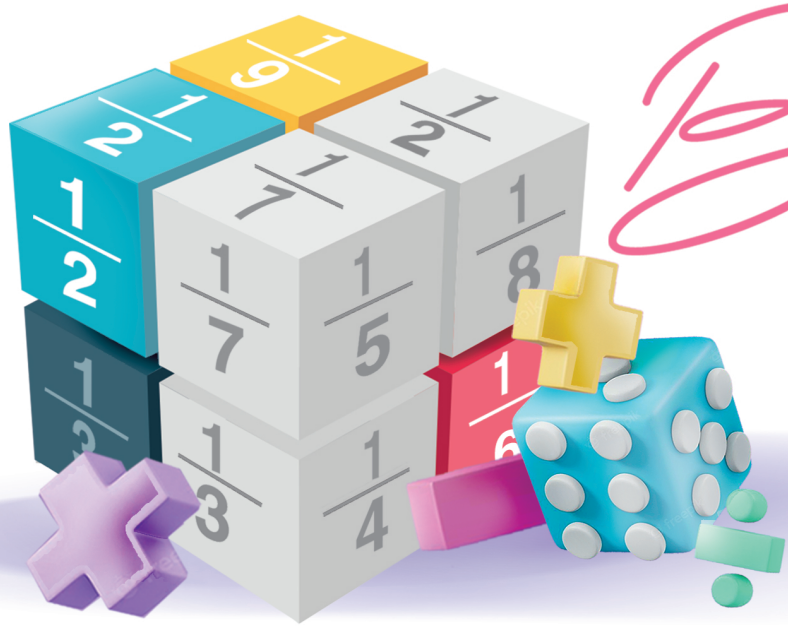
Spark of Math

Answer Key

Book 5



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Spark of Math

Answer Key
Book 5

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Contents

Unit 1

Understanding Operations and Their Order

Vocabulary

- multiplication
- factors
- multiplicand
- multiplier
- product
- division
- dividend
- divisor
- quotient
- remainder
- divisibility
- order of operations
- mathematical expression

Objectives

Upon completion of this unit, you will be able to:

- Multiply up to 3-digit numbers by 2-digit numbers.
- Multiply using the partial method.
- Divide numbers by 2-digit numbers.
- Apply the divisibility rules of 2, 3, 6, 5, and 10.
- Use the order of operations to solve mathematical expressions.
- Solve multiplication and division problems in given contexts.

(1-1) Multiplication up to 3-Digit Numbers by 2-Digit Numbers

factors

781 → multiplicand

× 95 → multiplier

74195 → product

1 Multiply the ones digit of the bottom factor (multiplier) by the top factor (multiplicand) and write down the result on the line below.
(5×781)

$$\begin{array}{r} {\scriptstyle 4}\\ 781\\ \times\ 95\\ \hline 3905 \end{array}$$

2 Multiply the digit in the tens digit of the bottom factor by the top factor and write down the result on the line below.
(90×781)

$$\begin{array}{r} {\scriptstyle 7}\\ {\scriptstyle \cancel{4}}\\ 781\\ \times\ 95\\ \hline 3905\\ 70290 \end{array}$$

3 Add the products.
(3905 + 70290)

$$\begin{array}{r} {\scriptstyle 7}\\ {\scriptstyle 4}\\ 781\\ \times\ 95\\ \hline {\scriptstyle 1}\\ 3905\\ +\ 70290\\ \hline 74195 \end{array}$$

1. Fill in the missing numbers.

50 × 93	2 ~~2~~ 74 × 67	3 3 ~~6 5~~ 876 × 59
150	518	7884
+ 4500	+ 4440	+ 43806
4650	4958	51684

2. Multiply.

621 × 13	3 1 ~~2 1~~ 153 × 64	3 ~~1~~ 407 × 52
+ 1863	612	814
6210	+ 9180	+ 20350
8673	9792	21164

3. Answer using the partial product method. Check using a calculator.

615 × 47

35	7 × 5
70	7 × 10
+ 4200	7 × 600
200	40 × 5
400	40 × 10
24000	40 × 600
28905	

903 × 86

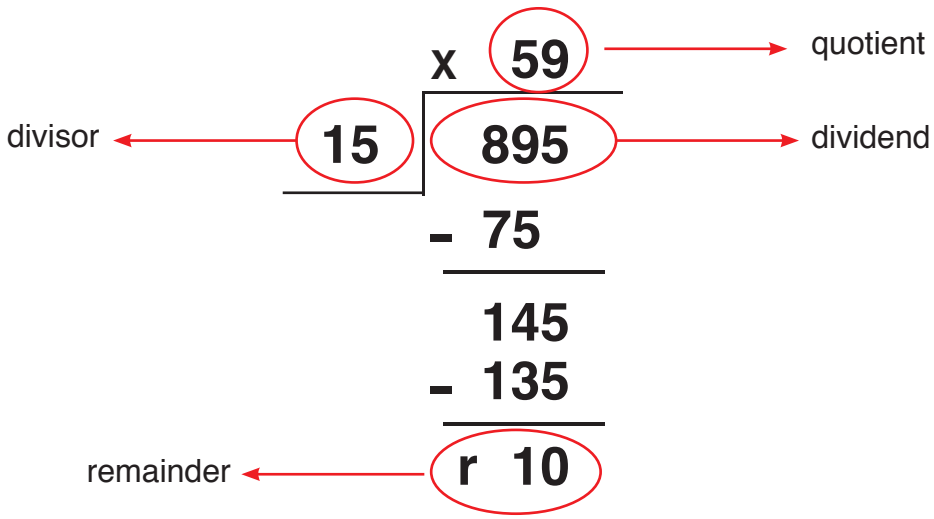
18	6 × 3
+ 5400	6 × 900
240	80 × 3
72000	80 × 900
77658	

Your Work Students' own answers

Write down two 3-digit and 2-digit numbers, find their product, and then check your answer.

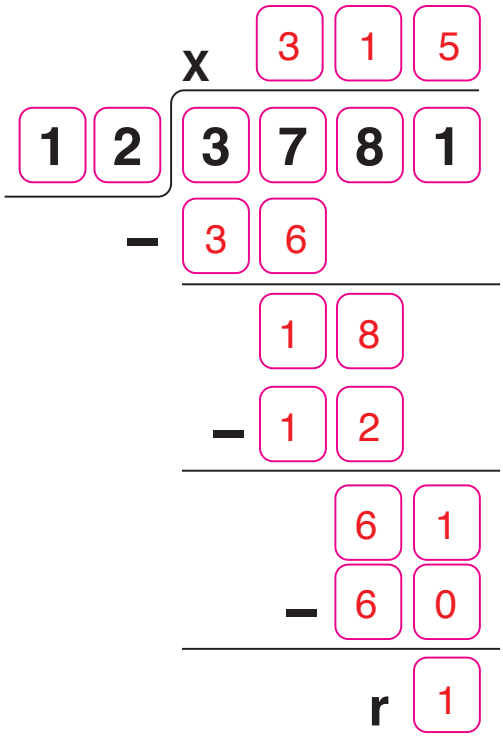
e.g., 111 x 22 = 2442
2442 ÷ 22 = 111

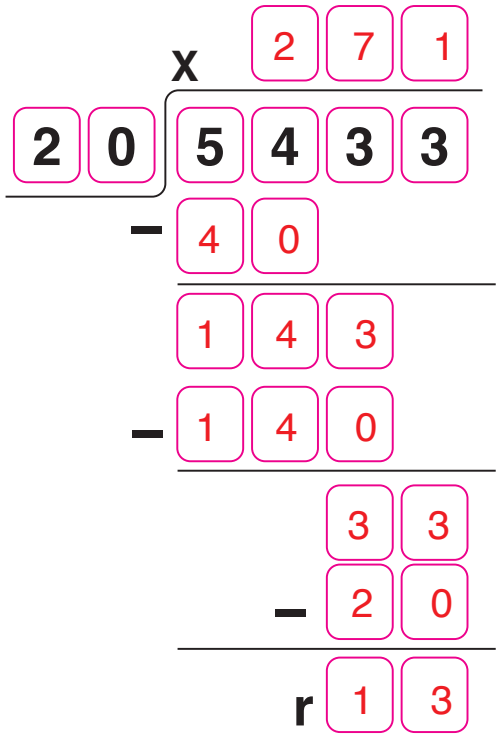
(1-2) Division of Numbers by 2-Digit Numbers



1. Look at the dividend's first digit, which is 8. Since 8 cannot be divided by 15, take the next digit, making it 89.
2. Now divide the first two digits of the new number (89) by the divisor (15), which goes 5 times. Write down 5 above the division bracket.
3. Multiply the divisor (15) by the quotient digit (5), which equals 75. Write down 75 below the corresponding part of the dividend (89).
4. Subtract 75 from 89, which leaves a remainder of 14.
5. Bring down the number from the ones column, which is 5, making it 145.
6. Divide 145 by 15, which goes 9 times. Write down 9 above the division bracket.
7. Multiply the divisor (15) by the quotient digit (9), which equals 135. Write down 135 below the corresponding part of the dividend (145).
8. Subtract 135 from 145, which leaves a remainder of 10.
9. The quotient is 59, and the remainder is 10. Therefore, 895 ÷ 15 = 59 remainder (r) 10.

1. Fill in the missing numbers.





2. Divide.

$$\begin{array}{r} \text{x } 63 \\ 12\overline{)756} \\ -\,72 \\ \hline 36 \\ -\,36 \\ \hline 0 \end{array}$$

$$\begin{array}{r} \text{x } 16 \\ 32\overline{)516} \\ -\,321 \\ \hline 196 \\ -\,192 \\ \hline 4 \end{array}$$

$$\begin{array}{r} \text{x } 5 \\ 65\overline{)388} \\ -\,325 \\ \hline 63 \end{array}$$

(1-3) Divisibility

A number is divisible by another number if the remainder is 0 when you divide.

$$\begin{array}{r|l} & \times\ 3 \\ \hline 8 & 24 \\ & -\ 24 \\ \hline & 0 \end{array}$$

24 is divisible by 8.

$$\begin{array}{r|l} & \times\ 2 \\ \hline 9 & 24 \\ & -\ 18 \\ \hline & 6 \end{array}$$

24 is not divisible by 9.

Since the remainder is 0, then 24 is divisible by 8.

The number 8 represents a factor of 24.

Here are all the factors of 24: 1, 2, 3, 4, 6, 8, 12, 24.

1. Are the following numbers divisible by 3, 5, 6, and 8? Complete the table with(✓) or (✗).

	divisible by 3	divisible by 5	divisible by 6	divisible by 8
408	✓	✗	✓	✓
176	✗	✗	✗	✓
900	✓	✓	✓	✗
6120	✓	✓	✓	✓

Divisibility by 2, 3, and 6

1. Complete.

	divisible by 2	divisible by 3	divisible by 6
42	✓	✓	✓
30	✓	✓	✓
18	✓	✓	✓
64	✓	✗	✗
81	✗	✓	✗
66	✓	✓	✓
702	✓	✓	✓

2. From the options below, match the statements with the correct endings.

A The number is divisible by 6 when (a, b, c)

B The number is divisible by 3 when (a, b, c)

C The number is divisible by 2 when (a, b, c)

a

the number is even (ending in 0, 2, 4, 6 or 8).

b

the number is divisible by both 2 and 3.

Example: 924 is divisible by 2 and 3.

c

the sum of the numbers' digits is divisible by 3.

Example: 285: 2 + 8 + 5 = 15.

3. Circle the numbers that are divisible by 2.

100	233	46
1,131	960	2,109

4. Circle the numbers that are divisible by 3.

504	99	1,000
339	23	7,125

5. Circle the numbers that are divisible by 6.

4,222	333	7,770
6,606	999	1,134

Divisibility by 5 and 10

1. Complete.

	divisibile by 5	divisibile by 10
300	✓	✓
204	✗	✗
516	✗	✗
9105	✓	✗
2070	✓	✓

A The number is divisible by 5 when it ends with 5 or 0.

B The number is divisible by 10 when it ends with 0.

2. Circle the numbers that are divisible by both 5 and 10.

367	855
(780)	4,932
8,608	(2,580)

3. Color the numbers that are divisible by 2 red, and 3 blue.

4. Apply the divisibility rules and color the numbers that are divisible by both 6 and 10.

Your Work

Students' own answers

Show a number that is divisible by 4 and another number that is divisible by 7.

e.g., 60 ÷ 4 = 15

161 ÷ 7 = 23

(1-4) Order of Operations

The order of operations is a rule that tells you the sequence to follow when you are performing operations in a mathematical expression.

Parentheses	Exponents	Multiplication Division	Addition Subtraction
P	E	M or D	A or S
( )	y^x	× ÷	+ −

Do P, then E. Then do M or D, from left to right. Lastly, do A or S, from left to right.

Example:

$$1 + 2 \times 5 = \ ?$$

Correct Method	Incorrect Method
$1 + 2 \times 5$	$1 + 2 \times 5$
$= 1 + 10$	$= 3 \times 5$
$= 11$	$= 15$

1. Find the answer to each expression.

A $5 \times 2 + (37 + 3 \times 5) + 37 =$

5 x 2 + (37 + 15) + 37 =

5 x 2 + 52 + 37 =

10 + 52 + 37 =

62 + 37 = 99

B $(20 + 30 + 14) + 21 + 1 \times 2^3 =$

64 + 21 + 1 x 2^3=

64 + 21 + 1 x 8=

64 + 21 + 8 =

85 + 8 = 93

C $(31 - 6 - 16) + 14 \times 5 + 12 =$

9 + 14 x 5 + 12=

9 + 70 + 12 =

79 + 12 = 91

D $(30 - 11) - 16 + 30 + 17 - 22 =$

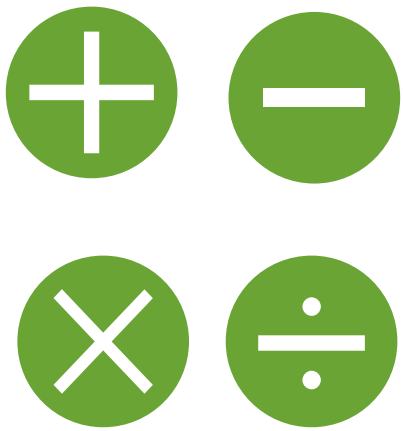
19 - 16 + 30 + 17 - 22 =

3 + 30 + 17 - 22 =

33 + 17 - 22 =

50 - 22 = 28

2. Add the operation symbols (+, -, x, ÷) to complete the expressions.



A 30 - 20 + 3 = 13

B 1 + 10 x 5 = 51

C 25 + 2 - 8 = 19

D 6 x 6 - 6 = 30

E 12 - 9 + 7 = 10

F 43 - 22 + 6 = 27

(1-5) Problem Solving

1. A private art gallery managed to sell a total of 98 paintings in one day. The sales averaged out to $482 per painting. Find the revenue generated from the sales made by the art gallery.

98 x 482 = 47,236

2. Miss King has 483 raffle tickets for the upcoming carnival. She wants to give them out equally among her 32 students. How many would each student get? And how many tickets would she have left over?

483 ÷ 32 = 15 r 3

```
   x 15
32 | 483
   - 32
     163
   - 160
       3
```

3. Woodhill Elementary School's 3rd and 4th grade classes are planning a joint field trip. There are a total of 450 students in these two grades and only 45 seats per bus. How many buses will be needed to fill all the students?

10

Show Your Turn

1. Multiply.

A

$$\begin{array}{r} {\scriptstyle 4\ 7} \\ 648 \\ \times\ 19 \\ \hline 5832 \\ +\ 6480 \\ \hline 12312 \end{array}$$

B

$$\begin{array}{r} {\scriptstyle 2\ \not{5}} \\ 571 \\ \times\ 38 \\ \hline 4568 \\ +\ 17130 \\ \hline 21{,}698 \end{array}$$

C

$$\begin{array}{r} {\scriptstyle 2} \\ 805 \\ \times\ 45 \\ \hline 4025 \\ +\ 32200 \\ \hline 36{,}225 \end{array}$$

2. Divide.

A

$$\begin{array}{r} {\scriptstyle x\ 19} \\ 40\overline{)798} \\ -\ 40 \\ \hline 398 \\ -\ 360 \\ \hline 38 \end{array}$$

B

$$\begin{array}{r} {\scriptstyle x\ 20} \\ 32\overline{)671} \\ -\ 64 \\ \hline 31 \\ -\ 0 \\ \hline 31 \end{array}$$

C

$$\begin{array}{r} {\scriptstyle x\ 14} \\ 56\overline{)821} \\ -\ 56 \\ \hline 261 \\ -\ 224 \\ \hline 37 \end{array}$$

3. Solve.

A $12 \div 2 \times 6 + 4 - 3 \times 3 =$

$6 \times 6 + 4 - 3 \times 3 =$

$36 + 4 - 9 =$

$40 - 9 = 31$

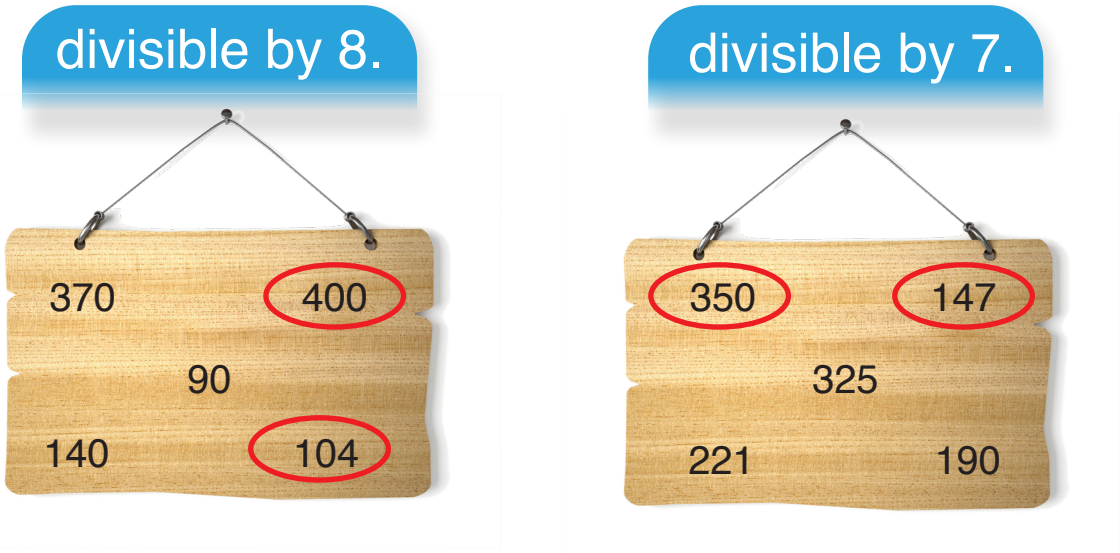
B $9 \times (6 - 2) + 8^2 =$

$9 \times 4 + 8^2 =$

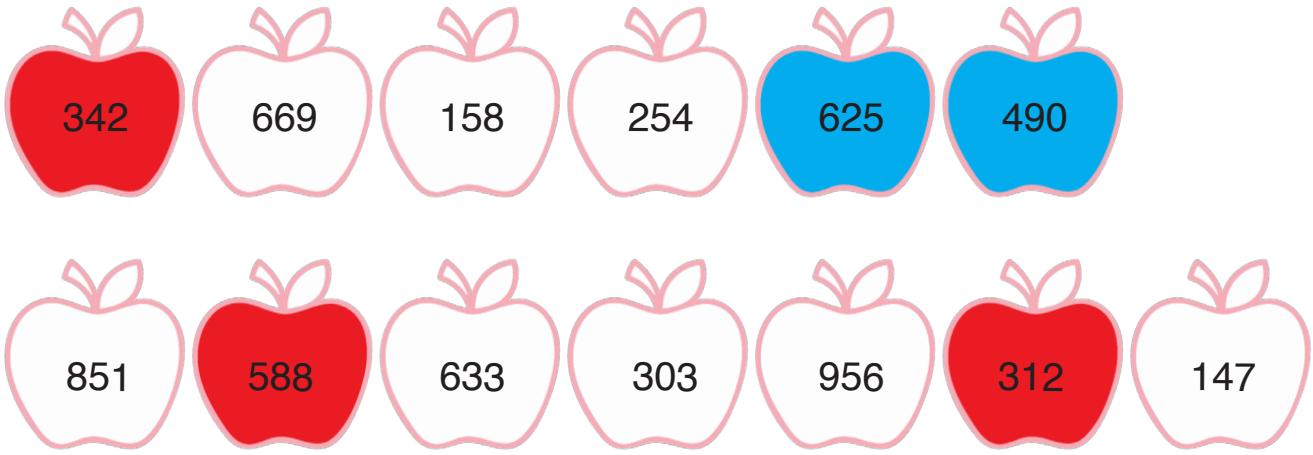
$9 \times 4 + 64 =$

$36 + 64 = 100$

4. Circle the numbers that are:



5. Color the apples that are divisible by 5 blue and the ones that are divisible by 6 red. If both apply, then color them yellow .



6. Find out if the numbers given below are divisible by any of the numbers 2, 3, 4, 5, 6, and 9. Write down the numbers in the space provided below. A sample question has been solved for help.

A. 450 is divisible by 2, 3, 5, 6, and 9.

B. 3939 is divisible by 3.

C. 2432 is divisible by 3 and 4.

D. 6273 is divisible by 3 and 9.

E. 60550 is divisible by 2 and 5.

F. 92454 is divisible by 2, 3 and 6.

G. 73384 is divisible by 2 and 4.

H. 9936 is divisible by 2, 3, 4, 6, and 9.

I. 899991 is divisible by 3 and 9.

7. Answer the following questions:

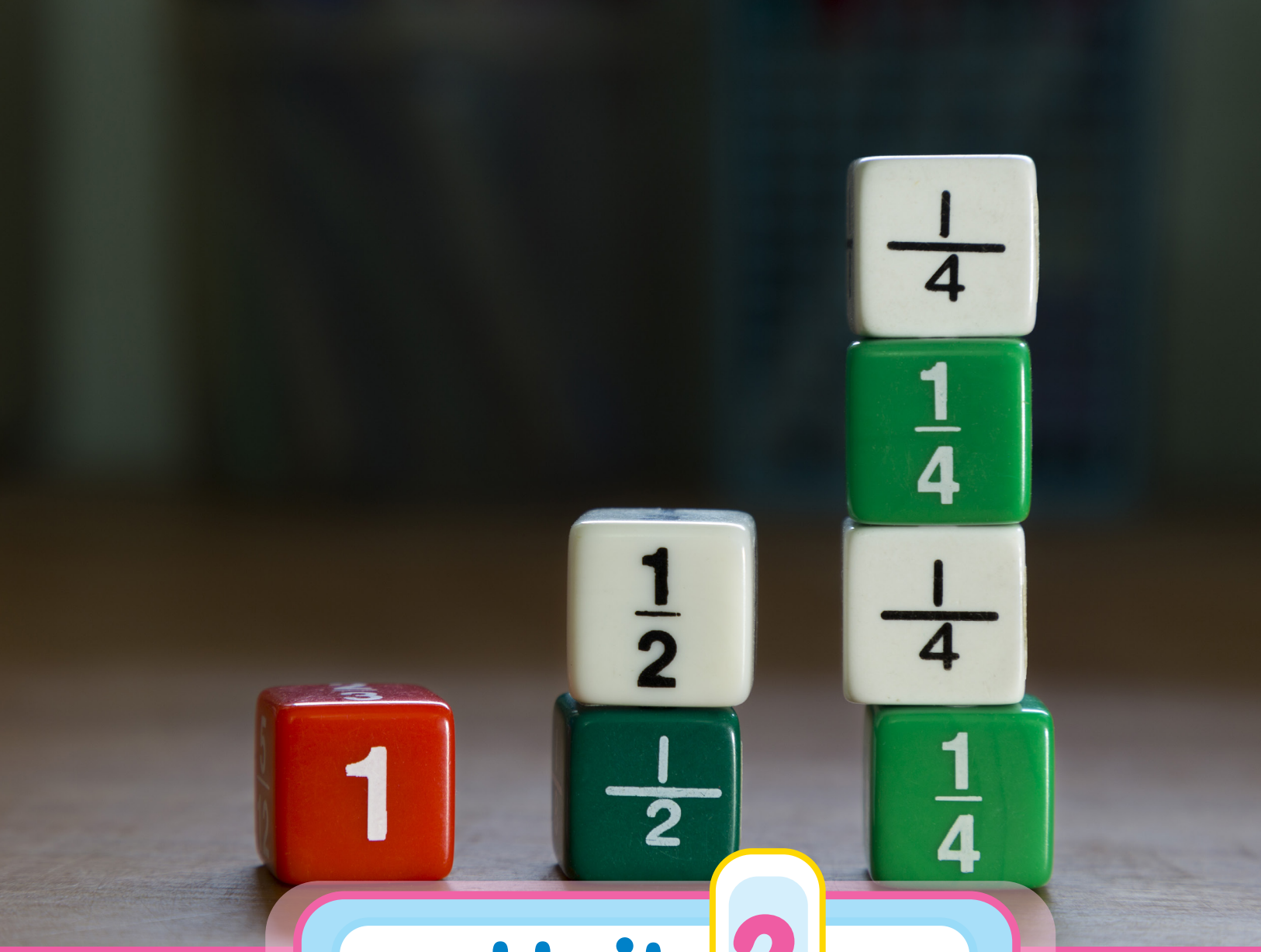
A. A number that is divisible by 4 is divisible by 2.

B. Give one number that is divisible by 6. 198

C. A number that is divisible by 2 and 3 is divisible by 6.

D. If the last digit of a number is 0, then it is divisible by 5. (True, False)

E. 1916 is divisible by 4. (True, False)



Unit 2

Fractions and Decimals

Vocabulary

- improper fractions
- mixed numbers
- greatest common factor
- prime factor
- least common multiple
- simplifying
- decimals
- tenths place
- hundredths place
- thousandths place

Objectives

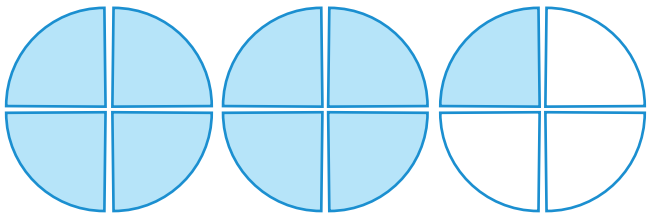
Upon completion of this unit, you will be able to:

- Define the improper fraction and the mixed number.
- Convert a mixed number to an improper fraction and vice versa.
- Find the greatest common factor (GCF)) of two numbers.
- Find the least common multiple (LCM) of two numbers.
- Simplify fractions.
- Add and subtract fractions.
- Define what a decimal is.
- Compare decimals.
- Solve problems involving fractions and decimals.

(2-1) Mixed Numbers

When a fraction has a numerator that is greater than or equal to the denominator, it is called an improper fraction.

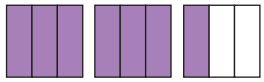
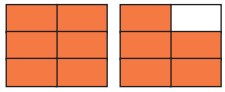
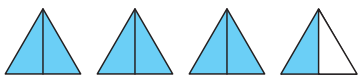
$\frac{9}{4}$ means there are 9 parts.
Each part is $\frac{1}{4}$ of a whole.



numerator ⟵ $\frac{9}{4} = 2\frac{1}{4}$
denominator ⟵

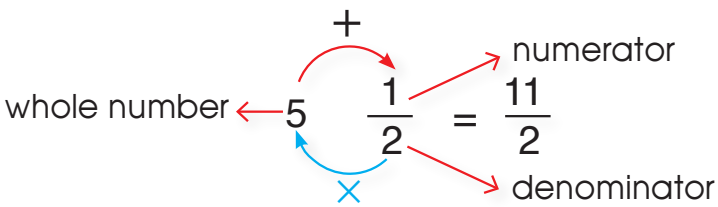
Also, $2\frac{1}{4}$ is called a mixed number, where 2 is the whole number part and $\frac{1}{4}$ is the fractional part.

1. Write down the improper fractions and the mixed numbers based on the example.

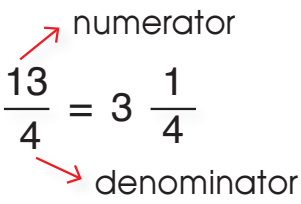
	Shape	Improper fraction	Mixed number
A		$\frac{7}{3}$	$2\frac{1}{3}$
B		$\frac{11}{6}$	$1\frac{5}{6}$
C		$\frac{7}{2}$	$3\frac{1}{2}$
D		$\frac{23}{8}$	$2\frac{7}{8}$

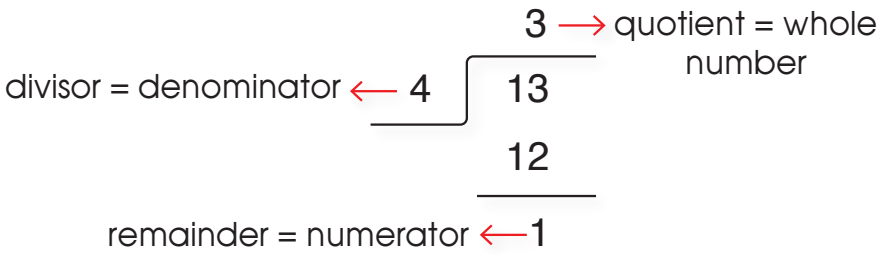
Converting a Mixed Number to an Improper Fraction and Vice Versa

To convert a mixed number to an improper fraction, multiply the whole number by the fraction's denominator and add the numerator.



To convert the improper fraction to a mixed number, divide the numerator by the denominator. The quotient becomes the whole number; the remainder becomes the fraction's numerator; and the denominator stays the same.





1. Convert each mixed number to an improper fraction.

A $1\frac{2}{3} = \frac{5}{3}$ (x, +)

B $6\frac{1}{10} = \frac{61}{10}$ (x, +)

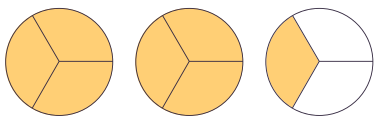
2. Convert each improper fraction to a mixed number.

A $\frac{15}{3} = 5$

B $\frac{17}{5} = 3\frac{2}{5}$

Your Work

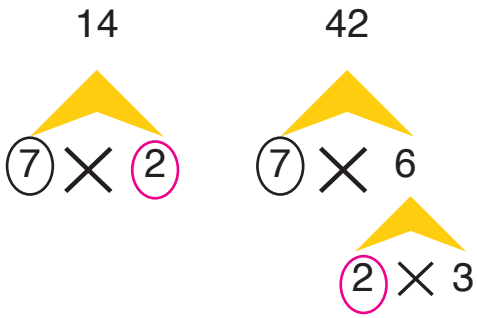
Use models to show $2\frac{1}{3}$.



(2-2) Simplifying Fractions

- **To simplify the fraction $\frac{14}{42}$, find the greatest common factor (GCF) between the numerator and the denominator.**

- To find the GCF of two numbers, identify all the prime factors of each number. A prime factor is a number greater than 1 that has no factors but itself.
  The prime factors of 14 are 2 and 7. The prime factors of 42 are 7, 6, 2, and 3.



- Identify the common prime factors between the two numbers.
  The common factors between 14 and 42 are 2 and 7.

- Multiply all of the prime common factors together to get the GCF.
  The greatest common factor (GCF) = 7 × 2 = 14.

- Divide both the numerator and the denominator by their GCF, which is 14.

$$\frac{14 \div 14}{42 \div 14} = \frac{1}{3}$$

$\frac{1}{3}$ is the simplified fraction. $\frac{14}{42}$ and $\frac{1}{3}$ are equivalent fractions.

1. Simplify the fractions.

A $\frac{15}{20} = \frac{15 \div 5}{20 \div 5} = \frac{3}{4}$

B $\frac{10}{16} = \frac{10 \div 2}{16 \div 2} = \frac{5}{8}$

C $\frac{18}{20} = \frac{18 \div 2}{20 \div 2} = \frac{9}{10}$

D $\frac{45}{50} = \frac{45 \div 5}{50 \div 5} = \frac{9}{10}$

2. Circle the equivalent fractions.

A $\frac{16}{20}$, $\frac{4}{5}$

B $\frac{3}{8}$, $\frac{24}{9}$

C $\frac{24}{30}$, $\frac{16}{20}$

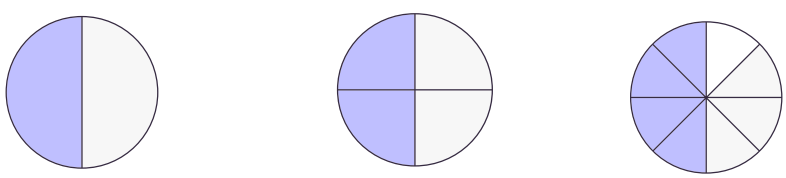
D $\frac{36}{45}$, $\frac{18}{30}$, $\frac{8}{10}$

Your Work

Students' own answers

Write down three equivalent fractions.
Use models to show.

$\frac{1}{2}$ $\frac{2}{4}$ $\frac{4}{8}$



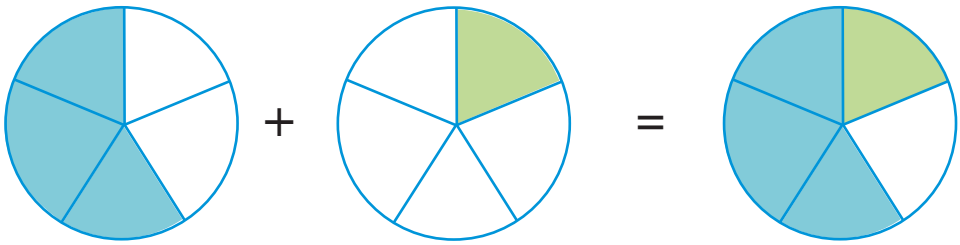
(2-3) Adding Fractions

Adding Fractions with Like Denominators

If the denominators are the same, we have like fractions.

Step 1 Add the numerators of the like fractions together.

Step 2 Place the new numerator on top and leave the denominator unchanged.



$$\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$$

Adding Fractions with Unlike Denominators

If the denominators are different, we have unlike fractions. To add unlike fractions, we must make the denominators equal. One option is to find the lowest common multiple (LCM).

Step 1 Find the LCM of the denominators.

- List the multiples of each denominator. In the following example, list the multiples of 2 and 4.

$$\frac{1}{2} + \frac{1}{4} =$$

Multiples of 2: 2, 4, 6, 8, 10,...

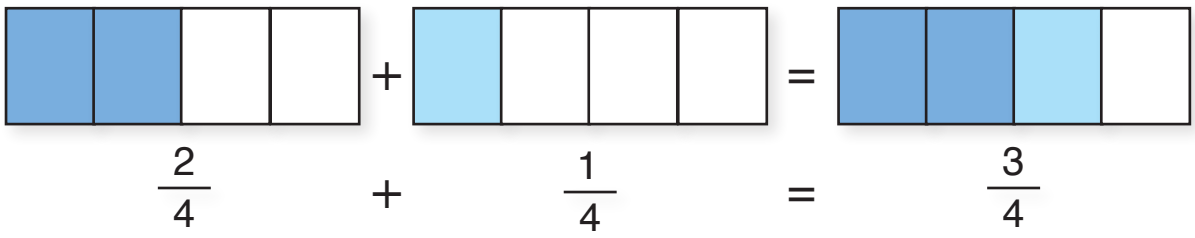
Multiples of 4: 4, 8, 12, 16,...

The least common multiple is 4. Therefore, the LCM of 2 and 4 is 4.

Step 2 Make the two denominators equal. Convert them to the LCM value by multiplying the numerator and denominator by the same number.

$$\frac{1 \times 2}{2 \times 2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4}$$

Step 3 Add the numerators of the equivalent fractions together.



$$\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$$

Step 4 Simplify the fraction. In this example, $\frac{3}{4}$ is already in its simplest form.

1. Add.

A $\frac{4x2}{4x3} + \frac{3x1}{3x4} =$

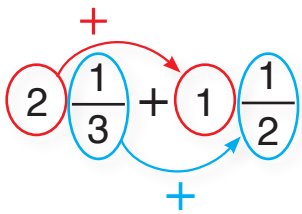
$$\frac{8}{12} + \frac{3}{12} = \frac{11}{12}$$

B $\frac{2x1}{2x7} + \frac{7x1}{7x2} =$

$$\frac{2}{14} + \frac{7}{14} = \frac{9}{14}$$

Adding Mixed Numbers

To add mixed numbers, we add the whole parts separately and the fractions separately.



Step 1 Add the whole number parts together.

$2 + 1 = 3$

Step 2 Find the least common multiple (LCM) of the fractions.

In the following example, list the multiples of 3 and 2.

$$\frac{1}{3} + \frac{1}{2}$$

Multiples of 3: 3, 6, 9, 12, 15,...
Multiples of 2: 2, 4, 6, 8, 10,...

The least common multiple is 6. Therefore, the LCM of 3 and 2 is 6.

Step 3 Make the two denominators equal. Convert them to the LCM value by multiplying the numerator and denominator by the same number.

$$\frac{1 \times 2}{3 \times 2} = \frac{2}{6} \quad \left| \quad \frac{1 \times 3}{2 \times 3} = \frac{3}{6} \right.$$

Step 4 Add the fractions.

$$\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$$

Step 5 Combine the results of the whole part and the fractional part to get the final sum.

$$2\frac{2}{6} + 1\frac{3}{6} = 3\frac{5}{6}$$

Step 6 Simplify the fraction. In this example, $\frac{5}{6}$ is already in its simplest form.

Example:

$1\frac{3}{8} + 2\frac{3}{4} =$

$1\frac{3}{8} + 2\frac{3 \times 2}{4 \times 2} = 1\frac{3}{8} + 2\frac{6}{8}$

$1\frac{3}{8} + 2\frac{6}{8} = 3\frac{9}{8}$

Now, simplify:

$3\frac{9}{8} = 3\frac{8}{8} + \frac{1}{8} = 4\frac{1}{8}$

Not that $\frac{8}{8} = 1$, which is a whole number.

1. Add and write down in the simplest form.

A $2\frac{2 \times 4}{3 \times 4} + 1\frac{3 \times 3}{4 \times 3} =$

$2\frac{8}{12} + 1\frac{9}{12} = 3\frac{17}{12}$

$= 3 + 1\frac{5}{12}$

$= 4\frac{5}{12}$

B $1\frac{3 \times 2}{7 \times 2} + 5\frac{1 \times 7}{2 \times 7} =$

$1\frac{5}{12} + 5\frac{7}{14} = 6\frac{13}{14}$

C $1\frac{6}{12} + 3\frac{1 \times 6}{2 \times 6} =$

$1\frac{6}{12} + 3\frac{6}{12} = 4\frac{12}{12} = 5$

D $2\frac{3 \times 4}{3 \times 5} + 1\frac{5 \times 2}{5 \times 3} =$

$2\frac{12}{15} + 1\frac{10}{15} = 3\frac{22}{15}$

$= 3 + 1\frac{7}{15}$

$= 4\frac{7}{15}$

Your Work

Students' own answers

Find the sum of two mixed numbers with different denominators.

$1\frac{2 \times 2}{4 \times 2} + 1\frac{2}{8} =$

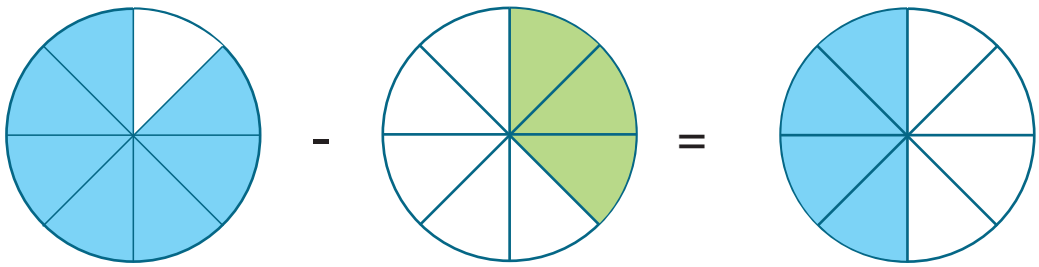
$1\frac{4}{8} + 1\frac{2}{8} = 1\frac{6}{8} = 1\frac{3}{4}$

(2-4) Subtracting Fractions

Subtracting Fractions with Like Denominators

Step 1 Subtract the numerators of the like fractions together.

Step 2 Place the new numerator on top and leave the denominator unchanged.



$$\frac{7}{8} - \frac{3}{8} = \frac{4}{8}$$

Step 3 Simplify the fraction.

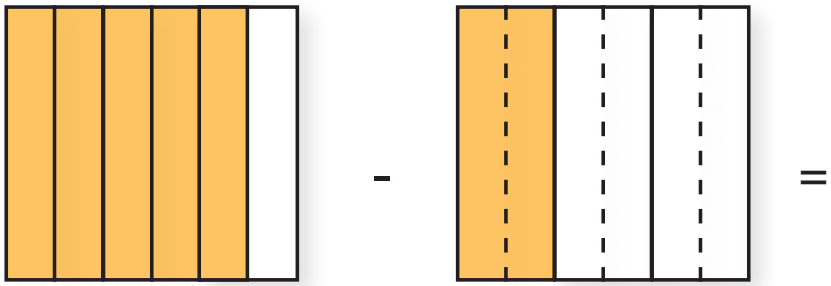
$$\frac{4}{8} \begin{matrix} \div 4 \\ \div 4 \end{matrix} = \frac{1}{2}$$

Subtracting Fractions with Unlike Denominators

To subtract unlike fractions, find the lowest common multiple (LCM).

Step 1 Find the LCM of the denominators.

- List the multiples of each denominator. In the following example, list the multiples of 3 and 6.



$\frac{5}{6} - \frac{1}{3} =$

Multiples of 3: 3, 6, 9, 12, 15, 18,...
Multiples of 6: 6, 12, 18, 24,...

The least common multiple is 6. Therefore, the LCM of 3 and 6 is 6.

Step 2 Make the two denominators equal. Convert them to the LCM value by multiplying the numerator and denominator by the same number.

$$\frac{5}{6} - \frac{1 \times 2}{3 \times 2} = \frac{5}{6} - \frac{2}{6}$$

Step 3 Subtract the numerators of the equivalent fractions.

$$\frac{5}{6} - \frac{2}{6} = \frac{3}{6}$$

Step 4 Simplify the fraction.

$$\frac{3 \div 3}{6 \div 3} = \frac{1}{2}$$

Subtracting Mixed Numbers

To subtract mixed numbers, we subtract the whole parts separately and the fractions separately.

$6\frac{3}{4} - 4\frac{1}{3}$

Step 1 Subtract the whole number parts.

$6 - 4 = 2$

Step 2 Find the least common multiple (LCM) of the fractions.

$$\frac{3}{4} - \frac{1}{3}$$

In the following example, list the multiples of 4 and 3.
Multiples of 4: 4, 8, 12, 16,...
Multiples of 3: 3, 6, 9, 12, 15,...

The least common multiple is 12. Therefore, the LCM of 4 and 3 is 12.

Step 3 Make the two denominators equal. Convert them to the LCM value by multiplying the numerator and denominator by the same number.

$$\frac{3 \times 3}{4 \times 3} = \frac{9}{12} \quad \left| \quad \frac{1 \times 4}{3 \times 4} = \frac{4}{12} \right.$$

Step 4 Subtract the fractions.

$$\frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

Step 5 Combine the results of the whole part and the fractional part to get the final subtraction.

$$6\frac{9}{12} - 4\frac{4}{12} = 2\frac{5}{12}$$

Step 6 Simplify the fraction. In this example, $\frac{5}{12}$ is already in its simplest form.

1. Subtract.

A $\frac{2}{3}\overset{\times 10}{\underset{\times 10}{}} - \frac{2}{10}\overset{\times 3}{\underset{\times 3}{}} = \frac{20}{30} - \frac{6}{30} = \frac{14}{30} = \frac{7}{15}$

B $\frac{4}{5}\overset{\times 4}{\underset{\times 4}{}} - \frac{2}{4}\overset{\times 5}{\underset{\times 5}{}} = \frac{16}{20} - \frac{10}{20} = \frac{6}{20} = \frac{3}{10}$

C $5\frac{2}{2}\overset{\times 3}{\underset{\times 5}{}} - 2\frac{1}{10} = 5\frac{16}{20} - 2\frac{1}{10} = 3\frac{5}{10} = 3\frac{1}{2}$

D $3\frac{1}{6} - 1\frac{1}{6} = 2$

E $5\frac{4}{4}\overset{\times 2}{\underset{\times 3}{}} - 4\frac{3}{3}\overset{\times 2}{\underset{\times 4}{}} = 5\frac{8}{12} - 4\frac{6}{12} = 1\frac{2}{12} = 1\frac{1}{6}$

F $\frac{10}{10}\overset{\times 2}{\underset{\times 1}{}} - \frac{2}{2}\overset{\times 3}{\underset{\times 5}{}} = \frac{20}{10} - \frac{6}{10} = \frac{14}{10} = \frac{7}{5} = 1\frac{2}{5}$

Your Work

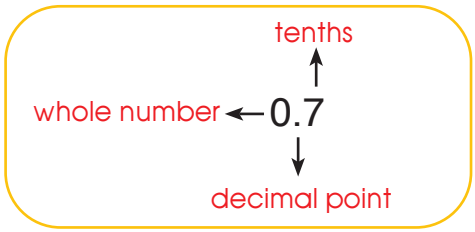
Find $(3\frac{2}{2}\overset{\times 1}{\underset{\times 4}{}} - 2\frac{6}{8})$, **then show using models.**

$= 3\frac{2}{8} - 2\frac{6}{8} = 1 - \frac{4}{8} = \frac{1}{2}$

(2-5) Decimals

A decimal is a type of number that includes a whole number and a fractional part separated by a decimal point. Digits can be placed to the left and right of the decimal point to represent numbers greater than one or less than one. The decimal point is placed to the right of the ones place.

The Tenths Place



The first digit to the right of the decimal point represents the tenths place.

To convert a decimal to a fraction:

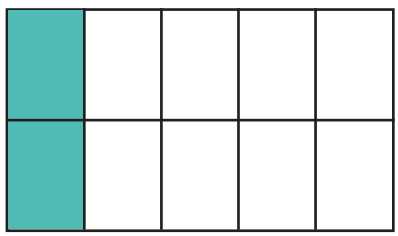
1. The whole number to the left of the decimal point becomes the whole number of the fraction.

2. The digits to the right of the decimal point represent the fraction's numerator.

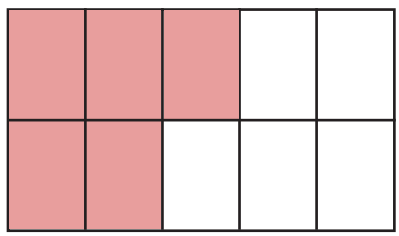
3. The last digit's place value denotes the denominator.

For example, the decimal **0.7** is equal to seven tenths. The whole number is **0**, the numerator is **7** and the denominator is the last digit's place value, which is **10**. So, **0.7** is equal to $\frac{7}{10}$.

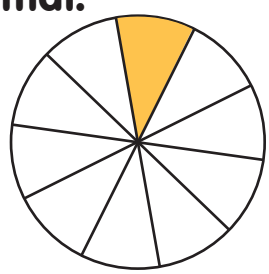
1. Write down each fraction and its equivalent decimal.



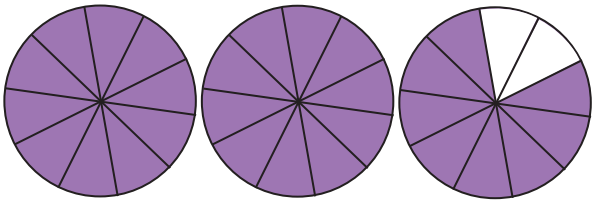
$\frac{2}{10} = 0.2$

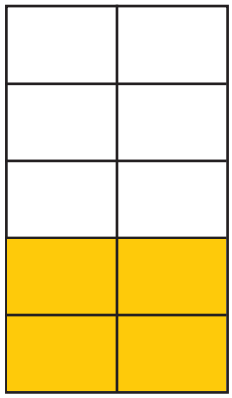


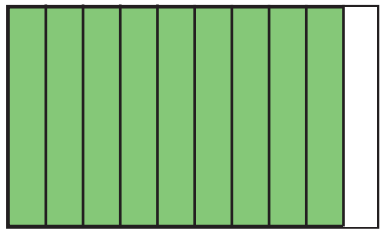
$\frac{5}{10} = 0.5$



$\frac{1}{10} = 0.1$

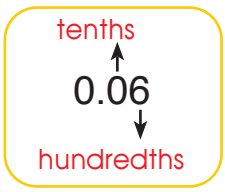




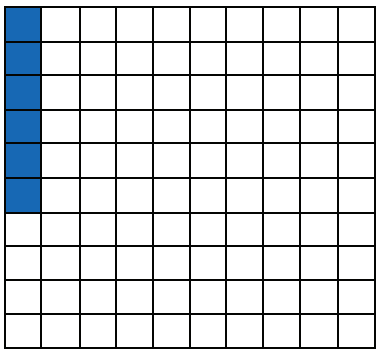


$2\frac{8}{10} = 2.8$ $\frac{4}{10} = 0.4$ $\frac{9}{10} = 0.9$

The Hundredths Place



The second digit to the right of the decimal point represents the hundredths place.



The square is divided into 100 equal parts. Six of those parts are shaded, which is equal to $\frac{6}{100}$.

The fraction's numerator directly represents the decimal value. The denominator (100) indicates the last digit's place value. Thus, the fraction $\frac{6}{100}$ is equivalent to the decimal (0.06).

1. Convert each fraction to a decimal.

A $\frac{15}{100} = 0.15$

B $\frac{38}{100} = 0.38$

C $\frac{4}{100} = 0.04$

D $\frac{9}{100} = 0.09$

2. Write down each decimal as a simplified fraction.

A $0.05 = \frac{5}{100} = \frac{1}{20}$

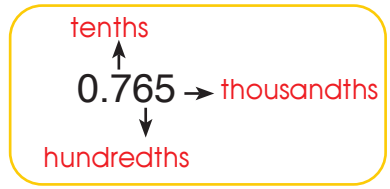
B $0.01 = \frac{1}{100}$

C $0.16 = \frac{16}{100} = \frac{4}{25}$

C $0.03 = \frac{3}{100}$

The Thousandths Place

The third digit to the right of the decimal represents the thousandths place.



In a decimal number, each digit's position relative to the decimal point indicates its place value. On the left of the decimal point, we have digits representing values greater than one, such as ones, tens, hundreds, and so forth. On the right of the decimal point, we have digits representing values less than one, such as tenths, hundredths, and thousandths.

Hundreds	Tens	Ones		Tenths	Hundredths	Thousandths
4	5	2	.	7	8	1

To read a decimal fraction,

Read the whole number part as usual.
Read the decimal point as the word "and."
Read the number to the right of the decimal point as if it were a whole number.
Say the name of the last digit's position.
Consequently, we write down and read 452.781 as four hundred fifty-two and seven hundred eighty-one thousandths.

The following table shows how to convert fractions or mixed numbers to decimals:

Fraction or Mixed Number	Decimal						
	Hundreds	Tens	Ones	Point	Tenths	Hundredths	Thousandths
$\frac{9}{100}$			0	.	0	9	
$32\frac{78}{100}$		3	2	.	7	8	
$401\frac{839}{1000}$	4	0	1	.	8	3	9
$26\frac{7}{100}$		2	6	.	0	7	
$172\frac{301}{1000}$	1	7	2	.	3	0	1
$25\frac{4}{10}$		2	5	.	4		

1. Write down these numbers in expanded form.

(A) 3.425 = 3 + 0.4 + 0.02 + 0.005

(B) 4.18 = 4 + 0.1 + 0.08

(C) 5.209 = 5 + 0.2 + 0.009

(D) 1.736 = 1 + 0.7 + 0.03 + 0.006

2. Write down the name of the decimal place value for each underlined digit in the given numbers.

(A) 6.9	(B) 23.340	(C) 89.321	(D) 64.225
tenths	hundredths	ones	thousandths

(2-6) Comparing Decimals

When we compare decimals, we start by examining the digits from left to right. If the first digits are the same, move to the next digits and continue until you find different digits.

Step 1 Line up the numbers according to their place value.

12.4
12.39

Step 2 Compare the numbers in each place, starting from the left.

Start here:

10 = 10

2 = 2

0.4 is more than 0.3

So, 12.4 **is greater than** 12.39 ⟶ 12.4 > 12.39

1	2	.	4	
1	2	.	3	9

1. Write down the correct sign (>, <, or =).

A 0.823 < 0.839

B 4.3 > 0.72

C 2.5 = 2.50

D 97 > 9.7

2. Circle the greatest number.

2.34	23.4	0.234	234.0

3. Circle the smallest number.

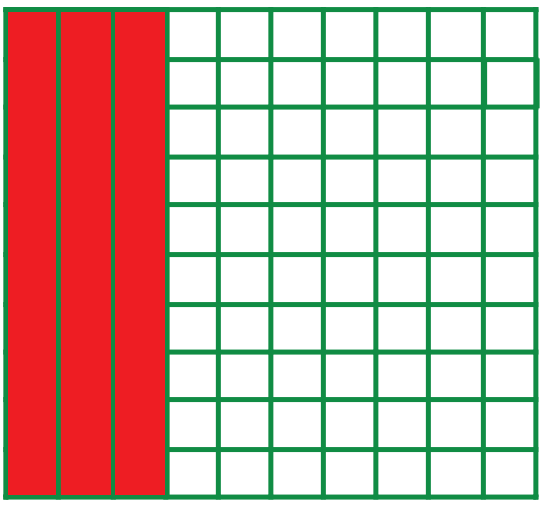
90.9	9.09	9.9	90.09

4. Circle the equivalent fractions in each group.

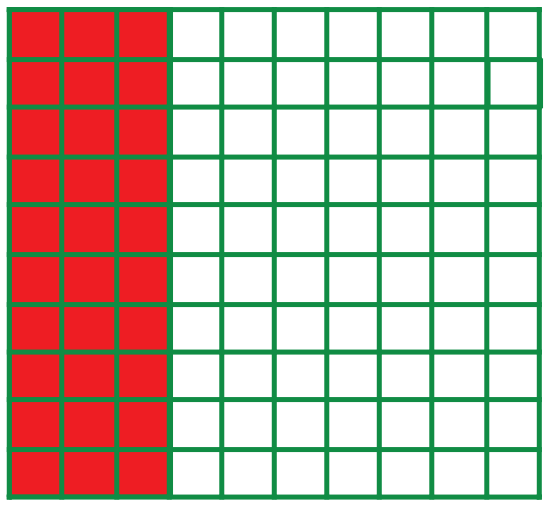
A	0.2	$\frac{7}{10}$	$\frac{4}{10}$	$\frac{2}{10}$
B	0.5	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$

Your Work

Prove that 0.3 = 0.30 using the following models:



$\frac{3}{10}$



$\frac{30}{100}$

(2-7) Problem Solving

1. A pitcher contains $2\frac{3}{4}$ pints of orange juice.

   After you pour $\frac{1}{5}$ of a pint into a glass, how much orange juice is left in the pitcher? Provide your answer using decimals.

   $2\frac{3}{4} - \frac{1}{5} = 2.75 - 0.2 = 2.55$

2. Susan swims a race in $\frac{293}{10}$ seconds. Patty swims the race in $\frac{339}{10}$ seconds. Write down each time using decimals. Who is faster?

   Susan ($29.3 < 33.9$)

3. A swimming pool is open for $7\frac{1}{2}$ hours a day.

   The pool keeps one lifeguard on duty at a time, and each lifeguard's shift is $1\frac{1}{2}$ hours long.

   How many shifts are there per day?

   $7\frac{1}{2} \div 1\frac{1}{2} = \frac{15}{2} \div \frac{3}{2} = \frac{15}{2} \times \frac{2}{3} = \frac{30}{6} = 5$

Show Your Turn

1. Simplify the following fractions:

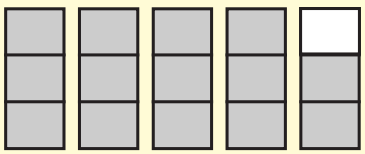
A $\frac{6}{12} = \frac{1}{6}$

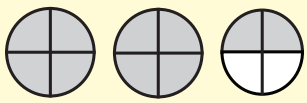
B $\frac{2}{8} = \frac{1}{4}$

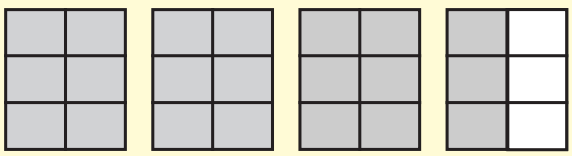
C $\frac{12}{36} = \frac{1}{3}$

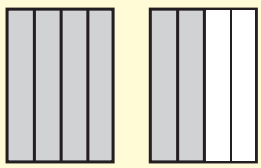
D $\frac{4}{20} = \frac{1}{5}$

2. Write down a mixed number for each of the shaded sets of shapes using the simplest form.

 = $4\frac{2}{3}$

 = $2\frac{2}{4}$

 = $3\frac{3}{6}$

 = $1\frac{2}{4}$

3. Add or subtract.

A $\frac{5x3}{5x4} + \frac{4x3}{4x5} + \frac{10x1}{10x2} =$

$\frac{15}{20} + \frac{12}{20} + \frac{10}{20} = \frac{37}{20} = 1\frac{17}{20}$

B $\frac{5x2}{5x4} + \frac{4x2}{4x5} + \frac{2x2}{2x10} =$

$\frac{10}{20} + \frac{8}{20} + \frac{4}{20} = \frac{22}{20}$

$= 1\frac{2}{20} = 1\frac{1}{10}$

C $3\frac{3x5}{3x7} + 3\frac{12}{21} =$

$3\frac{15}{21} + 3\frac{12}{21} = 6\frac{27}{21}$

$6 + 1\frac{6}{21} = 7\frac{2}{7}$

D $9\frac{8}{20} - 4\frac{4x2}{4x5} - \frac{10x1}{10x2} =$

$9\frac{8}{20} - 4\frac{8}{20} - \frac{10}{20} = 5\frac{10}{20}$

$= 5 - \frac{1}{2}$

$= 4\frac{1}{2}$

4. Write down the correct sign (>, <, or =).

A $6\frac{1}{4} - 3\frac{2}{20}$ [=] $6\frac{1}{4} - 3\frac{1}{10}$

B $9\frac{5}{6} + 5\frac{2}{3}$ [>] $8\frac{7}{9} - 4\frac{1}{3}$

C $5\frac{1}{4} - 1\frac{1}{8}$ [<] $3\frac{1}{2} + 5\frac{3}{6}$

D $3\frac{1}{4} + 2\frac{4}{6}$ [<] $2\frac{1}{2} + 3\frac{1}{2}$

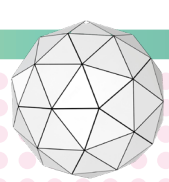
5. Fill in the missing numbers.

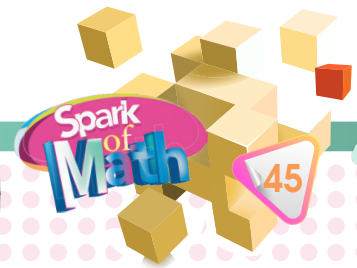
A $4\frac{1}{2} - \square\frac{\square}{\square} = 2\frac{7}{8}$

B $7\frac{5}{8} - \square\frac{\square}{\square} = 5\frac{3}{8}$

C $\square\frac{\square}{\square} + 8\frac{7}{8} = 13\frac{3}{8}$

D $\square\frac{\square}{\square} + 1\frac{1}{2} = 11$





Unit 3

Measurement and Geometry

Vocabulary

- metric units
- kilometer (km)
- meter (m)
- decimeter (dm)
- centimeter (cm)
- millimeter (mm)
- area units
- square meter (m^2)
- square decimeter (dm^2)
- square centimeter (cm^2)
- square millimeter (mm^2)
- volume units
- cubic meter (m^3)
- cubic decimeter (dm^3)
- cubic centimeter (cm^3)
- cubic millimeter (mm^3)
- capacity units
- liter (l)
- milliliter (ml)
- mass units
- kilogram (kg)
- gram (g)
- protractor
- angles
- acute
- right
- obtuse
- straight

Objectives

Upon completion of this unit, you will be able to:

- Compare and convert the different units of length.
- Compare and convert the different units of area.
- Compare and convert the different units of volume.
- Compare and convert the different units of capacity.
- Compare and convert the different units of mass.
- Use a protractor to draw or measure the angles.

(3-1) Metric Units

Different metric units measure various lengths and distances accurately. We use centimeter (cm) to measure the length of a pencil or the width of a book. However, this unit is too large to measure the thickness of a pencil, so we use another unit called millimeter (mm). Decimeters (dm) are useful for measuring slightly larger objects, like a notebook.

To measure the length of a classroom, we use meters (m). Even meter is too small of a unit when stating the distance between two cities; that is why we need kilometers (km).

The following table compares millimeters, centimeters, meters, and kilometers and how to convert between them:

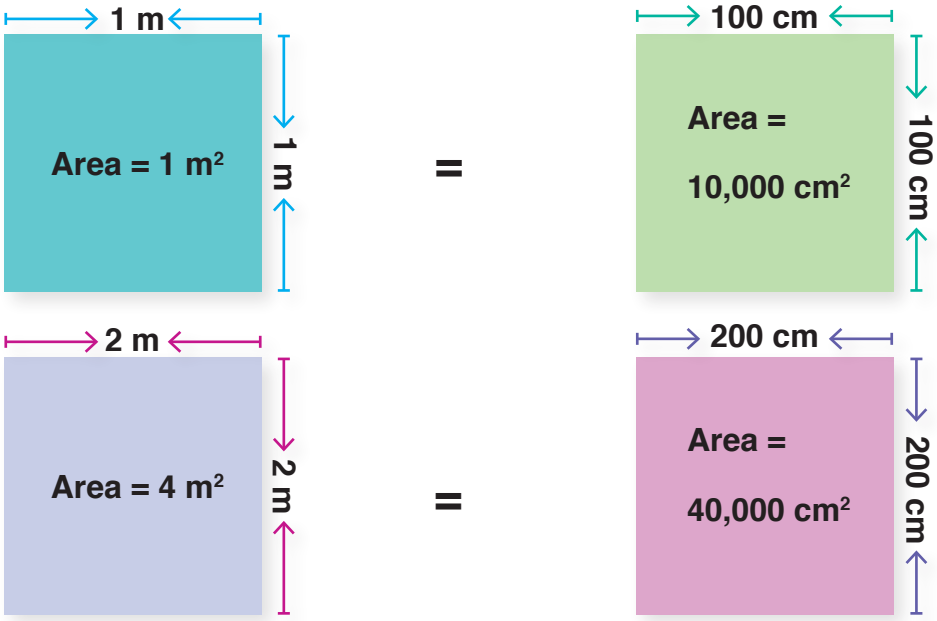
Kilometer	Meter	Decimeter	Centimeter	Millimeter
km	m	dm	cm	mm
1	1000	10,000	100,000	1,000,000
$\frac{1}{1000}$	1	10	100	1000
$\frac{1}{10,000}$	$\frac{1}{10}$	1	10	100
$\frac{1}{100,000}$	$\frac{1}{100}$	$\frac{1}{10}$	1	10

Since 1 km = 1000 m, then 7 km = 7000 m $(7 \times 1000 = 7000)$.

Since 1 m = 100 cm, then 500 cm = 5 m $(500 \div 100 = 5)$.

Area Units

The area of a square equals the length of any of its sides multiplied by itself.



$1\ m^2 = 1\ m \times 1\ m = (100\ cm) \times (100\ cm) = 10{,}000\ cm^2$

$4\ m^2 = \underline{2\ m} \times \underline{2\ m} = \underline{(200\ cm)} \times \underline{(200\ cm)} = \underline{40{,}000}\ cm^2$

1. Convert.

13 m =	130	dm	180 cm =	1800	mm
4 km =	40,000	dm	11 m^2 =	110,000	cm^2
200 cm =	2	m	49000 cm^2 =	4,900,000	mm^2
2300 mm =	23	dm	25 m^2 =	25,000,000	mm^2

2. Write down the correct sign (>, <, or =).

A 45 cm [<] 6 dm

B 12 km [>] 1200 m

C 1 m^2 [>] 10 dm^2

D 62000 mm^2 [>] 73 cm^2

Your Work

300 cm = [0.003] **km. Why?**

1 km = 100,000 cm

$1 \text{ cm} = \frac{1}{100{,}000} \text{ km}$

$300 \text{ cm} = \frac{300}{100{,}000}$

$= \frac{3}{1000} = 0.003 \text{ km}$

(3-2) Volume Units

Volume is the measurement of an amount of space occupied by on object.

Volume is measured in cubic units, such as cm^3, dm^3, and mm^3. We use cubic meters (m^3) for larger volumes like rooms, and cubic centimeters (cm^3) for smaller objects like erasers.

$1\ m^3 = 1000000\ cm^3$

note $1\ m^3 = 1\ m \times 1\ m \times 1\ m$
$= 100\ cm \times 100\ cm \times 100\ cm$
$= 1000000\ cm^3$

1. Convert.

A $455\ cm^3 =$ 455,000 mm^3

B $25\ m^3 =$ 25,000,000 cm^3

C $14000\ dm^3 =$ 14 m^3

D $11900000\ cm^3 =$ 11.9 m^3

2. Circle the correct answers.

A	$7\ m^3 > 8\ dm^3$	**(True / False)**
B	$1200\ dm^3 < 20\ m^3$	**(True / False)**
C	$280\ cm^3 < 4900\ mm^3$	**(True / False)**
D	$1200\ m^3 > 20\ km^3$	**(True / False)**

Your Work

Ali has a box; its volume is 15 cm^3.

Dana's box volume is 8 dm^3. But Hana's is 0.6 m^3.

Who has the greatest box volume? Why?

Hana has the greatest box volume because:

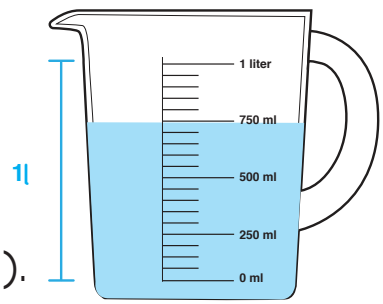
Ali's box volume: 15 cm^3
Dana's box volume: 8 dm^3 (which equals 8,000 cm^3)
Hana's box volume: 0.6 m^3 (which equals 600,000 cm^3)
Hana's volume is the largest.

(3-3) Capacity Units

Capacity is the amount a container can hold.

The standard unit to measure capacity is liter.

For example, we buy milk in liters (l), whereas liquids and medicines are measured in milliliters (ml).



1 liter (l) = 1000 milliliters (ml).

1. Convert.

A 62 l = 62,000 ml

B 250 l = 250,000 ml

C 9000 ml = 9 l

D 40 ml = 0.04 l

Your Work

Show the relationship between 1 liter and 1 dm³.

1 liter = 1000 cm³.
1 dm³ = 1000 cm³.
So, 1 liter = 1 dm³.

(3-4) Mass Units

Mass is a measure of the amount of matter in an object. We measure the mass of things like sugar, rice, and apples in kilograms (kg).

However, we measure smaller items like chilies in grams (g).

For compounds or chemicals in medicines, we use an even smaller unit called milligrams (mg).

The relationships between these three units of measurement of mass are:

1 kilogram (kg) = 1000 grams (g).

1 gram (g) = 1000 milligrams (mg).

1 kilogram (kg) = 1,000,000 milligrams (mg).

1. Convert.

A 25 kg = 25,000 g

B 3 g = 3,000 mg

C 3000 mg = 0.003 kg

D $\frac{1}{2}$ kg = 500 g

E 1000 g = 1 kg

2. Write down the suitable numbers.

Students' own answers

e.g,

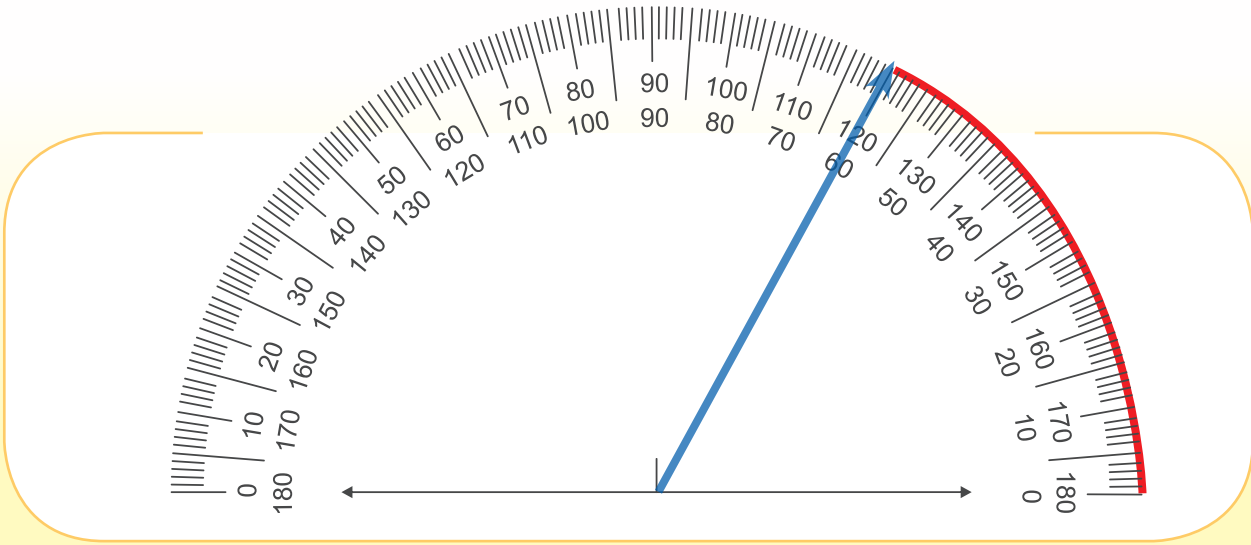
A 5400 kg > 5,500,000 g

B 3920 g < 5 kg

(3-5) Measuring Angles

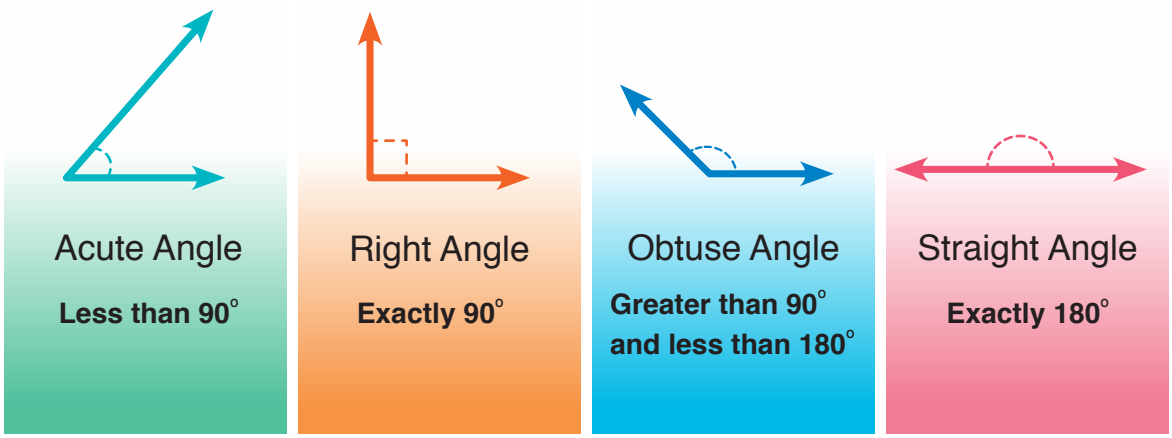
The Protractor

A protractor is a tool used to measure angles.

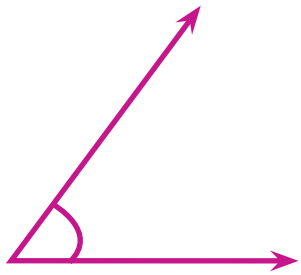


The center of the protractor is placed over the vertex of the angle. The protractor's baseline is aligned with one of the angle lines.

There are four main types of angles: acute, right, obtuse, and straight.

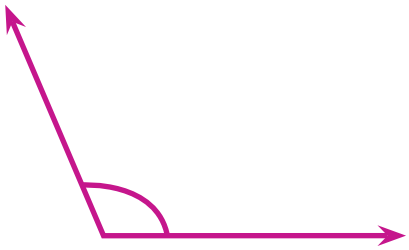


1. Measure each angle using a protractor and write down its type.



Angle: 55°

Type: acute

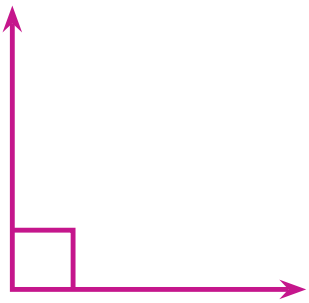


Angle: 110°

Type: obtuse

Angle: 180°

Type: straight



Angle: 90°

Type: right

Your Work

Draw two angles: one measuring 70° and another measuring 140°.

Students' own answers

(3-6) Problem Solving

1. **Mary has a rectangular dining room that spans 20 m^2. What are the possible carpet dimensions (width and length) required to completely cover the room?**

$20\ m^2 = 5m \times 4m$

2. **During a long walk, Ahmad drank 5 full 600-ml bottles of water. How many liters of water is this equal to?**

$600\ ml = 0.6l$

3. **The volume of a rectangular refrigerator is found by calculating (width × depth × height). If the refrigerator on sale is 80 cm wide, $1\frac{1}{2}$ m high and 500 mm deep, find the refrigerator's volume.**

$80\ cm \times 1\frac{1}{2}\ m \times 500\ mm =$

$80\ cm \times 150\ cm \times 50\ cm = 600{,}000\ cm^3$

4. **Masa and Zaid are twins. When they were born, Masa was 600 g heavier than Zaid. If Zaid was 3 kg at birth, then how much more was Masa at birth?**

Masa's weight = Zaid's weight + 600g
Masa's weight = 3000 g + 600 g = 3600 g

Show Your Turn

1. Fill in the blanks.

(A) 200 g + 800 g = 1 kg

(B) 500 ml + 500 ml = 1 l

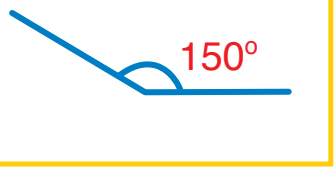
(C) 250 m + 750 m = 1 km

(D) 2 m^3 = 2,000,000 cm^3

(E) 3000 g + 1000 g = 4 kg

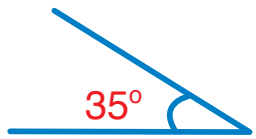
(F) 13 l = 13,000 ml

2. Measure each angle with a protractor. Is it acute, obtuse, or a right angle?



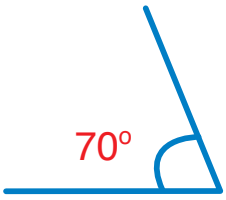
obtuse

obtuse



acute

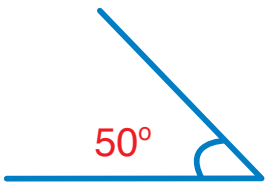
obtuse



acute

obtuse

obtuse



acute

acute

Unit 4

Statistics

Vocabulary

bar graphs
line graphs
circle graphs
title
scale
interval
labels
X-axis (horizontal axis)
Y-axis (vertical axis)
point

Objectives

Upon completion of this unit, you will be able to:

Read the data using a bar graph.

Read the data using a line graph.

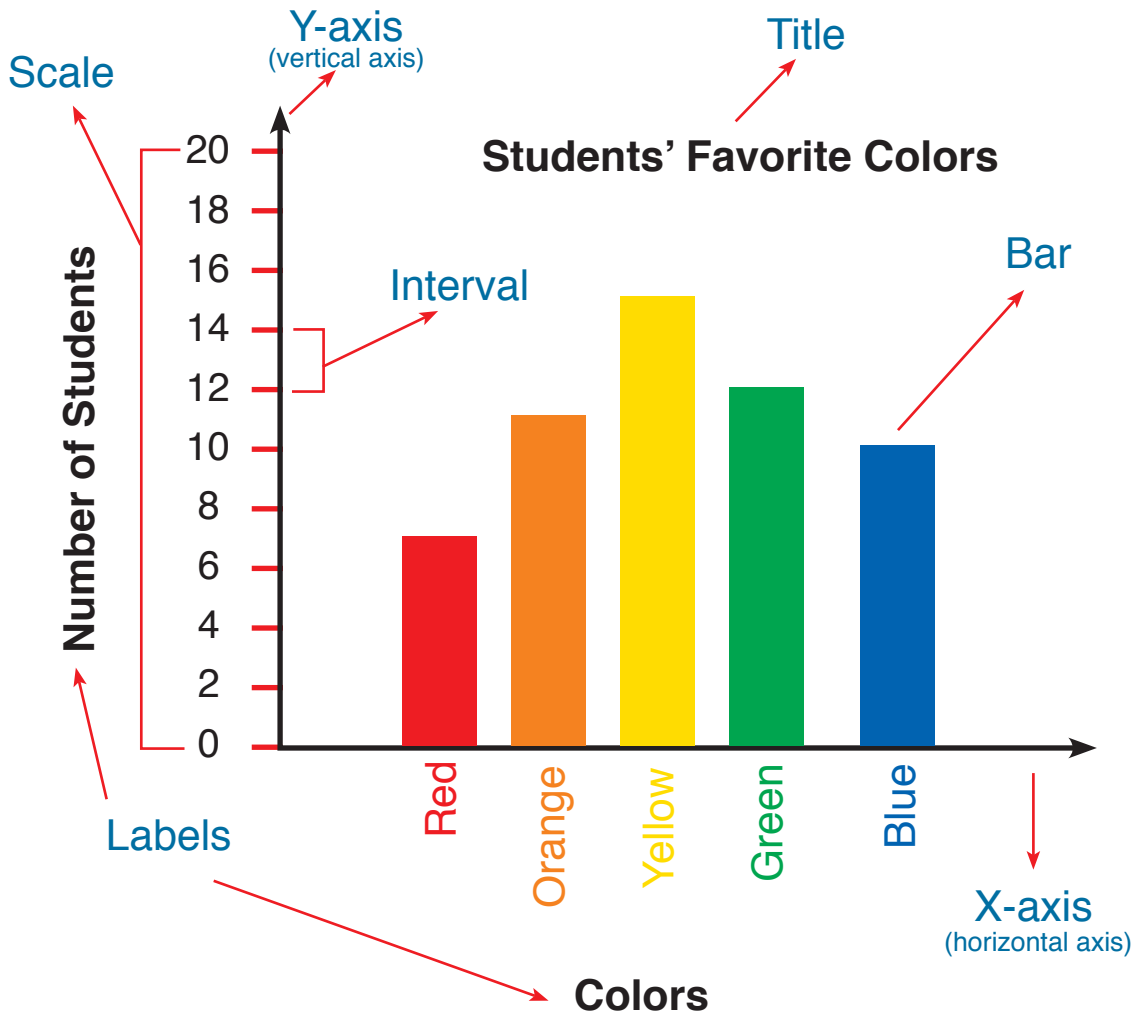
Read the data using a circle graph.

Represent the data visually.

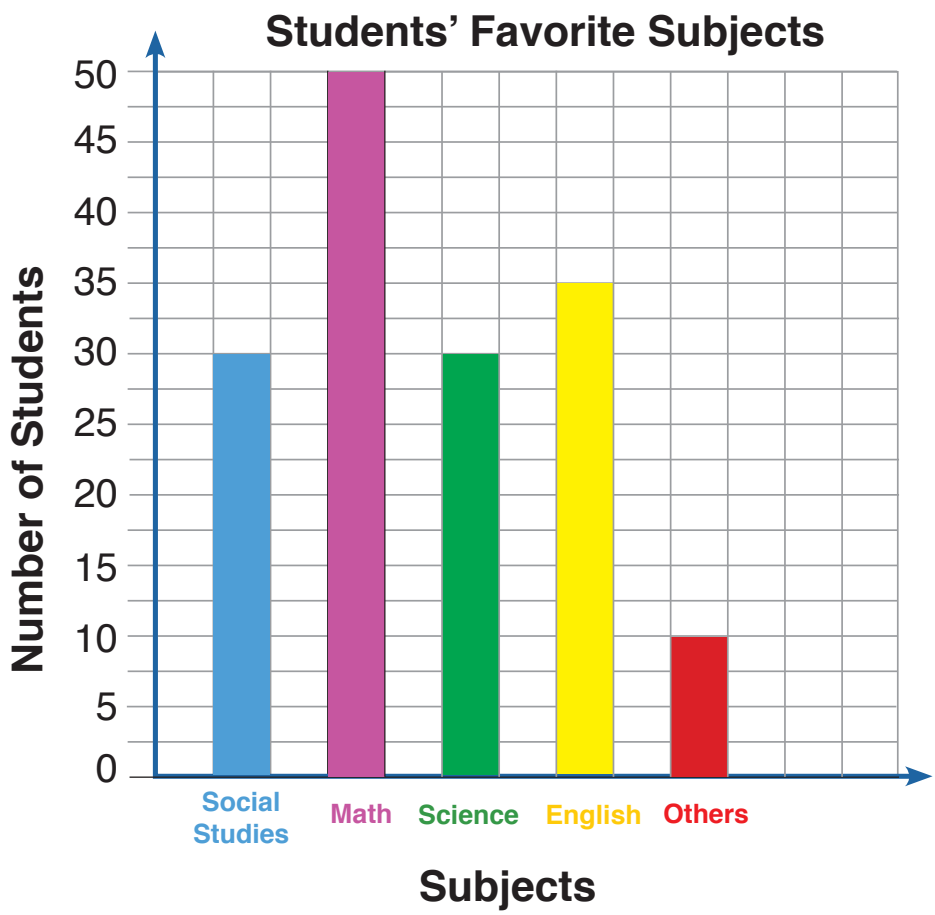
(4-1) Bar Graphs

Bar graphs are visual representations that help us organize information easily. The information is drawn into rectangular bars with heights or lengths proportional to the values that they represent. Bar graphs are also called bar charts.

Parts of a Bar Graph



1. Miss Sara recorded the favorite subjects of her students in a bar graph. Use the graph to answer the questions.



A What unit scale is used to display the popularity of subjects among the students? Number of students by 5

B Which subject is the second most popular? English

C Which subject is less popular: science or English? science

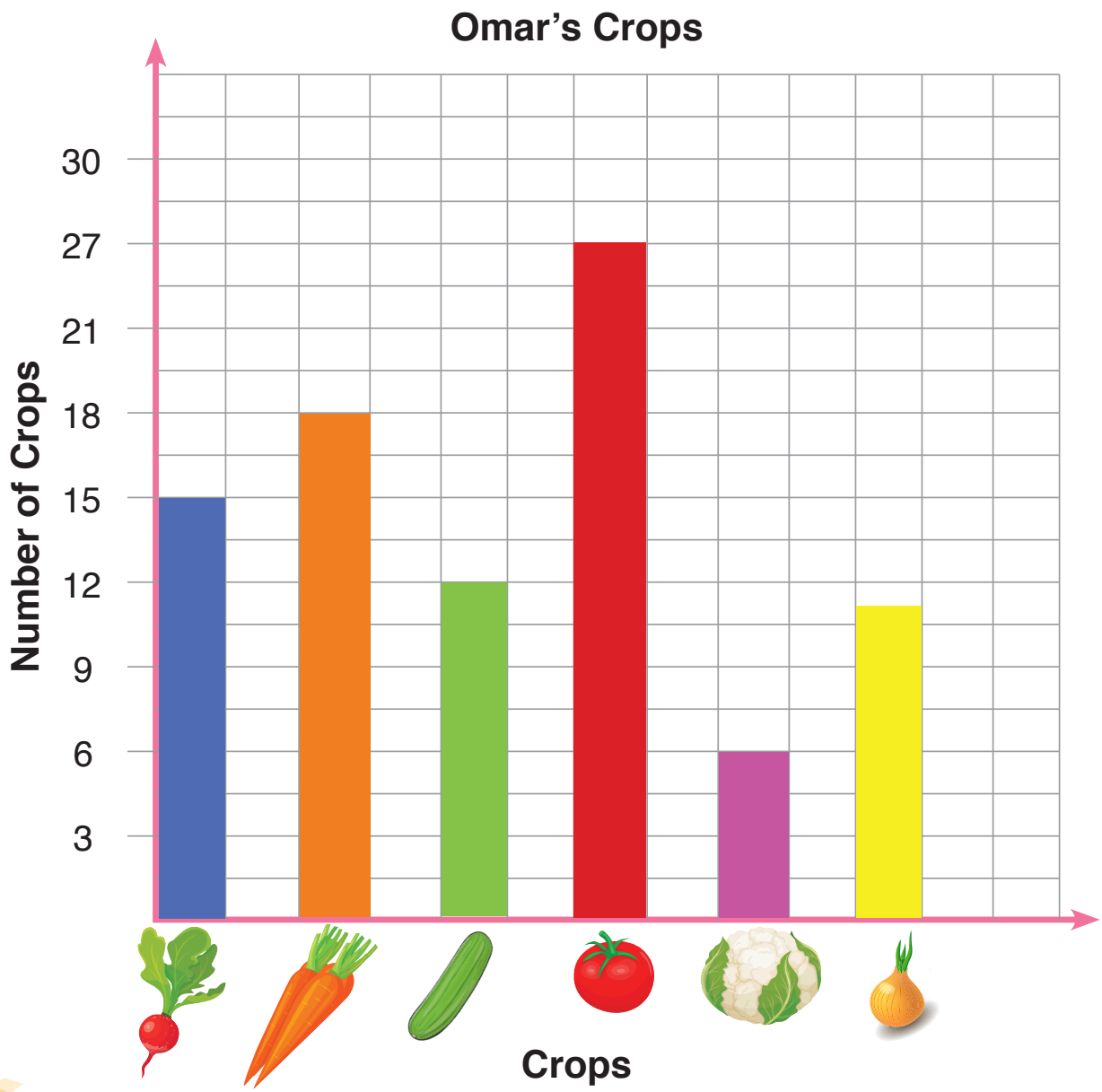
D Which subject is the most popular? Math

E Which subjects have the same number of votes? Social Studies and Science

F What number of students favor math and science? 80

2. Help Mr. Omar count his crops by creating a bar graph.
Color in the correct number of boxes for each crop.
The first crop has been done for you.

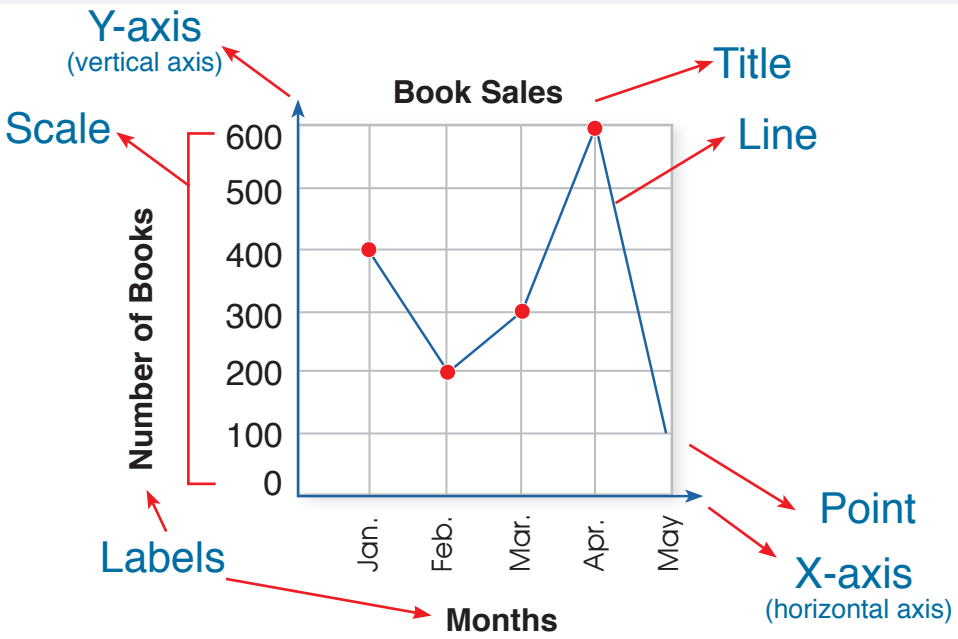
15 Radishes	18 Carrots	12 Cucumbers
27 Tomatoes	6 Cauliflowers	10 Onions



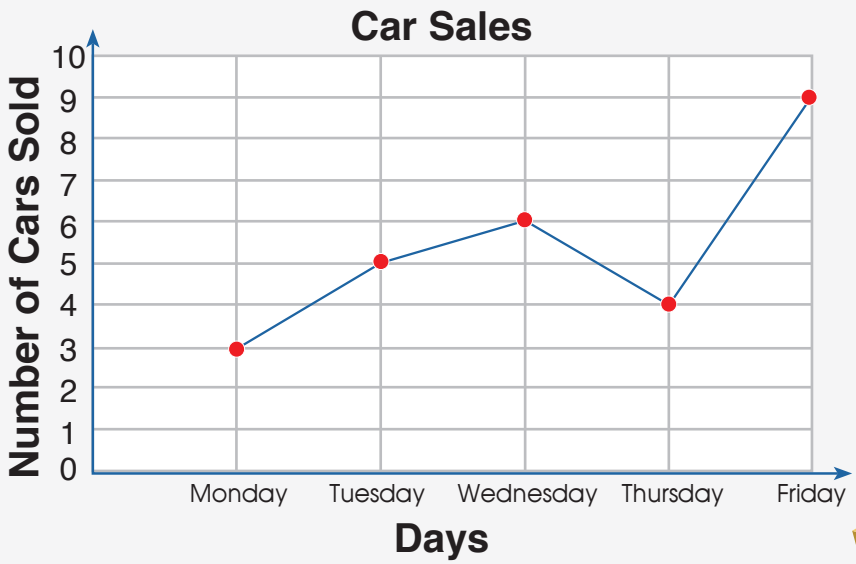
(4-2) Line Graphs

Line graphs show how things change over time or other continuous periods. It uses lines to connect points that represent data.

Parts of a Line Graph



1. Karam is a salesman in an authorized car showroom. He recorded the number of cars sold in five days (Monday to Friday) on a line graph. Study the graph and answer the questions.



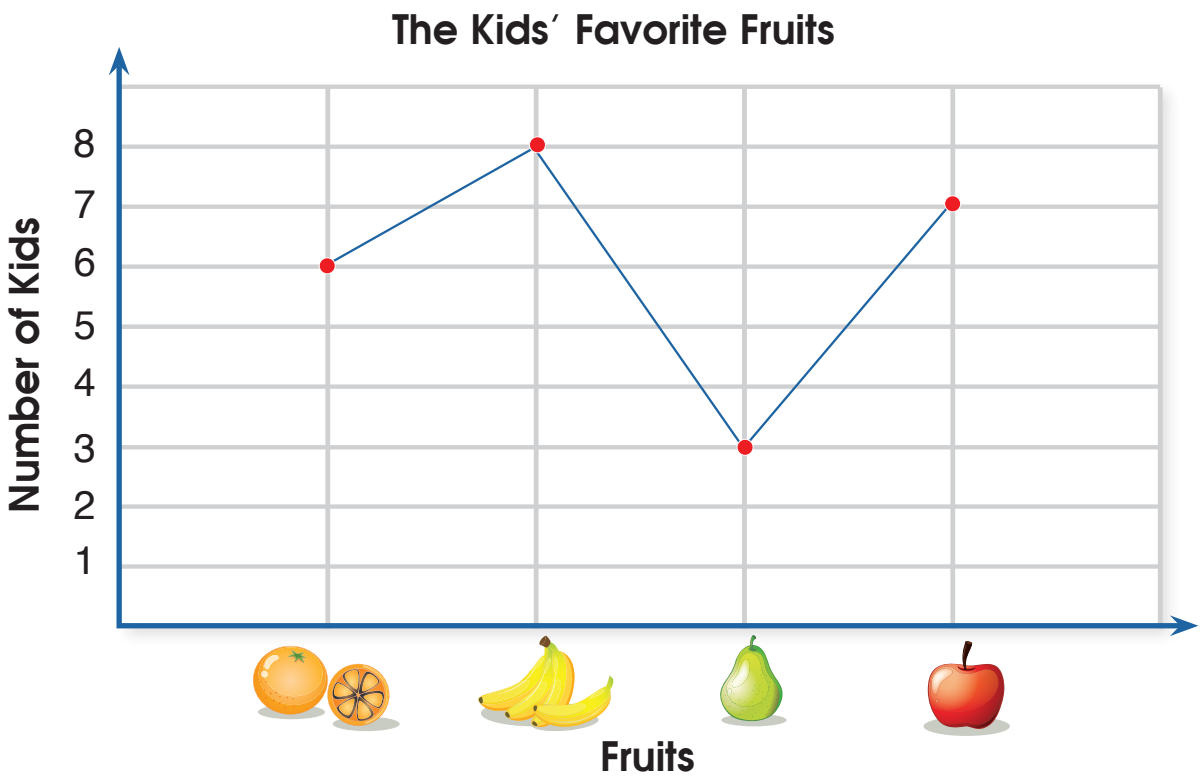
A The day with the maximum number of cars sold was Friday .

B The number of cars sold on Wednesday was 6 .

C The difference between cars sold on Tuesday and cars sold on Monday was 2 .

D The number of cars sold in all 5 days was 27 .

2. Study the line graph and answer the questions.



A How many kids like apples? 7

B Which fruit do the kids like the most? bananas

C Which fruit do the kids like the least? pears

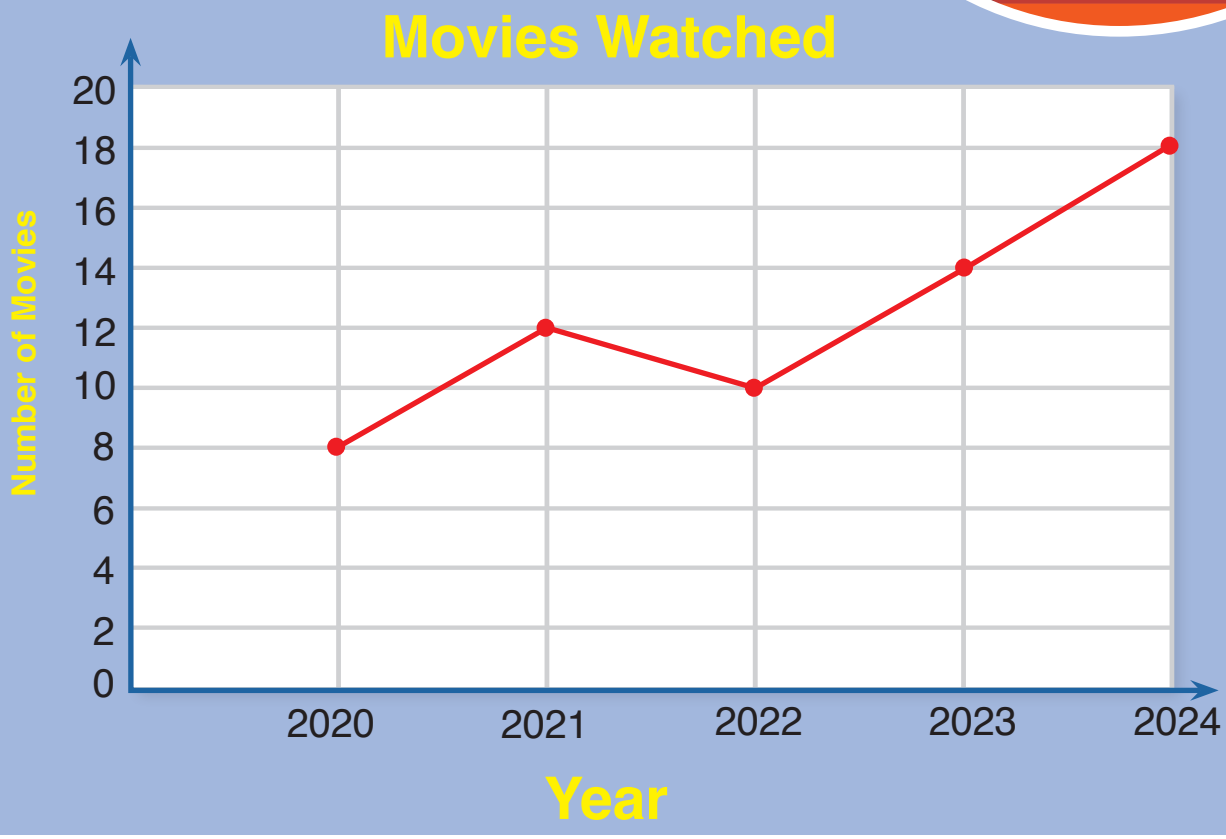
D How many kids like bananas? 8

E How many kids like pears and bananas? 11

F How many kids like oranges and apples? 13

3. Ghada and her family often watch movies at home. The data shows the number of movies watched by them from 2020 to 2024. Draw a line graph to represent the data.

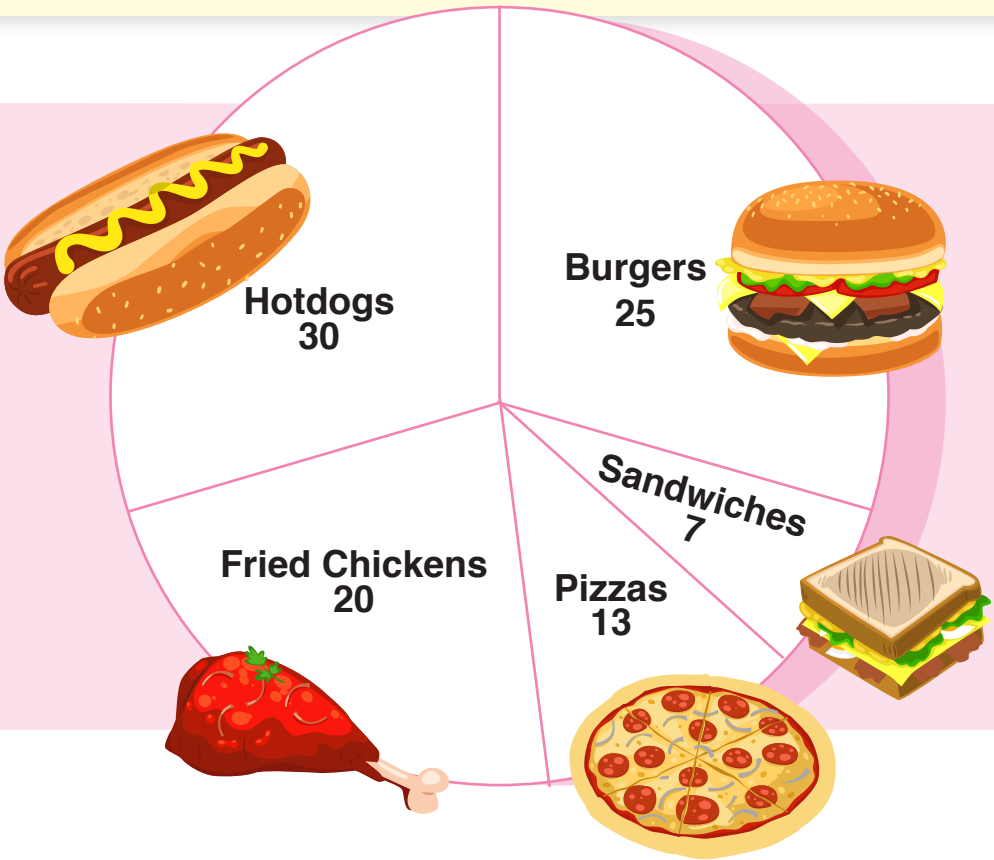
Year	Number of Movies
2020	8
2021	12
2022	10
2023	14
2024	18



(4-3) Circle Graphs

Circle graphs show how the parts of something relate to the whole. Each sector of a circle graph represents a specific category. The entire circle is 1 whole, or %100, and a sector of the circle is a part.

1. Hala's restaurant surveyed a sample of customers about their favorite food. They made a circle graph with the survey results. Read the circle graph and answer the questions.



A What is the most favorite food among the customers? Hotdogs

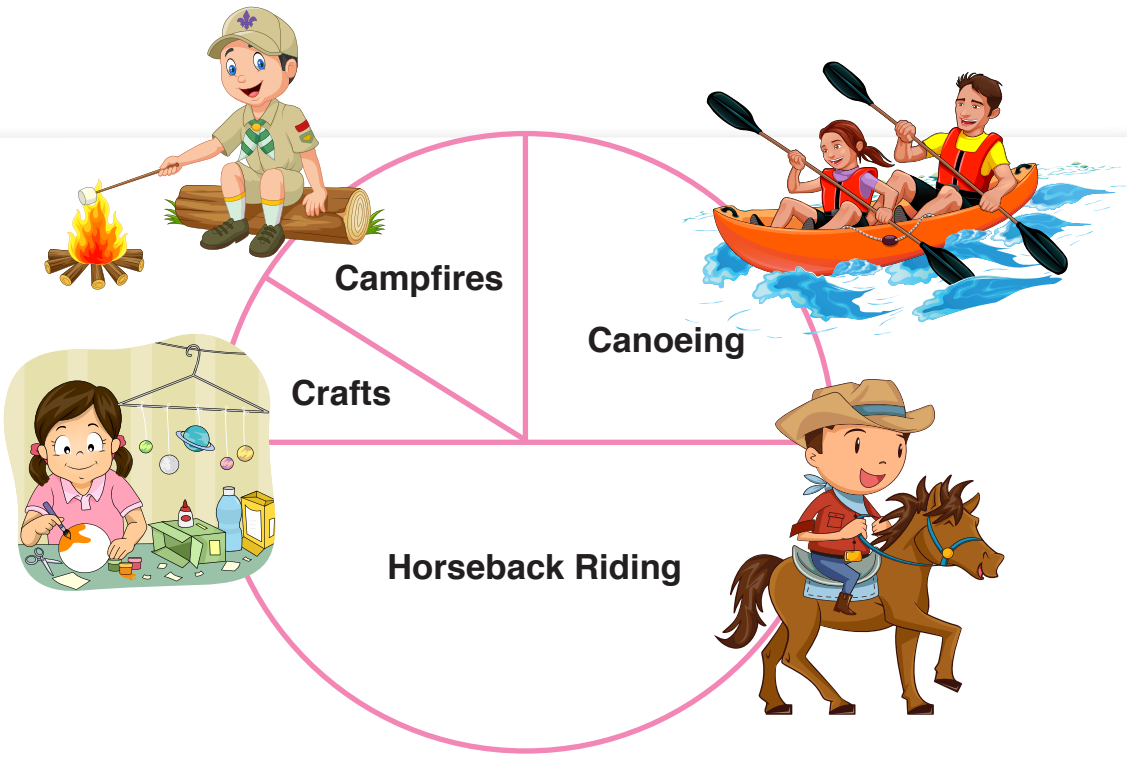
B How many customers like fried chicken? 20

C Which is the least favorite food for customers? Sandwiches

D How many customers has voted for burgers as their favorite? 25

E How many customers has participated in the survey? 95

2. A group of kids spent a week at Big Tree Summer Camp. At the end of the week, they were asked about their favorite and least favorite activities. Read the circle graph and answer the questions.



A What activity did campers enjoy the most?

Horseback Riding

B What was the percentage of camp participants who chose canoeing as their favorite activity?

25%

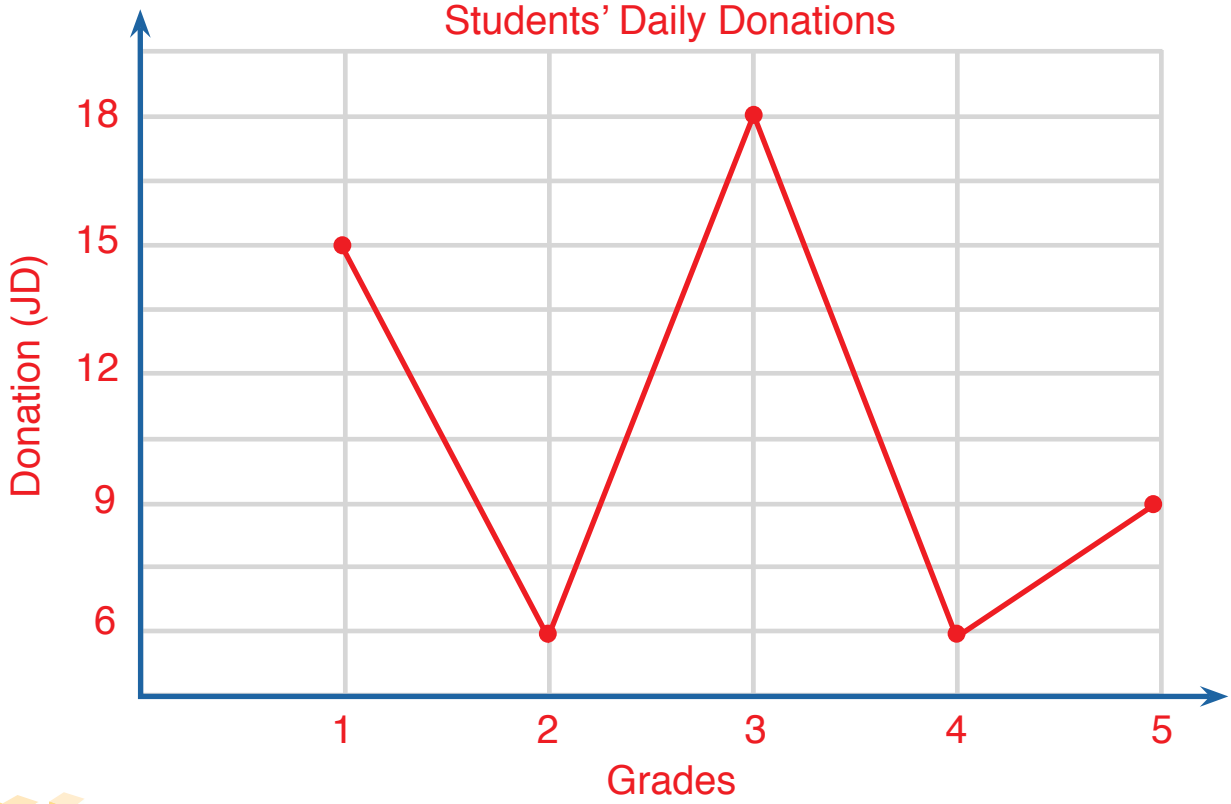
C What activity did campers enjoy the least?

Crafts

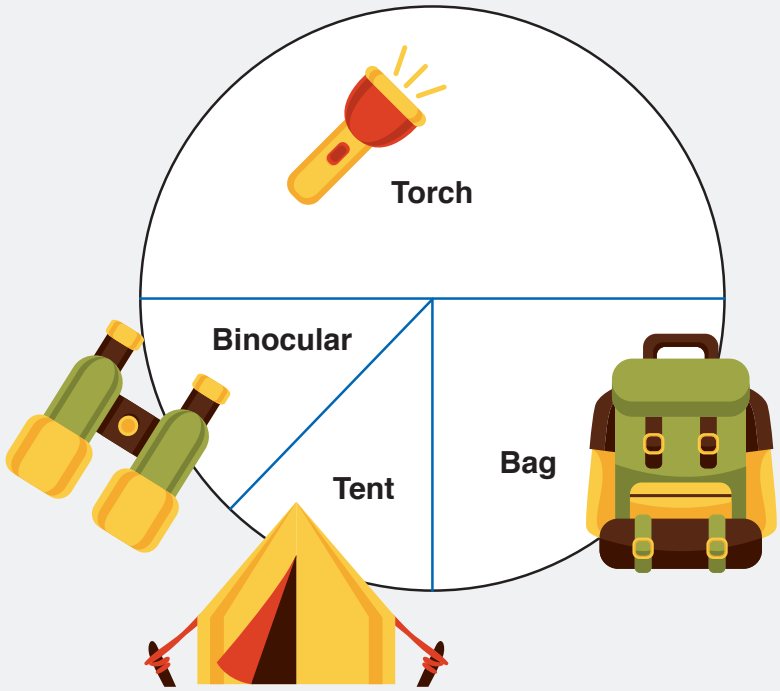
Show Your Turn

1. The table below displays the daily donations in JD from grades 1 to 5 at a specific school. Make an appropriate scale and draw a line graph. Also label the axes and write down a title for the graph.

Grade	Donation
Grade 1	15
Grade 2	6
Grade 3	18
Grade 4	6
Grade 5	9



2. Richards Store is the best for selling camping supplies. They made a circle graph of the sales for certain items during the month of July. Use the graph to answer the questions.



A Which item sold the most in Richards Store?

Torch

B What was the fraction that indicates the number of torches sold?

$\frac{1}{2}$

C Did the store sell fewer bags or torches?

bags

D Were the sales of bags greater than the sales of tents?

Yes

Spark of Math