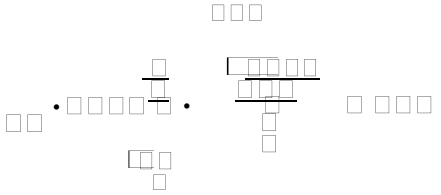
Step 6 The answer is reasonably close to our estimate.

3. ***Step 1*** The problem asks for the fraction of students who speak Spanish.

Step 2 □ of the □ of the students who speak a

(c) From the circle graph, the fraction is □/□

(d) Multiply □/□ by □□□□. Since we can estimate the answer using the exact values, our estimated answer will be the same as the exact answer.



□□□ children buy food from a convenience store or street vendor.

2.6 Section Exercises

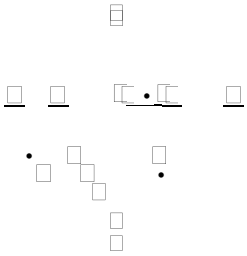
1. The words that are indicator words for multiplication are *of*, *times*, *twice*, *triple*, *product*, and *twice as much*.

2. The final step when solving an application problem is to check your work.

3. When you multiply length by width you are finding the area of a rectangular surface.

4. When calculating area, the length and the width must be in the same units of measurement. If the measurements are both in miles, the answer will be in square miles and shown as mi□

5. Multiply the length and the width.



The area of the digital photo frame is □/□ ft□.

6. Multiply the length and width.

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foreign language, speak Spanish.

Step 3 An estimate is

Step 4 The exact value is , which is the same as the estimate since we didn't round.

Step 5 The fraction of students who speak Spanish is .

Step 6 The answer, , matches our estimate.

4. **(a)** From the circle graph, the fraction is

(b) Multiply by the number of people in the survey, Since we can estimate the answer using the exact values, our estimated answer will be the same as the exact answer.

children buy food from vending machines.

The area of the floor is yd.

7. Multiply the length and the width.

The area of the cookie sheet is ft.

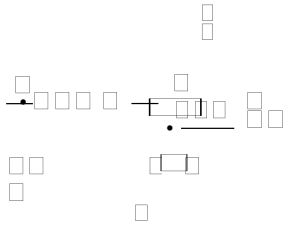
8. Multiply by

people who shop at flea markets on a daily basis purchase produce.

9. Multiply the length and the width.

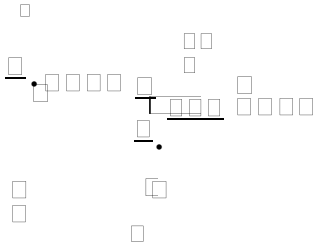
The area of the top of the table is yd.

10. Multiply the number of bowls by the fraction eaten in the summer months.



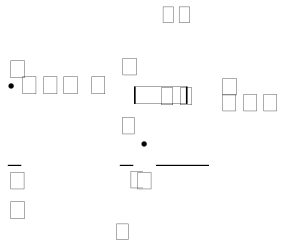
The average person consumes □□ bowls of cereal
in the summer months.

11. Multiply □ by □□□□□



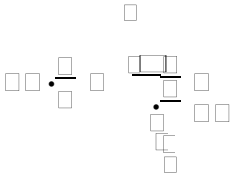
He earned $□□□□ on his job.

12. Multiply □ by □□□□



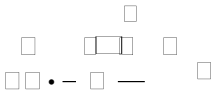
The average household does □□□ loads of wash in the winter months.

13. Multiply the daily parking fee by the fraction.

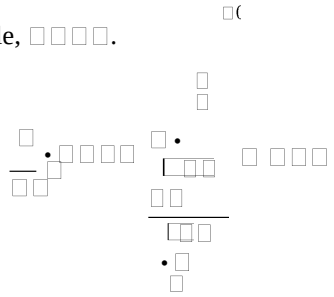


The daily parking fee in Boston is $□□.

14. Multiply the daily parking fee by the fraction.

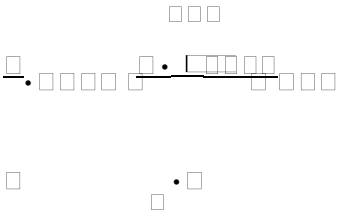


17. The smallest sector of the circle graph is the *4 hours* group, so this response was given by the least number of people. To find how many people gave this response, multiply □ by the total number of people, □□□□.



□□□ people gave this response.

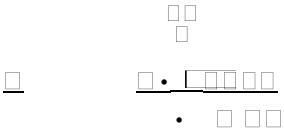
18. The largest sector of the circle graph is the *2 hours or less* group, so this response was given by the greatest number of people. To find how many people gave this response, multiply □ by the total number of people, □□□□.



□□□ people gave this response.

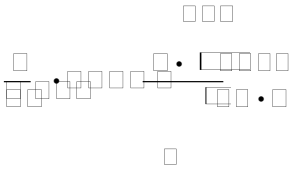
19. The only group that is *not* willing to wait □ hours or less is the *8 hours* group, and the fraction corresponding to that group is □. Thus, the fraction willing to wait □ hours or less is

The total number of people willing to wait □ hours or less is



The daily parking fee in San Francisco is $□□.

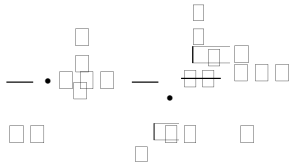
15. **(a)** □/□ of the □□□□ runners are women.



□□□ runners are women.

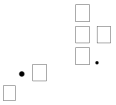
(b) The number of runners that are men is

16. **(a)** Multiply the fraction of nonsmoking rooms by the number of rooms.



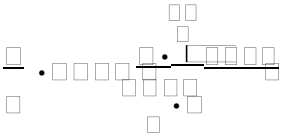
There are □□□ nonsmoking rooms.

(b) The number of smoking rooms is



20. The only group that is *not* willing to wait □ hours or more is the *2 hours or less* group, and the fraction corresponding to that group is □/□. Thus, the fraction willing to wait □ hours or more is

The total number of people willing to wait □ hours or more is



21. Because everyone is included and fractions are given for *all* groups, the sum of the fractions must be *1*, or *all* of the people.

22. Answers will vary. Some possibilities are

1. You made an addition error.
2. The fractions on the circle graph are incorrect.
3. The fraction errors were caused by rounding.

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23. Add the income for all twelve months to find the income for the year.

The Owens family had income of $□□,□□□ for the year.

24. Multiply the fraction by the total income ($□□,□□□).

Their taxes were $□□,□□□.

25. From Exercise 23, the total income is $□□,□□□.
The circle graph shows that of the income is for rent.

The amount of their rent is $□□,□□□.

26. Multiply the fraction by the total income.

They spent $□□,□□□ on food.

27. Multiply the total income by the fraction saved.

31. Multiply the cost in the United States by

The cost of laser eye surgery for one eye in Thailand is $□□□.

32. Multiply the cost in the United States by

The cost of a knee replacement in Mexico is $□□□□.

33. We want of the actual length.

The length of the scale model is □ feet.

34. First multiply and □□,□□□ to find the number of pounds saved.

To find the weight of the test truck, subtract:

10,□□□ □ □□□□ □ □□□□

pounds. The test truck weighs □□□□ pounds.

35. First multiply and □□,□□□ to find the number of

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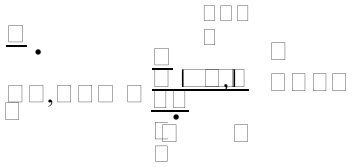
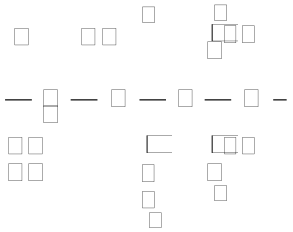
The Owens family saved $□□□□ for the year.

28. Multiply the fraction □ by the total income.



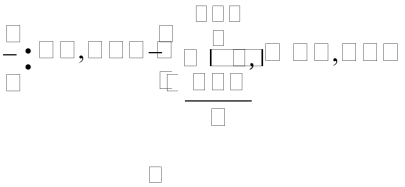
They spent $□□□□ on clothing.

29. The error was made when dividing □□ by □ and writing □ instead of □. The correct solution is



30. Yes, the statements are true. Since whole numbers are □ or greater, when you multiply, the product will always be greater than either of the numbers multiplied. But, when you multiply two proper fractions, you are finding a fractional part of a fraction, and the product will be smaller than either of the two proper fractions.

her votes from senior citizens.

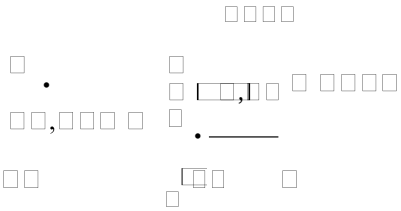


To find the votes needed from voters other than the senior citizens, subtract:

□□,□□□ □ □□,□□□ □ □□□□ votes.

She needs □□□□ votes from voters other than the senior citizens.

36. Multiply the fraction □ by the cost ($□□,□□□).



To find the amount borrowed in the first years, subtract:

$□□,□□□ □ $□□□□ □
$□□,□□□

$□□,□□□ was borrowed in the first years.

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37. Multiply the remaining $\frac{\square}{\square}$ of the estate by the fraction going to the American Cancer Society.

$\square \cdot \square = \square$

$\frac{\square}{\square}$ of the estate goes to the American Cancer Society.

38. Multiply the remaining $\frac{\square}{\square}$ of their total investments by the fraction invested in bonds.

$\square \cdot \square = \square$

The couple invested $\frac{\square}{\square}$ of their total investment in bonds.

2.7 Dividing Fractions

2.7 Margin Exercises

1. **(a)** $\square \cdot \square = \square$; The reciprocal of $\square$ is $\square$ because

$\square \cdot \square = \square$.

(b) $\square \cdot \square = \square$; The reciprocal of $\square$ is $\square$ because

$\square \cdot \square = \square$.

(c) The reciprocal of $\frac{\square}{\square}$ is $\square$ because

$\square \cdot \square = \square$.

3. **(a)** $\square \cdot \square = \square$

(b) $\square \cdot \square = \square$

(c) $\square \cdot \square = \square$

(d) $\square \cdot \square = \square$

4. **(a)** ***Step 1*** The problem asks for the number of $\square$-ounce dispensers that can be filled using $\square\square$ ounces of eye drops.

Step 2 Divide the total number of ounces of eye drops by the fraction of an ounce each dispenser holds.

Step 3 An estimate is $\square\square \div \square = \square\square$

Step 4 Solving gives us

$\square\square \div \square = \square\square \cdot \square = \square$

Step 5 $\square\square$ $\square$-ounce dispensers can be filled.

Step 6 The answer is reasonably close to our estimate.

(b) ***Step 1*** The problem asks for the number of

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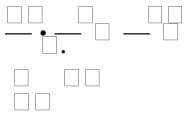
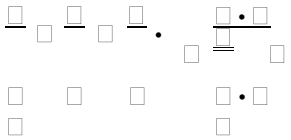
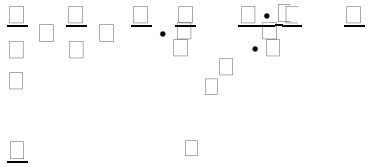
(d) The reciprocal of is because



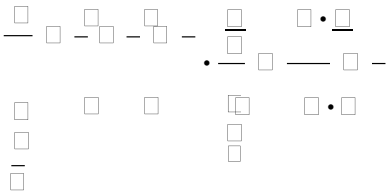
2. **(a)**



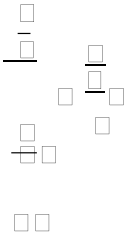
(b)



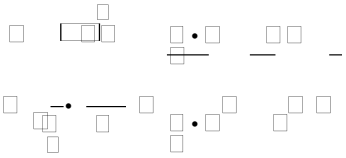
(c)



(d)



2

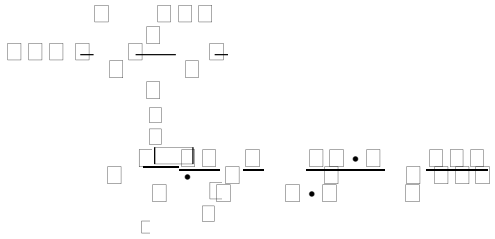


-quart bottles that can be filled from a -quart cask.

Step 2 Divide the total number of quarts in the cask by the size of the bottles.

Step 3 An estimate is

Step 4 Solving gives us



Step 5 -quart bottles can be filled.

Step 6 The answer is reasonably close to our estimate.

5. **(a)** ***Step 1*** The problem asks for the fraction of the bonus money that each employee will receive.

Step Divide the fraction of the bonus money, , by the number of employees, .

Step 3 An estimate is

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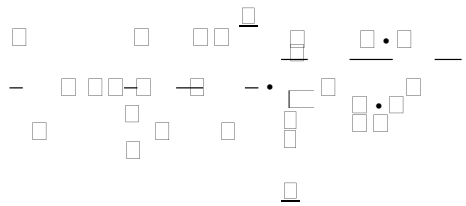
Step 4 Solving gives us



Step 5 Each employee will receive $\frac{\square}{\square}$ of the bonus money.

Step 6 The answer is reasonably close to our estimate.

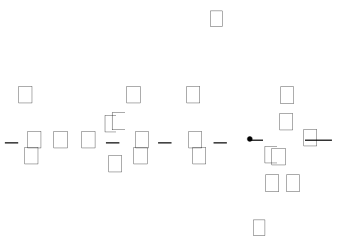
(b) ***Step 1*** The problem asks for the fraction of the prize money that each employee will receive.

Step 2 Since they donate $\frac{\square}{\square}$ of the winnings, they have

of the winnings left to divide. Divide the fraction of the winnings that remain, $\frac{\square}{\square}$, by the number of employees, $\square$.

Step 3 An estimate is $\square \cdot \square = \square$

Step 4 Solving gives us



Step 5 Each employee will receive $\frac{\square}{\square}$ of the prize money.

Step 6 The answer is reasonably close to our estimate.

2.7 Section Exercises

9. The reciprocal of $\frac{\square}{\square}$ is $\frac{\square}{\square}$ because $\frac{\square}{\square} \cdot \frac{\square}{\square} = \frac{\square}{\square} = \square$.

10. The reciprocal of $\frac{\square}{\square}$ is $\frac{\square}{\square}$ because

$\frac{\square}{\square} \cdot \frac{\square}{\square} = \frac{\square}{\square} = \square$.

11. The reciprocal of $\square$ is $\frac{\square}{\square}$ because $\frac{\square}{\square} \cdot \frac{\square}{\square} = \frac{\square}{\square} = \square$.

12. The reciprocal of $\frac{\square}{\square}$ is $\frac{\square}{\square}$ because

$\frac{\square}{\square} \cdot \frac{\square}{\square} = \frac{\square}{\square} = \square$.

13. $\square \div \square = \square \cdot \square$

14. $\square \div \square = \square \cdot \square$

15. $\square \div \square = \square \cdot \square$

16. $\square \div \square = \square \cdot \square$

17. $\square \div \square = \square \cdot \square$

18. $\square \div \square = \square \cdot \square$

19. $\square \div \square = \square \cdot \square$

1. When you invert or flip a fraction, you have the reciprocal of the fraction.

2. To find the reciprocal of a whole number, you must first write the whole number over 1, and then invert it.

3. To divide by a fraction, you must first invert the divisor and then change division to multiplication.

4. After completing a fraction division problem, it is best to write the answer in lowest terms.

5. The reciprocal of $\frac{\square}{\square}$ is $\frac{\square}{\square}$ because $\frac{\square}{\square} \cdot \frac{\square}{\square} = \frac{\square\square}{\square\square} = \square$.

6. The reciprocal of $\frac{\square}{\square}$ is $\frac{\square}{\square}$ because $\frac{\square}{\square} \cdot \frac{\square}{\square} = \frac{\square\square}{\square\square} = \square$.

7. The reciprocal of $\frac{\square}{\square}$ is $\frac{\square}{\square}$ because $\frac{\square}{\square} \cdot \frac{\square}{\square} = \frac{\square\square}{\square\square} = \square$.

8. The reciprocal of $\frac{\square\square}{\square\square}$ is $\frac{\square\square}{\square\square}$ because $\frac{\square\square}{\square\square} \cdot \frac{\square\square}{\square\square} = \frac{\square\square}{\square\square} = \square$.

20. $\square \div \square = \square \cdot \square = \square$

21. $\square \div \square = \square \cdot \square = \square$

22. $\square \div \square = \square \cdot \square = \square$

23. $\square \div \square = \square \cdot \square = \square$

24. $\square \div \square = \square \cdot \square = \square$

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25.

26.

27.

28.

29.

30.

31.

32.

37. Divide the total number of ounces of eye drops by the fraction of an ounce each dispenser holds.

dispensers can be filled.

38. Divide the number of pounds of peanuts by the fraction of pounds of peanuts each person will likely eat.

guests can be served with pounds of peanuts.

39. Divide the total weight of a carton by the weight per fastener.

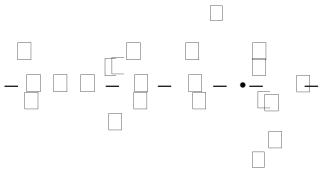
There are -pound fasteners in each carton.

40. Divide the total acreage by the acreage per lot.

There are -acre lots in the subdivision.

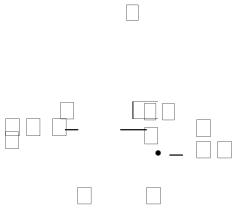
41. Answers will vary. A sample answer follows:

33. of a quart divided into parts:



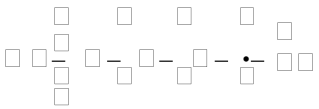
Each horse will get of a quart.

34. Divide the number of quarts of shampoo by the fraction of a quart each container holds.



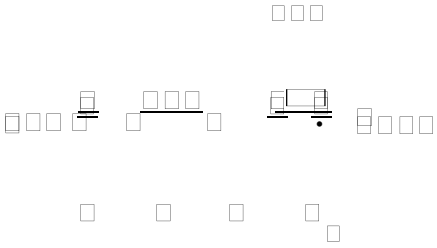
Harold can fill containers.

35. Divide the total number of cups by the size of the measuring cup.



They need to fill the measuring cup times.

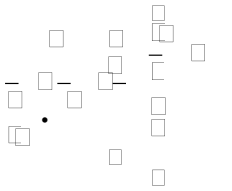
36. Divide the total number of pounds of jelly beans by the size of the bag.



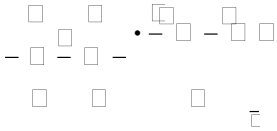
-pound bags can be filled.

You can divide two fractions by multiplying the first fraction by the reciprocal of the second fraction (divisor).

42. Sometimes the answer is less and sometimes it is greater.

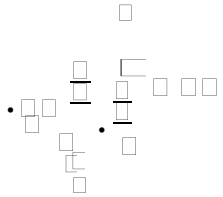


(less than , but not less than



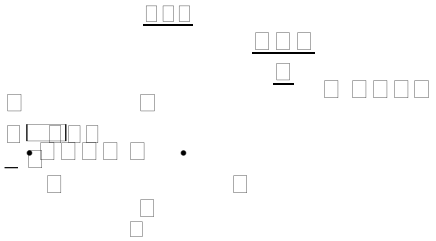
(greater)

43. Each loafcake requires pound of jellybeans, so to make loafcakes, use multiplication.



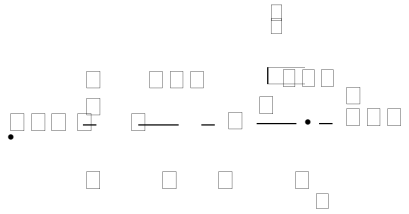
pounds will be needed.

44. We want of patients—use multiplication.



patients were still taking their drugs.

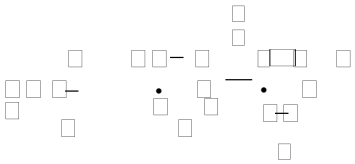
45. Divide the □□□ cans of compound by the fraction of a can needed for each new home.



□□□ homes can be plumbed.

46. Divide the □□ gallons of differential fluid by the

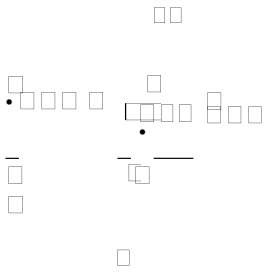
fraction of a gallon needed for each car serviced.



□□ cars can be serviced.

47. **(a)** In □ of the □□□ visits, doctors failed to discuss

the issues—use multiplication.

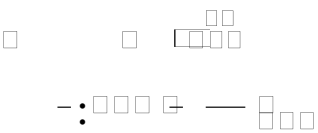


The doctors failed to discuss the issues in □□□ visits.

(b) The doctors *did* discuss the issues in □□□ □ □□□ □ □□ visits.

48. **(a)** □ of the □□□ miles have been completed—use

multiplication.

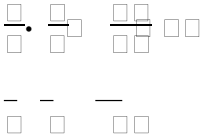


52. The indicator words for division are underlined below.

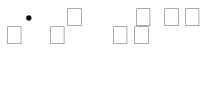
fewer	sum of
goes into	divide
per	quotient
equals	double
loss of	divided by

53. To divide two fractions, multiply the first fraction by the reciprocal of the second fraction.

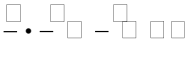
54. The reciprocal of □ is □ because



The reciprocal of □ is □ because



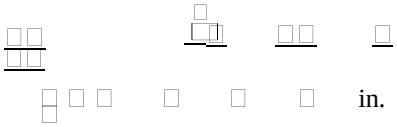
The reciprocal of □ is □ because



The reciprocal of □□ is □□ because

55. **(a)** To find the perimeter of any flat equal-sided 3-, 4-, 5-, or 6-sided figure, multiply the length of one side by 3, 4, 5, or 6, respectively.

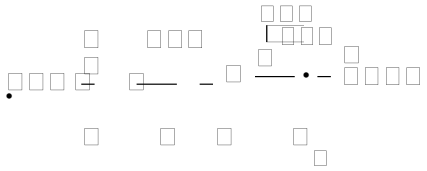
(b) The stamp has four sides, so multiply □□ by □.


in.

He has gone ___ miles.

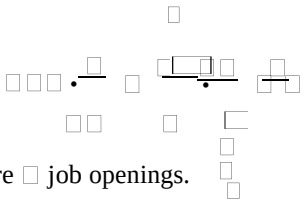
(b) The number of miles that remain is ___ miles.

49. Divide the ___ yards of fabric by the fraction of a yard needed for each dish towel.



___ towels can be made.

50. Multiply the number of applicants by the fraction of jobs available per applicant.



There are ___ job openings.

Relating Concepts (Exercises 51–56)

51. The indicator words for multiplication are underlined below.

more than	per
double	twice
times	product
less than	difference
equals	twice as much

The perimeter of the stamp is ___ inches.

56. Area = length • width

The area is ___ in.^{2}. Multiply the length by the width to find the area of any rectangle.

2.8 Multiplying and Dividing Mixed Numbers

2.8 Margin Exercises

1. (a) ___ is ———— more than ___ Half of ___ is ___

___ rounds up to ___.

(b) ___ is less than ___ Half of ___ is ___

___ rounds down to ___.

(c)

is more than

Half of is

rounds up to

.

(d)

is more than

Half of is

rounds up to

.

(e)

is the same as

Half of is

rounds up to

.

(f)

is less than

Half of is

rounds down to

.

(d)

Estimate: rounds to rounds to .

Exact:

3. (a)

Estimate: rounds to . rounds to .

Exact:

(b)

Estimate: rounds to rounds to .

Exact:

(c)

2. **(a)**

Estimate: rounds to rounds to .

Exact:

(b)

Estimate: rounds to rounds to .

Exact:

(c)

Estimate: rounds to rounds to .

Exact:

Estimate: rounds to rounds to .

Exact:

(d)

Estimate: rounds to rounds to .

Exact:

4. Multiply the amount of paint needed for each car by the number of cars.

Estimate: rounds to rounds to .

Exact:

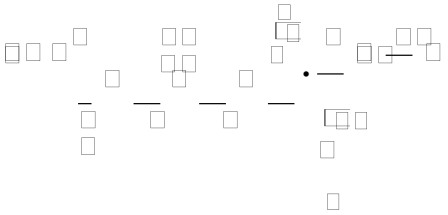
quarts are needed for cars. The answer is reasonably close to the estimate.

5. **(a)** Divide the total pounds of brass by the number of pounds needed for one engine.

Estimate: □□ rounds to □□. □□ rounds to □.

□□ □ □ □ □□

Exact:



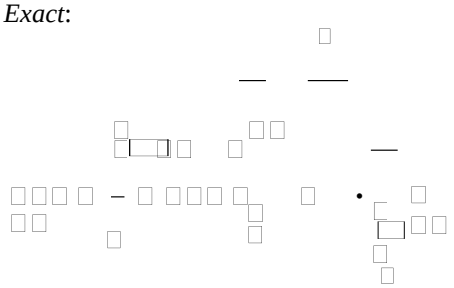
□□ propellers can be manufactured from □□ pounds of brass. The answer is reasonably close to the estimate.

(b) Divide the total number of quarts by the number of quarts needed for each oil change.

Estimate: □□□ rounds to □□□. □□ rounds to □□.

□□□ □ □□ □ □□

Exact:



□□ oil changes can be made with □□□ quarts of oil. The answer is reasonably close to the estimate.

2.8 Section Exercises

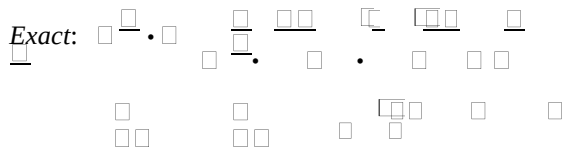
1. The statement "When multiplying two mixed numbers, the reciprocal of the second mixed number must be used." is *false*. A reciprocal is used when *dividing* fractions, not *multiplying* fractions.

2. The statement "If you were dividing a mixed number by the whole number □□, the reciprocal of

7. □ □/□ • □ □/□□

Estimate: □ • □ □ □

Exact: □ □/□ • □



8. □ □/□ • □ □/□

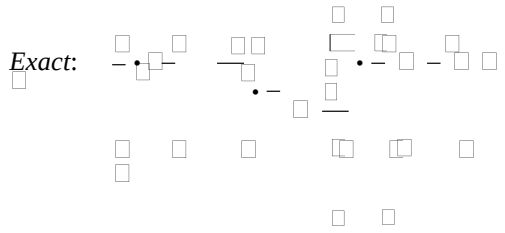
Estimate: □ • □ □ □□

Exact: □ □/□ • □ □ □/□ • □ □□ □ □□/□

9. □ □/□ • □ □/□

Estimate: □ • □ □ □

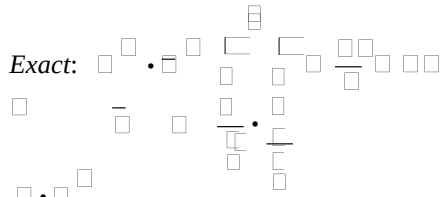
Exact:



10. □ □/□ • □ □/□

Estimate: □ • □ □ □□

Exact: □ □/□ • □



11. □ • □ □/□

Estimate: □ • □ □ + □□

would be ." is *false*. The reciprocal of is .

3. The statement "To round mixed numbers before estimating the answer, decide whether the numerator of the fraction part is less than or more than half of the denominator." is *true*.

4. The statement "When rounding mixed numbers to estimate the answer to a problem, the estimated answer can vary quite a bit from the exact answer. However, it can still show whether the exact answer is reasonable." is *true*.

5.

Estimate:

Exact:

6.

Estimate:

Exact:

Exact:

12.

Estimate:

Exact:

13.

Estimate:

Exact:

14.

Estimate:

Exact:

15.

Estimate:

Exact:

16.

Estimate:

Exact:

17. *Estimate*:

The best estimate is choice **D**.

18. *Estimate*:

The best estimate is choice **A**.

19. *Estimate*:

The best estimate is choice **B**.

20. *Estimate*:

The best estimate is choice **C**.

21.

25.

Estimate:

Exact:

26.

Estimate:

Exact:

27.

Estimate:

Exact:

28.

Estimate:

Exact:

29.

Estimate:

Exact:

22.

Estimate:

Exact:

23.

Estimate:

Exact:

24.

Estimate:

Exact:

Estimate:

Exact:

30.

Estimate:

Exact:

31.

Estimate:

Exact:

32.

Estimate:

Exact:

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33. Multiply each amount by $\frac{3}{4}$.

(a) Applesauce: $\frac{1}{2}$ cup

Estimate: $1 \cdot 0 = 0$ cups

Exact: $\frac{1}{2} \cdot \frac{3}{4} = \frac{3}{8}$ cups

(b) Salt: $\frac{1}{4}$ tsp.

Estimate: $1 \cdot 0 = 0$ tsp.

Exact: $\frac{1}{4} \cdot \frac{3}{4} = \frac{3}{16}$ tsp.

(c) Flour: $2\frac{1}{4}$ cups

Estimate: $2 \cdot 0 = 0$ cups

Exact: $2\frac{1}{4} \cdot \frac{3}{4} = \frac{9}{4} \cdot \frac{3}{4} = \frac{27}{16} = 1\frac{11}{16}$ cups

34. Multiply each amount by $\frac{2}{3}$.

(a) Flour: $2\frac{1}{4}$ cups

Estimate: $2 \cdot 0 = 0$ cups

Exact: $2\frac{1}{4} \cdot \frac{2}{3} = \frac{9}{4} \cdot \frac{2}{3} = \frac{18}{12} = 1\frac{6}{12}$ cups

(b) Applesauce: $\frac{1}{2}$ cup

Estimate: $1 \cdot 0 = 0$ cups

Exact: $\frac{1}{2} \cdot \frac{2}{3} = \frac{2}{6}$ cups

36. Divide each amount by 2.

(a) Flour: $2\frac{1}{4}$ cups

Estimate: $2 \div 2 = 1$ cup

Exact: $2\frac{1}{4} \div 2 = \frac{9}{4} \div \frac{2}{1} = \frac{9}{4} \cdot \frac{1}{2} = \frac{9}{8} = 1\frac{1}{8}$ cup

(b) Salt: $\frac{1}{2}$ tsp.

Estimate: $1 \div 2 = 0$ teaspoon

Exact: $\frac{1}{2} \div 2 = \frac{1}{2} \div \frac{2}{1} = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ teaspoon

(c) Applesauce: $\frac{1}{2}$ cup

Estimate: $1 \div 2 = 0$ cup

Exact: $\frac{1}{2} \div 2 = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ cup

37. Divide the number of gallons available by the number of gallons needed for each unit.

Estimate: $12 \div 3 = 4$ units

Exact: $12 \div 3\frac{1}{2} = \frac{12}{1} \div \frac{7}{2} = \frac{12}{1} \cdot \frac{2}{7} = \frac{24}{7} = 3\frac{3}{7}$

$3\frac{3}{7}$ units can be painted with 12 gallons of paint.

(c) Vegetable oil: cup

Estimate: cups

Exact: cup

35. Divide each amount by .

(a) Vanilla extract: tsp.

Estimate: tsp.

Exact: tsp.

(b) Applesauce: cup

Estimate: cup

Exact: cup

(c) Flour: cups

Estimate: cup

Exact: cup

38. Divide the number of total minutes by the number of minutes per moment.

Estimate: moments

Exact:

There are moments in an 8-hour work day.

39. Each handle requires inches of steel tubing. Use multiplication.

Estimate: in.

Exact: in.

inches of steel tubing is needed to make jacks.

40. Assume that the inch length listed in the overall dimensions is the length of the handle. Use multiplication.

Estimate: in.

Exact: in.

The amount of wood that is necessary to make handles is inches.

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41. The answer should include:

Step 1 Change mixed numbers to improper fractions.

Step 2 Multiply the fractions.

Step 3 Write the answer in lowest terms, changing to mixed or whole numbers where possible.

42. The additional step is to use the reciprocal of the second fraction (divisor).

43. Multiply the amount of money for each cell phone times the number of cell phones to get the total amount of money from the sale of gold.

Estimate: \$□ • □□□ million □ \$□□□ million

Exact: □□ • □□□ million □ □ • □□□ □ □□□ □ □□□ million

You would have \$□□□ million from the sale of the gold.

44. Divide the number of square yards of carpet by the amount of carpet needed for each apartment unit.

Estimate: □□□□ □ □□ □ □□□ units

Exact: □□□□ □ □□ □ □□□□ □ □□□□ □ □□□

□□□ units can be carpeted.

45. Divide the total amount of firewood to be delivered by the amount of firewood that can be delivered per trip.

Estimate: □□□ □ □ □ □□□ trips

Exact: □□ • □ • □ □ □ □□ in.

The hydraulic lift must raise the car □□ inches.

(b) There are □□ inches in a foot, so the □-foot-tall mechanic is □ □ □□ □ □□ inches tall. So no, the mechanic can not stand under the car without bending.

48. (a) The maximum height of the low-profile jack is □□ inches. Use division.

Estimate: □□ □ □ □ □ in.

Exact: □□ □ □ □□□ • □ □□□ □ □ in.

The low-profile lift must raise the car □ inches.

(b) No, because □ in. is greater than □ in.

49. Multiply the swimming speed of the person times the number of times faster that a shark can swim than a person.

Estimate: □ • □ □ □□ miles per hour

Exact: □ • □ □ □□ • □□ □ □□□ □ □□

The shark can swim □□ miles per hour.

50. Multiply the boxes of tile per floor times the number of floors (homes) to get the total number of boxes needed.

Estimate: □□ • □□ □ □□□ boxes

Exact: □□ • □□ □ □□□ • □□ □ □□□□ □ □□□

Exact: □□□ □ □ □ □□□ □ □ □ □□□ • □ □ □□□

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trips will be needed to deliver cords of firewood.

46. Divide the total amount of roofing material by the amount of roofing material needed for each roof.

Estimate: homes

Exact:

homes can be re-roofed with squares of roofing material.

47. **(a)** The maximum height of the standard jack is

inches. Use multiplication.

Estimate: in.

boxes of tile are needed.

Chapter 2 Review Exercises

1. There are parts, and is shaded.

2. There are parts, and are shaded.

3. There are parts, and are shaded.

4. Proper fractions have numerator (top) smaller than denominator (bottom).

They are:

Improper fractions have numerator (top) larger than or equal to the denominator (bottom).

They are:

5. Proper fractions have numerator (top) smaller than denominator (bottom).

They are: [illegible]

Improper fractions have numerator (top) larger than or equal to the denominator (bottom).

They are: [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

[illegible] Whole number part

[illegible] Remainder

9. [illegible]

[illegible] Whole number part

[illegible] Remainder

14. [illegible]

15. [illegible]

16. [illegible]

17. [illegible]

18. [illegible]

19. [illegible]

20. [illegible]

21. All [illegible] parts out of a possible [illegible] parts are gold.

[illegible]

22. 18 of the possible [illegible] parts are gold.

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10. Factorizations of □:

□ • □ □ □ □ • □
□ □

The factors of □ are □, □, □, and □.

11. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □ □ □□
□ • □ □ □□

The factors of □□ are □, □, □, □, □, □, □□, and □□.

12. Factorizations of □□:

□ • □□ □ □□ □ • □□
□ □□

The factors of □□ are □, □, □□, and □□.

13. Factorizations of □□:

□ • □□ □ □□ □ • □□ □ □□ □ • □□ □ □□
□ • □□ □ □□

□ • □□ □ □□ □ • □□
□ □□

The factors of □□ are □, □, □, □, □, □, □□, □□, □□, □□,

□□, and
□□.

□□ □□ □ □
□ □
□□ □□ □ □
□

23. 1□ of the possible □□ □ □□ □ □□ parts are gold.

□□ □□ □ □
□ □
□□ □□ □ □
□□

24. 1□ of the possible □□ □ □□ □ □□ parts are gold.

□□ □□ □ □
□ □
□□ □□ □ □
□□

□

25. □□ □ □ • □ □ □
□□ □ • □ • □ • □ □□
□

26. □ □ □ □ □ □
□□ • • • • • □ • □ • □
□ □ □ □ □ □

27. and

The fractions are equivalent

28. and

The fractions are not equivalent

29. and

The fractions are equivalent

30.

31.

32.

39.

40.

41.

42.

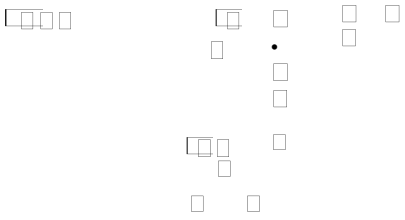
43.

44.

45. To find the area, multiply the length and the width.

The area is ft.

46. To find the area, multiply the length and the width.



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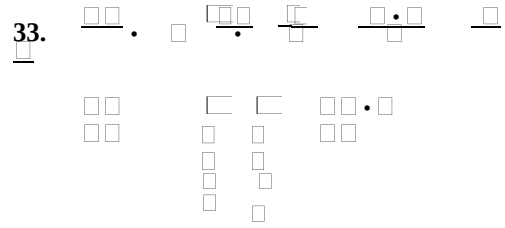

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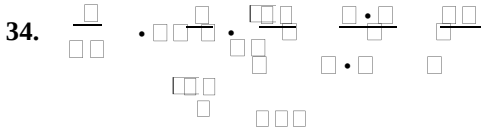

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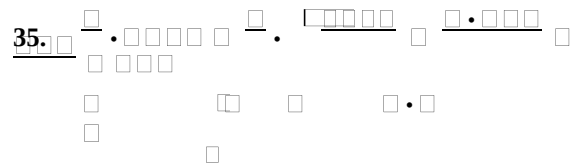

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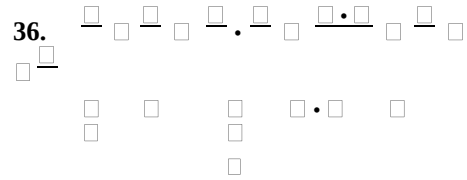

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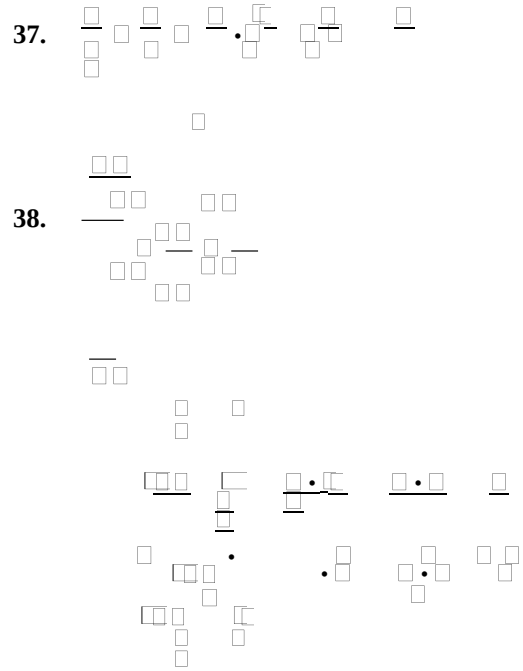
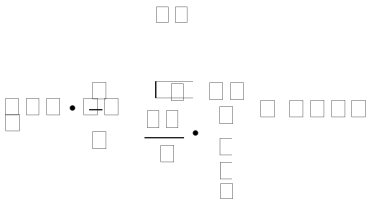


38.

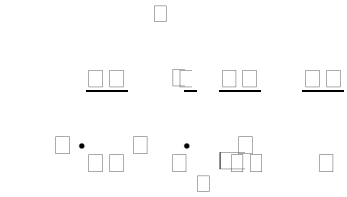
The area is $\square\frac{\square\square}{\square\square}$ yd$^{\square}$.

47. Multiply the length and width.



The area is $\square\square\square\square$ ft$^{\square}$.

48. Multiply the length and width.

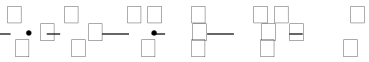


The area is $\square\frac{\square}{\square}$ ft$^{\square}$.

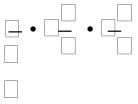
49.

Estimate: $\square\cdot\square\ \square\ \square$

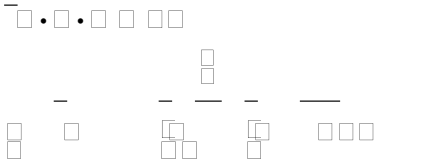
Exact:



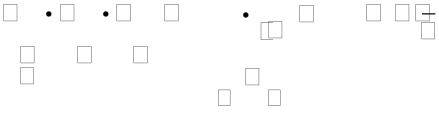
50.



Estimate:



Exact:



51.

Estimate:

Exact:

52.

Estimate:

Exact:

53. Divide the total tons of almonds by the size of the bins.

Estimate: bins

Exact:

bins will be needed to store the almonds.

54. The other equal partners own

of the business. Divide that amount by .

Each of the other partners owns of the business.

55. Divide the total yardage by the amount needed for each pull cord.

pounds

Ebony gave pounds to her parents. The amount she has left is pounds.

58. Sheila paid of $ for taxes, social security, and a retirement plan.

She paid $ for taxes, social security, and a retirement plan.

She paid of the remainder,

$ $ $, for basic living expenses.

She has $ $ $ left.

59. must be divided by .

Each school will receive of the amount raised.

60. of the catch must be divided evenly among fishermen.

Estimate: pull cords

Exact:

pull cords can be made.

56. Multiply the weight per gallon times the number of aquariums times the gallons per aquarium.

Estimate:

Exact:

The weight of the water is , or pounds.

57. Ebony sold of pounds of rice.

pounds

Thus, pounds remain. She gave of pounds to her parents.

Each fisherman receives ton.

61. **[2.5]**

62. **[2.5]**

63. **[2.8]**

64. **[2.8]**

65. **[2.7]**

66. **[2.7]**

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67. **[2.5]**

68. **[2.8]**

69. **[2.2]**

Whole number part

Remainder

70. **[2.2]**

Whole number part

Remainder

71. **[2.2]**

79. **[2.8]** Multiply ounces per gallon by the number of gallons.

Estimate: ounces

Exact:

ounces of the product are needed.

80. **[2.8]** Multiply the number of tanks by the number of quarts needed for each tank.

Estimate: qt

Exact:

quarts are needed.

81. **[2.8]** To find the area, multiply the length and the width.

The area of the stamp is in.².

82. **[2.8]** To find the area, multiply the length and the width.

The area of the patio table top is yd².

Chapter 2 Test

1. There are parts, and are shaded.

There are parts,

2. and are shaded.

3. Proper fractions have the numerator (top) smaller than the denominator (bottom).

4.

Whole number part

5.

Remainder

72. [2.2]

73. [2.4]

74. [2.4]

75. [2.4]

76. [2.4]

77. [2.4]

78. [2.4]

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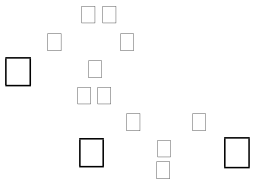
6. Factorizations of □□:

□ • □□ □ □□ □ • □ □ □□ □ • □ □ □□

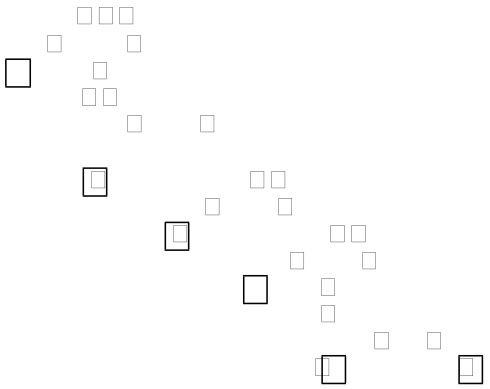
The factors of □□ are □, □, □, □, □, and □□□

7.



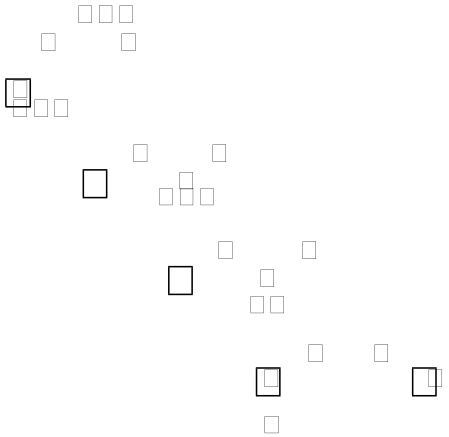
□□ □ □ • □ • □ □ □ □ • □

8.



□□□ □ □ • □ • □ • □ • □ □ □ • □ □

9.



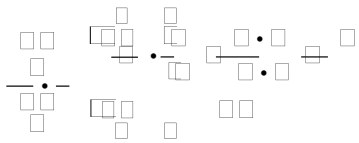
□□□ □ □ • □ • □ • □ □ □ • □ □

10. □□ □ □□ □ □□ / □ □□ □ □□

11. □□ □ □□ □ □□ □ □

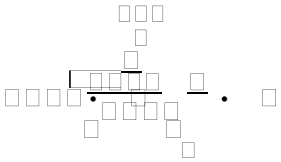
15. □□ • □ / □ □ □□ / □

16. Multiply the length and the width.



The area of the grill is □ yd□.

17. First, find the number of seedlings that don't survive.

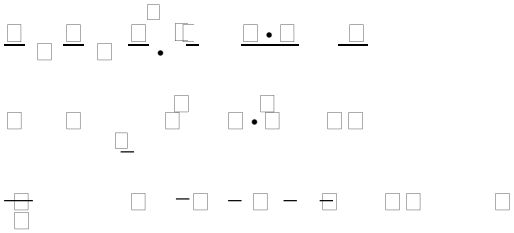


Next, subtract to find the number that do survive.

□□□□ □ □□□□ □ □□□□

□□□□ seedlings do survive.

18.



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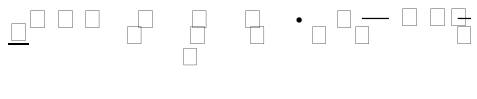
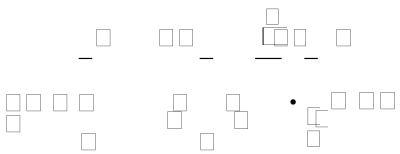
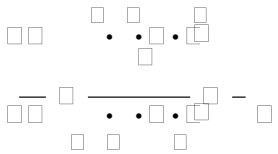


20. Divide the total length by the length of the pieces.



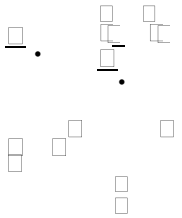
□□ pieces can be cut.

12. Write the prime factorization of both numerator and denominator. Divide the numerator and denominator by any common factors. Multiply the remaining factors in the numerator and denominator.



13. Multiply fractions by multiplying the numerators and multiplying the denominators. Divide two fractions by using the reciprocal of the divisor (the second fraction) and then changing division to multiplication.

14.



21.

Estimate:

Exact:

22.

Estimate:

Exact:

23.

Estimate:

Exact:

24.

Estimate:

Exact:

25. If grams can be synthesized per day, multiply to find the amount synthesized in days.

Estimate: grams

Exact:

grams can be synthesized.