4

Measurement

Design a Playground

Playground Hours
8:00 A.M. – 8:00 P.M.

Learning Goals

- read and record time using analog and digital clocks
- read and record calendar dates
- estimate and measure area
- construct rectangles for a given area

122

analog clock

digital clock

elapsed time

24-hour clock

units

area

square units

square centimetre

square metre

- What does the sign on the gate mean?
- Suppose you went to the playground at 4 o' clock and stayed for 1 hour. What time would you leave?
- Which section of the playground covers the most space?
- Which sections cover about the same amount of space?

Calendar Time

What do you know from looking at these calendar pages?

FEBRUARY 2004

S	M	T	W	T	F	S
1	2 Groundhog Day	3	4	5	6	7
8	9	10	11	12 Math Test	13	14 ♥
15	16	17 Dentist 10:00	18	19	20	21
22	23	24	25 Ben's Birthday	26	27	28
29						

FEBRUARY 2005

S	M	T	W	T	F	S
		1	2 Groundhog Day	3	4	5
6	7	8	9 Library	10	11	12
13	14 ♥	15	16	17	18	19
20	21	22	23	24	25 Ben's Birthday	26
27	28					

Explore

➤ Talk to 5 classmates.
  Find out the month, day of the month,
  and year each classmate was born.
  Record your results in a table.

➤ Write your own date of birth in the table.
  Write the dates of birth of some of your
  family members.

➤ Order your list of people from oldest to youngest.

Birthdays

Name	Month	Day	Year
Sindar	Nov.	19th	
Jacob			
Dallas			
Moira			
Saffa			

Show and Share

Share your list of birth dates with another pair of classmates.
Talk about how you recorded the dates.
Explain the strategy you used to order your list of people from oldest to youngest.

➤ The circled date is October 24th, 2006.

We can write this date in metric notation:

We start with the greatest unit of time – the year, and go to the least unit of time – the day.

2006	10	24
↑	↑	↑
Year	Month	Day

October is the 10th month.

➤ When we write the date in metric notation, we use 2 digits for the month and 2 digits for the day.

The circled date is April 8th, 1999.
In metric notation, we write:

We put a zero in the tens place for numbers from 1 to 9.

1999	04	08
↑	↑	↑
Year	4th month (April)	8th day of the month

➤ Some people also use 2 digits for the year.
Then, April 8th, 1999 could be written: 99 04 08

➤ Other ways to write dates are month, day, year and day, month, year.
This means that a date written as 05 04 01 could be interpreted two ways:

05	04	01	or	05	04	01
↑	↑	↑		↑	↑	↑
5th month	4th day	Year		5th day	4th month	Year
May 4th, 2001 or May 4, 2001				5 April, 2001		

Practice

● ●

1. Write each date in metric notation.
  a) December 14th, 2002   **b)** April 25, 2110
  c) May 5, 1941   **d)** October 1st, 2000
  e) September 8, 2005   **f)** June 25, 1927

2. Write each date using words and numbers.
  a) 2008 11 04   **b)** 2025 03 09
  c) 1846 08 13   **d)** 2007 10 19
  e) 2006 05 28   **f)** 2000 01 01

3. Use metric notation to record each circled date on the calendar at the right.

4. Write each date in metric notation.
  a) the first day of next month
  b) the last day of this month
  c) the date of your 15th birthday
  d) the last day of this year
  e) 5 months before October 31st of this year
  f) 2 months after today

September 2007

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

5. Joe wrote his birth date as 02 08 94.
Jane was confused.
Did Joe mean February 8, 1994 or August 2, 1994?
Joe said, "I was born in the winter."
Write Joe's birth date in metric notation.

6. Read each statement.
Re-write the date in metric notation.
  a) Nunavut entered
     confederation on
     April 1st, 1999.

b) The American spacecraft *Apollo 11* landed on the moon on July 20th, 1969.

c) Sir John A. MacDonald was the first Prime Minister of Canada.
He was born on January 11th, 1815.

d) The first Oreo cookie was sold on March 6th, 1912.

e) The rings of Uranus were discovered on March 10th, 1977.

f) The first toy ever advertised on TV was Mr. Potato Head, on April 30th, 1952.

g) Chewing gum was patented on December 28th, 1869.

7. Match each date to the correct calendar page below.

   a) 2007 07 08   **b)** 2007 06 17   **c)** 2007 08 07

JUNE 2007						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
(17)	18	19	20	21	22	23
24	25	26	27	28	29	30

JULY 2007						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
(8)	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

AUGUST 2007						
S	M	T	W	T	F	S
			1	2	3	4
5	6	(7)	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

8. Use the calendar pages above.
Write each date using words and numbers.

   a) 19 08 2007   **b)** 27 06 2007   **c)** 11 07 2007

9. Dennis left for Yellowknife on 2006 07 24 and returned on 2006 08 05.
How long was Dennis away?
Show your work.

Reflect

Use metric notation to write a date that is important to you.
Tell why it is important.

2

Exploring Time

It's 8 o'clock.
Tyrell gets up.

It's quarter after 8.
Tyrell eats breakfast.

It's half past 8.
Tyrell leaves for school.

It's quarter to 9.
Tyrell arrives at school.

Explore

➤ Use the clock cards your teacher gives you.
Place the cards in a pile face down.
Take turns to turn over the top card.
Say the time the clock shows.
Continue until all the cards have been used.

➤ Choose a card from the pile.
Draw a picture to show what you might do at that time.
Repeat with two more cards.

Show and Share

Share your pictures with your partner.
Tell whether each picture happens in the morning, the afternoon, or at night.

Connect ···

➤ A clock with numbers and hands is an **analog clock**.
A clock face shows the numbers from 1 to 12.

Minute hand   Clock face
Hour hand
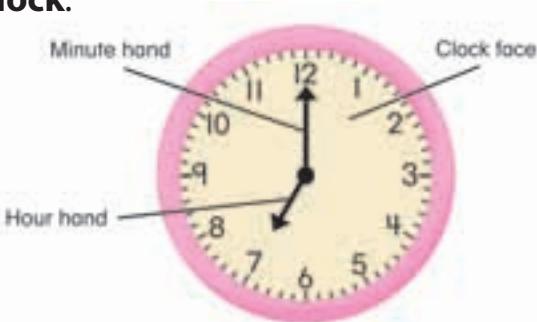
➤ There are 24 hours in 1 day. Each day,
the hour hand moves twice around the clock.
It takes 1 hour for the hour hand to
move from one number to the next.

➤ There are 60 minutes in 1 hour.
Each hour, the minute hand moves once around the clock.
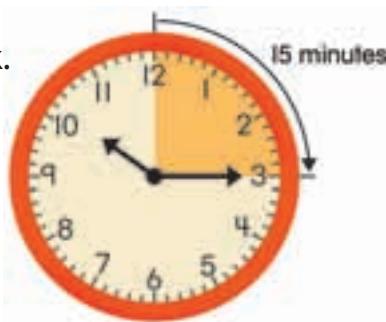
15 minutes

➤ It takes 15 minutes for the minute hand to move
$\frac{1}{4}$ of the way around the clock.
It is 15 minutes after 10 o'clock.
We say: "It is *quarter after* 10" or "ten fifteen."

10:15

➤ It takes 30 minutes for the
minute hand to move half
way around the clock.
It is 30 minutes
after 10 o'clock.
We say: "It is *half past* 10"
or "ten thirty."

> The hour hand is
> half way between the
> 10 and the 11.

30 minutes

10:30
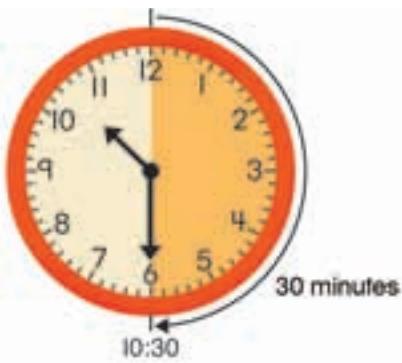
➤ It takes 45 minutes for
the minute hand to
move $\frac{3}{4}$ of the way
around the clock.
It is 45 minutes
after 10 o'clock.
We say: "It is ten forty-five."

> When the *minute*
> hand has moved
> through another $\frac{1}{4}$ turn, it
> will be 11 o'clock. So,
> we can also say: "It is
> *quarter to* 11."

45 minutes

10:45

➤ A clock with numbers and no hands is a **digital clock**.
It shows the time using numbers and a colon.

The hour is 11.

11:15

The colon separates the hour and minutes.

It is 15 minutes after the hour.

The clock shows 15 minutes after 11 o'clock. We say: "Eleven fifteen"

Practice

1. Match each analog clock with the digital clock that shows the same time.

a)

b)

c)

d)

A 2:45

B 5:00

C 6:15

D 9:30

2. Write each time in two ways. The first one is done for you.

a)

12:30
half past 12

b)

c)
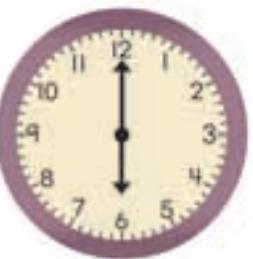
d)
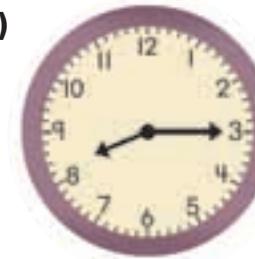
e)

f)

3. Write each time in a different way.
   a) 6:00   **b)** quarter to 1   **c)** eleven forty-five   **d)** 4:15

4. Draw a digital clock to show each time.
   a) seven thirty   **b)** one fifteen   **c)** four forty-five
   d) three o'clock   **e)** quarter to eight   **f)** half past two

5. Draw and label a picture to show what you might be doing at each time.
   a) 5:00 in the morning   **b)** 2:45 in the afternoon

6. Jodie started her homework at 5:00. She worked for $\frac{1}{2}$ an hour.
   At what time did Jodie finish?

7. Ho went fishing for 45 minutes. He started at quarter to 7.
   At what time did Ho finish?

8. Stefan looked at this clock and said, "It is quarter to six."
   Petra looked at the clock and said, "It is five forty-five."
   Who is correct? Explain.

9. Jessie practised archery for half an hour. She started at 3:30.
   At what time did she finish?

10. Julia's school has two 15-minute recesses each day –
   one in the morning and one in the afternoon.
   a) What time might each recess start and end?
   b) Draw an analog clock to show each start time.
   c) Draw a digital clock to show each end time.

Reflect

Which clock do you prefer to use – analog or digital?
Explain your choice.

Telling Time

It takes 5 minutes for the minute hand to move from one number to the next number.
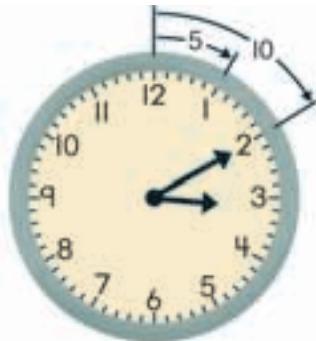
5 minutes after 3 o'clock   10 minutes after 3 o'clock

Explore

➤ Use the 9 clock cards your teacher gives you.
Make a set of 9 time cards to match the clock cards.

➤ Mix the time cards and the clock cards.
Trade with your partner.
Sort your partner's cards into 9 matching sets.

7:25

6:50

Show *and* Share

Check each other's work.
How did you match the cards?

Math Link

Number Sense

You can multiply by 5 to find the time in minutes.

1 × 5 = 5 after
2 × 5 = 10 after
3 × 5 = 15 after
4 × 5 = 20 after
5 × 5 = 25 after
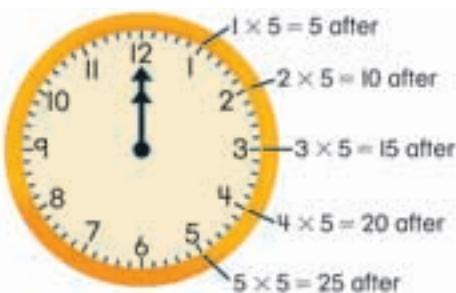
➤ This analog clock shows
20 minutes after 9 o'clock.

We write: 9:20
We say: "Twenty after nine"
or "Twenty past nine"
or "Nine twenty"
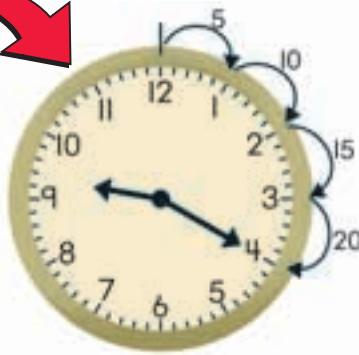
Skip count
the minutes:
5, 10, 15, 20

➤ This analog clock shows
55 minutes after 11 o'clock or
5 minutes before 12 o'clock.

We write: 11:55
We say: "Five before 12"
or "Five to twelve"
or "Eleven fifty-five"
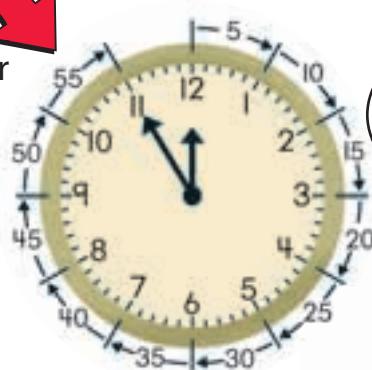
Skip count the minutes:
5, 10, 15, 20, 25, 30, 35,
40, 45, 50, 55

➤ This digital clock shows
20 minutes after 4 o'clock.
We write: 4:20
We say: "Four twenty"

4:20

➤ This digital clock shows
5 minutes after 6 o'clock.
We write: 6:05
We say: "Six O five"

6:05

Use a play clock when it helps.

1. Write the time shown on each analog clock.
   Skip count the minutes if you need to.

   a) b) c)

   d) e) f)

2. Write each time two ways. The first one is done for you.

   a) 10 after 10
       10:10

   b) c)

   d) e) f)

3. Match each analog clock with the digital clock
   that shows the same time.

   a) b) c) d)

   A **5:05**   B **9:45**   C **4:25**   D **6:50**

4. a) Suppose it is 6:20.
   What time will it be in 5 minutes?
b) Suppose it is 9:00.
   What time will it be in 10 minutes?
c) Suppose it is 4:55.
   What time will it be in 15 minutes?

5. School starts at 9:00.
   a) Corrina was 5 minutes late.
      Draw a digital clock to show what
      time she arrived.
   b) Sammy was 10 minutes early.
      Draw an analog clock to show what time he arrived.
      Write the time two ways.
   Show your work.

6. On an analog clock, show 10 minutes to 11.
   Then write 10 minutes to 11 another way.

7. Pilan began to read at 2 o'clock.
   He read for 60 minutes.
   At what time did Pilan finish reading?

8. Draw a digital clock to show each time.
   a) eleven thirty-five
   b) half past two
   c) two twenty
   d) six fifty
   e) quarter to eleven
   f) one fifty-five

Reflect

When you tell time from an analog
clock, how do you know what the
hour is? Use words and pictures
to explain.

At Home

Find all the clocks in
your home.
Draw a picture of each
clock at a different time
during the day. Write each
time in words.

Elapsed Time

Explore

➤ Saba sent this invitation to 5 friends.
Help Saba plan the afternoon.
Choose 4 games to play.

➤ Make a chart to show each game
and its start and end times.
Remember to include a time for eating.

➤ Trade charts with another pair
of classmates.
Find how many minutes will be
spent playing each game.

Show *and* Share

Check each other's work.
Talk about the strategies you used
to figure out the time in minutes.

You are invited to an afternoon of fun & games

Place: 235 Hickory Hollow Drive
Date: Saturday, February 6
Time: 1:15 pm - 4:00 pm

Food will be served

A.M.—times from midnight to noon
P.M.—times from noon to midnight

Connect

The amount of time from the start to the
end of an activity is the **elapsed time**.

Fatima and Clara played checkers from
9:20 A.M. to 10:05 A.M.

To find the elapsed time in minutes,
count on by 5s.

Fatima and Clara played checkers for 45 minutes.
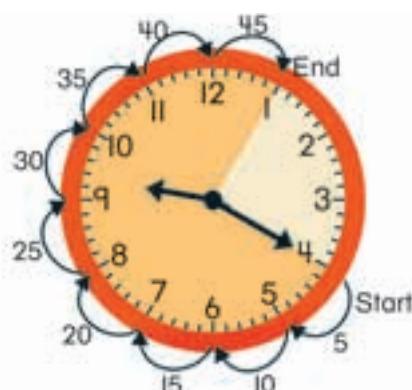
Use a play clock when it helps.

1. Recess starts at 10:10 A.M. and ends at 10:25 A.M.
   How long is recess?

2. Find each elapsed time.
   a) 9:15 A.M. to 10:10 A.M.
   b) 3:30 P.M. to 4:15 P.M.
   c) 11:50 A.M. to 12:10 P.M.

3. Aaron listened to music for 35 minutes.
   He started at 6:25 P.M.
   At what time did Aaron stop?

4. You have 20 minutes to clean your room.
   You start at 3:45 P.M.
   You finish at 4:10 P.M.
   Did you clean your room in time? Explain.

5. Suppose it is now 7:50 P.M.
   How many minutes will it be until 8:15 P.M.?
   How do you know?

6. A spider took 30 minutes to spin its web.
   The spider finished spinning at 11:40 A.M.
   At what time did it start?

7. This chart shows Emma's Saturday activities.
   Copy and complete the chart.

	Activity	Start Time	End Time	Elapsed Time
a)	Library visit	9:15 A.M.	9:55 A.M.	
b)	Hockey practice	4:25 P.M.		40 minutes
c)	Help with supper		7:10 P.M.	35 minutes

8. Arlo and Wilfred met at the lake at 2:30 P.M.
Arlo had taken 20 minutes to get to the lake.
Wilfred had taken 25 minutes.
At what time did each boy leave home? How do you know?

9. Look at each analog clock. What time will it be 45 minutes later?

a)   **b)**   **c)**   **d)**
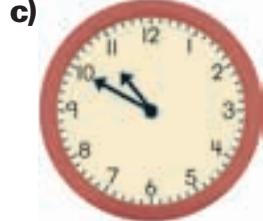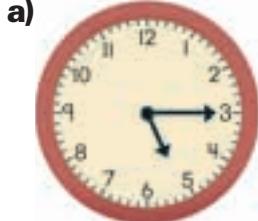
10. Here is a schedule of activities
for the trip to the Outdoor
Nature Centre.

Activity	Time Period
Snowshoeing	1:00 – 1:50
Bird-watching	2:00 – 2:30
Snack time	2:40 – 2:55
Snow sculpture	3:00 – 3:55

a) Why does the chart
not show A.M. or P.M.?
b) Which activity takes the
most time?
How much time does it take?
c) How much time do bird-watching
and snow sculpture take together?
d) It takes 40 minutes to ride from school
to the nature centre.
At what time should the class leave school?
e) About what time will the class arrive back
at school after the trip? How do you know?
f) Make up your own question about the trip.
Answer your question.
Show your work.

Reflect

Name an activity you usually do before 9:00 A.M.
Name an activity you might do between 1:00 P.M.
and 7:00 P.M.

5 Telling Time to the Minute

Maria can do 25 push-ups in 1 minute.
What can you do in 1 minute?

Explore · **Game**

Make a set of 6 clock cards.
The minute hand on each clock should be between the 5-minute marks.

| | | 6:12 | 9:43 |
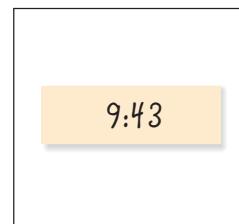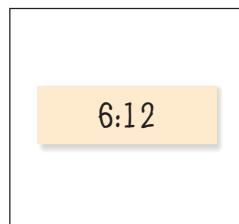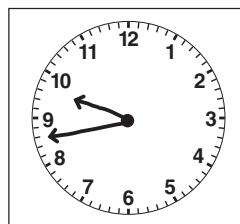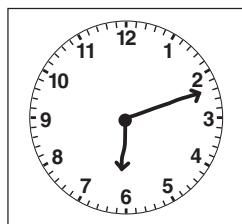
Now make a set of 6 time cards to match the times on the clock cards.

Play the Matching Time Game.

➤ Mix up the 12 cards.
   Place the cards face down
   in 3 rows of 4.

➤ Take turns turning over 2 cards.

➤ If the cards match, keep them.

➤ If the cards do not match,
   put them back, face down.

➤ Keep playing until all the cards
   have gone.

Show and Share

Talk about the strategies you used
to find matching pairs of cards.

Connect

It takes 1 minute for the minute hand to move from one mark on the clock to the next mark.

20 minutes after 7 o'clock

7:20

21 minutes after 7 o'clock

7:21

You can read times after the half-hour in two ways.

We say: 54 minutes after 11 o'clock or 11:54

We say: 6 minutes before 12 o'clock or 6 minutes to 12

Practice

1. Write the time shown on each clock.

a)

b)

c)

d)

e)

f)

2. Write each time two ways. Write A.M. or P.M.

a) school ends **b)** dinner time **c)** wake up

d) bed time **e)** play baseball **f)** lunch time

3. Draw an analog clock to show each time.

a) 9 minutes after 3 **b)** 14 minutes to 2 **c)** 27 minutes after 7

4. Draw a digital clock to show each time.

a) 14 minutes after 3 **b)** 8 minutes to 7
c) 36 minutes after 5 **d)** 7 minutes to 1
e) 25 minutes to 8 **f)** 10 minutes to 9

5. Bernard and Stephan agreed to meet at the music store.
Bernard arrived at 4:47 P.M.
Stephan arrived at quarter to 5.
Who arrived first?
How many minutes earlier was he than the other boy?
Show your work.

At Home

Reflect

Are 3:48 and 12 minutes to 4
the same time?
Use words and pictures to explain.

How is your sense of time?
Guess what time you think it
is right now.
Go and check a clock.
How close was your guess?

6 The 24-Hour Clock

What time is shown on the clock?
Can you tell from the clock if it is morning or afternoon?
Suppose a clock face had a different number for each hour of the day. What might the clock look like?
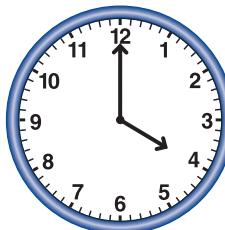
Explore

Planes leave Vancouver airport at the times shown.
They fly to the cities shown.

01:15 Hong Kong	15:15 Hong Kong
06:00 Toronto	20:50 London
11:10 Toronto	23:45 Toronto
14:55 London	

➤ Which flights leave very early in the morning? How do you know?

➤ Which flights leave before noon?

➤ Which flights leave after noon? How do you know?

➤ Which flights leave late at night? How do you know?

Show and Share

Share your results with another pair of students.
If the answers do not agree, try to find out who is correct.
Why do you think the times are written in this way
instead of using A.M. and P.M.?

Your friend says she will be at your house at 8 o'clock.
You need to know if she means 8 A.M. or 8 P.M.
There is another way to write the time where
we do not use A.M. or P.M. We use a **24-hour clock**.
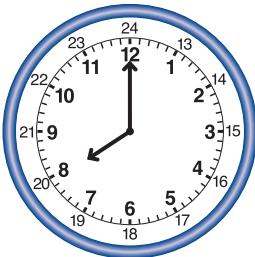
➤ There are 24 hours in one day.
From midnight to noon, the hours are from 0 to 12.
From 1 o'clock to midnight, the hours are from 13 to 24.
When we use the 24-hour clock, we use 4 digits
to write the time.

9:45 A.M. is written 09:45.

6:15 P.M. is written 18:15.
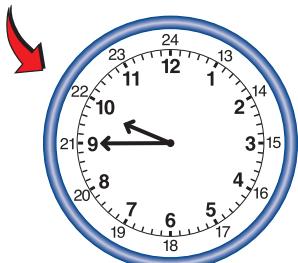
Before 10:00 A.M.,
I write 0 in front of
the hour. After noon, I add 12
to the hour.
So, 2 o'clock in the afternoon
is 12:00 + 2:00 = 14:00
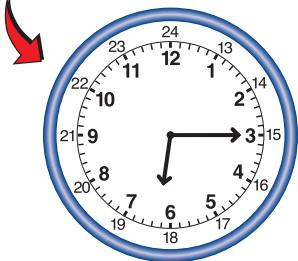
➤ Kathy arrived at the library at 11:45 and left at 14:20.
How long did she spend in the library?
Count on to find the time.

We write 15 minutes as 15 min. We write 2 hours as 2 h.

11:45 to 12:00 is 15 min.   12:00 to 14:00 is 2 h.   14:00 to 14:20 is 20 min.
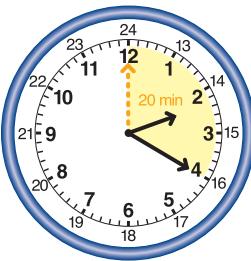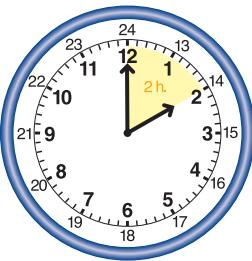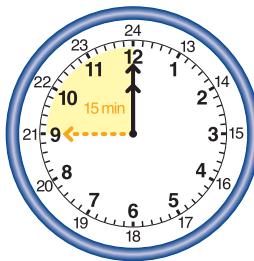
Total time: 15 min + 2 h + 20 min = 2 h 35 min

Practice

1. Which clocks show the same time?

a)

P.M.

b)

00:05

c)

14:35

d)

16:45
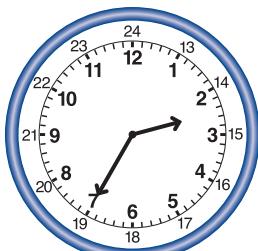
e)
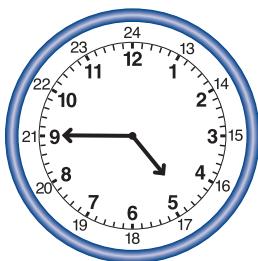
P.M.

f)
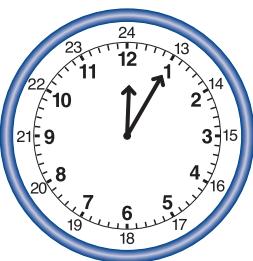
A.M.

2. Write each time using A.M. or P.M.

a)

14:24

b)

06:12

c)

23:59

d)

11:36

3. Write each time using a 24-h clock.

a)
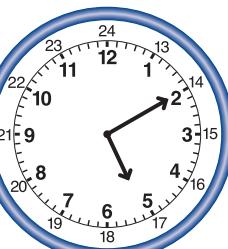
P.M.

b)
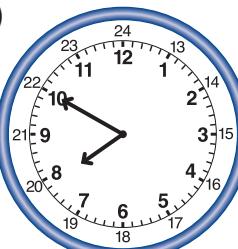
P.M.

c)
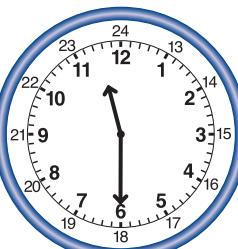
P.M.

d)
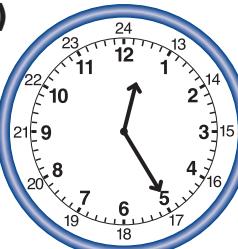
A.M.

4. Sandeep picked up his cousin at the airport.
Her flight arrived at 19:40.
What time is this on a 12-h clock?

5. a) A ferry leaves Port Hardy at 07:30 and arrives in Prince Rupert at 22:45.
How long is the journey?
b) An overnight ferry leaves Shearwater at 23:45 and arrives at
Port Hardy at 08:10. How long is the journey?

6. A bus leaves Anatown at 11:50 A.M. and
arrives in Beaconsfield 3 h 25 min later.
What time does the bus arrive in Beaconsfield?
Show the time as many different ways as you can.

7. A bus leaves Halifax, Nova Scotia, at 09:50.
It arrives in Sydney, Nova Scotia, at 16:20. How long is the trip?

8. Michel is flying from Montreal, Quebec, to Fort
Lauderdale, Florida. The flight leaves at 16:15.
Passengers to the United States should check in
at least 1 h 30 min before their flights leave.
Michel's watch shows the time he arrived at the airport.
Is he on time? Explain how you know.

Reflect

When you write or tell a time, which way do you prefer:
using a 12-h clock or a 24-h clock?
Give examples in your answer.

7

Covering Shapes

Louis counts how many blue Pattern Blocks it takes to cover this star.

Explore

You will need Pattern Blocks.

Estimate how many blue Pattern Blocks cover each shape.

Cover each shape to check your estimate.

Order the shapes by the number of blocks that cover them, from greatest to least.

Show your work.

A

B

C

D

LESSON FOCUS | Count congruent non-standard units to measure area.
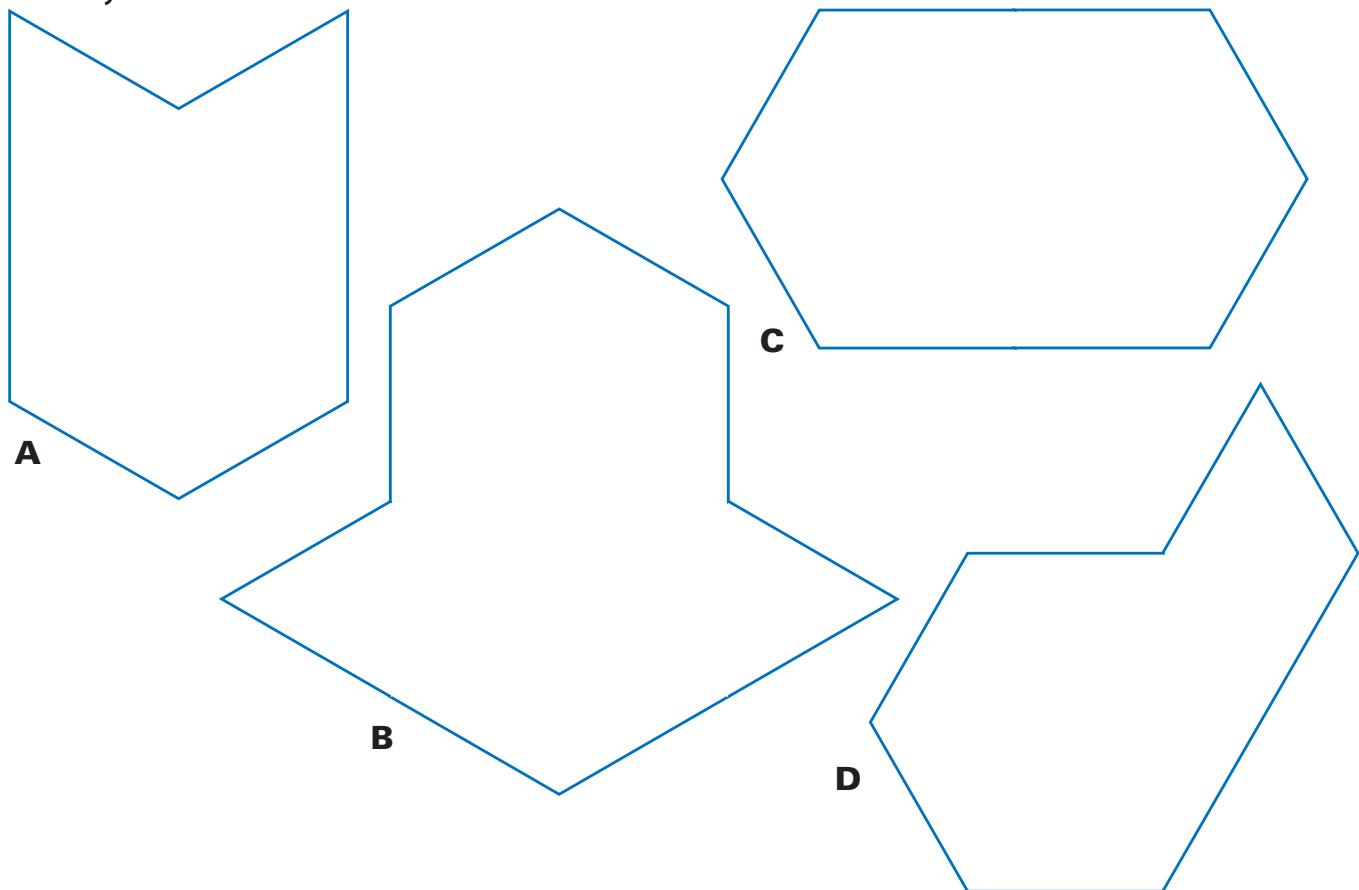
Show *and* Share

Share how you ordered the shapes.
How close were your estimates to the actual numbers
of blocks?

Connect

The number of units needed to cover a shape is the **area** of the shape.
The units must be the same size. The units must be *congruent*.
You can find the area of a shape by counting how many units cover it.
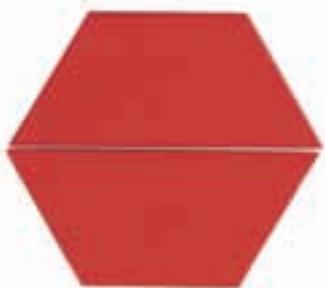
The unit is 1 red Pattern Block.
The area is 2 red Pattern Blocks.

The unit is 1 green Pattern Block.
The area is 7 green Pattern Blocks.

1. Make each shape with Pattern Blocks.
   Use 1 green Pattern Block as the unit.
   Find the area of each shape.

   a)
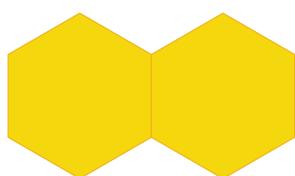
   b)
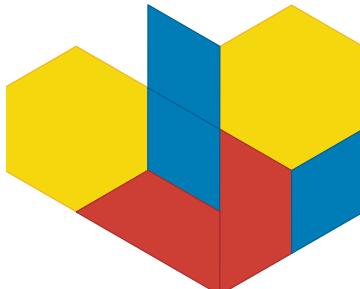
   c)
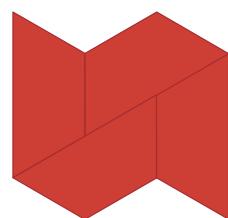
   d)
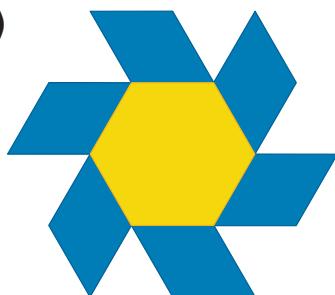
   e)
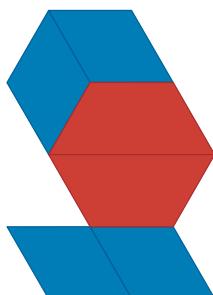
   f)
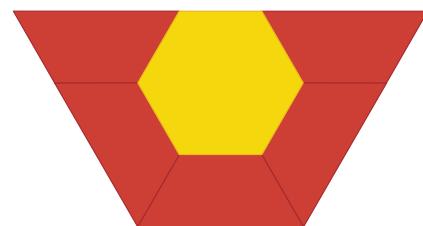
2. Make your own shape with Pattern Blocks.
   Draw the shape on triangular dot paper.
   Have a classmate find the area of the shape.
   She can choose the units.

3. Use red and yellow Pattern Blocks.
   a) Make a design with
       area 12 green Pattern Blocks.
   b) Make a design with area between
       10 and 15 green Pattern Blocks.
   c) Make a design with
       area 6 blue Pattern Blocks.
   d) Make a design with
       area 9 blue Pattern Blocks.
   Colour triangular grid paper to show your designs.

4. The area of a shape is 6 green Pattern Blocks.
Draw the shape on triangular dot paper.
How many different shapes can you make?
Explain how you made the different shapes.

5. Use Pattern Blocks to find the area of this fish.
The unit is 1 blue Pattern Block.
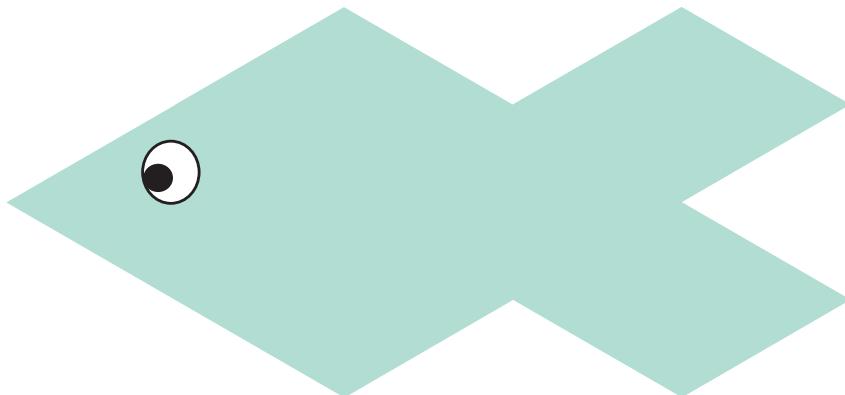
6. Suppose the unit for area is 1 green Pattern Block.
How can you find the area of the fish above without
using green Pattern Blocks? Explain.

7. Use Tangram pieces.
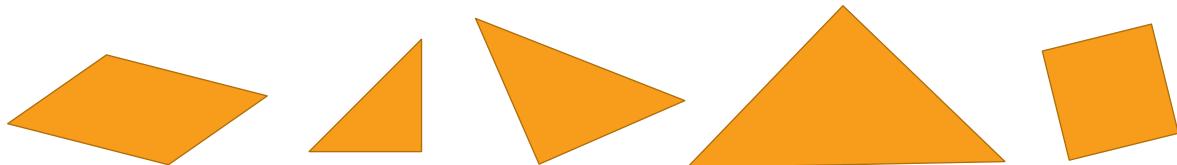
Find the area of each shape in small triangles.
a) the medium triangle   **b)** the square
c) the quadrilateral that is *not* the square   **d)** the large triangle

Reflect

Suppose you know how many blue Pattern Blocks cover
a shape. How can you find how many green Pattern
Blocks cover the same shape?
Use words, pictures, or numbers to explain.

8

Exploring Area

Explore •

You will need Pattern Blocks and a small book.
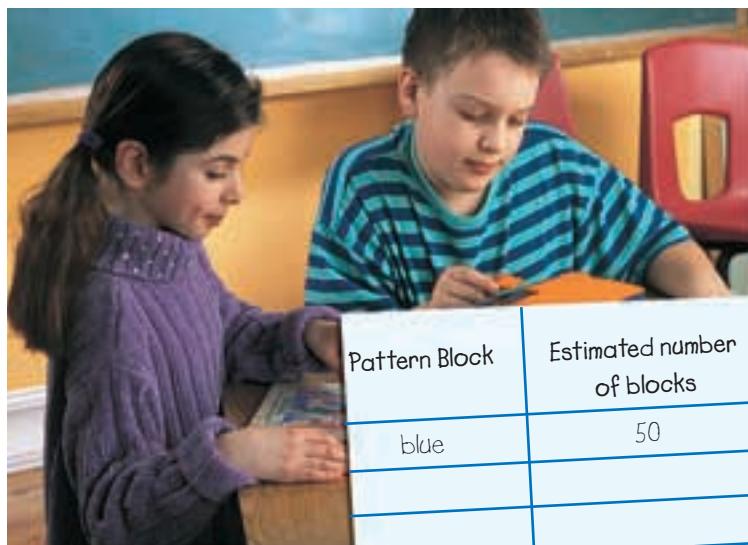
Pattern Block	Estimated number of blocks	Area
blue	50	64 blue blocks

➤ Estimate how many blue Pattern Blocks will cover the surface of the book.

➤ Cover the book. Find its area in blue Pattern Blocks.

➤ Record your work in a table.

Repeat this activity with:
*   red Pattern Blocks
*   orange Pattern Blocks
*   green Pattern Blocks

Show *and* Share

Which Pattern Blocks worked best to cover the book? Why?
What did you do when the blocks did not cover the book completely?
Share your ideas with your partner.

The area of a surface is usually measured in **square units**.

➤ To find the area of a surface, you can count the number of square units.
The area of this patio is 6 square units.

Squares fit together well. They are easy to count.

➤ To find the area of a rectangle, you can count the square units or multiply.
There are 4 rows of 3 squares.
$4 \times 3 = 12$

The area of this rectangular patio is 12 square units.

Practice

1. Estimate which shape has the greatest area.
   Then find the area of each shape in square units.

   a)   b)   c)   d)
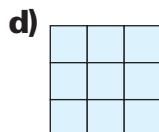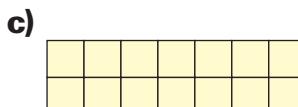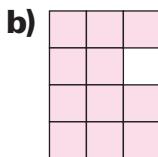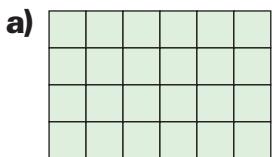
2. Order the shapes in question 1 from least to greatest area.

3. Write a multiplication fact to find the area of each rectangle.

   a)   b)   c)

   d)   e)   f)
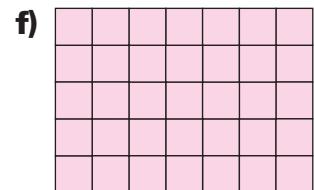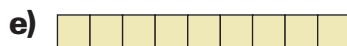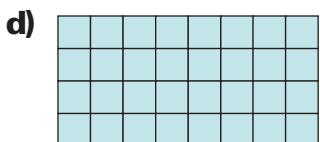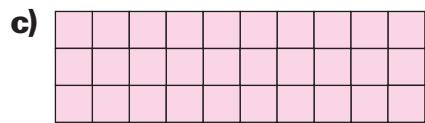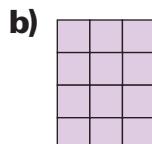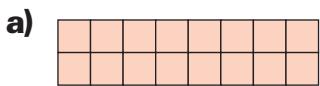
4. Find the area of each game board in square units.
Write a multiplication fact for each area.
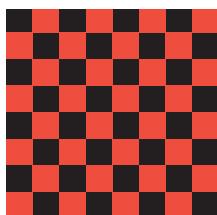
    a) Checkers   **b)** Snakes and Ladders
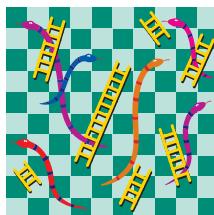
5. The area of a rectangle is 32 square units.
The rectangle has 8 rows of squares.
How many squares are in each row? How do you know?

6. Estimate which shape has the greatest area.
Then find each area in square units.
How can you do this by multiplying, then adding?

    a)   **b)**   **c)**
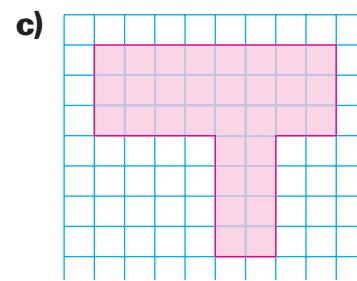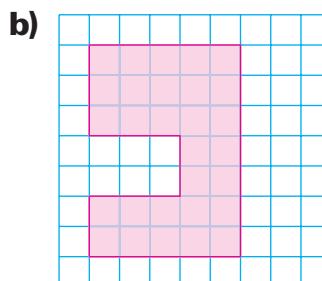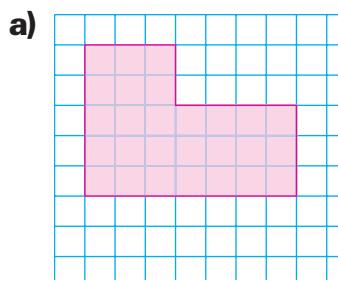
7. Use grid paper.
Draw a rectangle with each area.

    a) 12 square units   **b)** 7 square units
    c) 15 square units   **d)** 9 square units

8. Kelly drew a shape with an area of 48 square units.
What might the shape look like?
Use words, pictures, or numbers to show your ideas.

Reflect

Explain why the square unit is best for finding area.

Measuring Area in Square Centimetres

Explore

You will need cardboard rectangles and a transparent 1-cm grid.
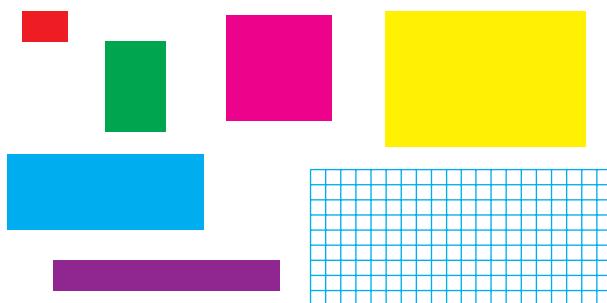
➤ Choose a rectangle. Estimate its area in centimetre squares.

➤ Place the transparent grid over the rectangle.
Make sure you line up the sides of the rectangle with the lines on the grid.

➤ Find the area of the rectangle.

➤ Record your work in a table.

➤ Repeat the activity with the other rectangles.

➤ Order the rectangles from least to greatest area.

Rectangle	Estimated area	Actual area
Yellow	20 squares	
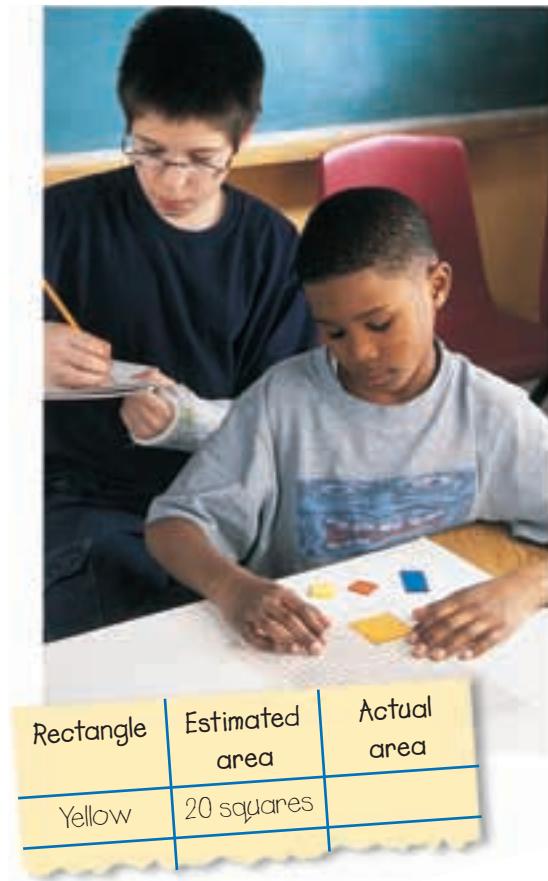
Show *and* Share

How could you use the area of one rectangle to estimate the area of another?
Why must the grid lines line up with the sides of the rectangle?

LESSON FOCUS | Use a 1-cm grid to measure area in square centimetres.

153

Connect

Each side of every square on this grid paper is 1 cm long.
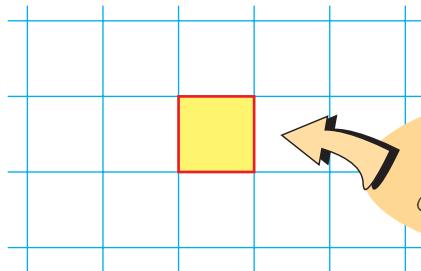
Each square has an area of one **square centimetre** ($1\ cm^2$).

You can use square centimetres to measure area.
This rectangle is drawn on 1-cm grid paper.
It has 2 rows of 3 squares.
$2 \times 3 = 6$
The area of the rectangle is $6\ cm^2$.
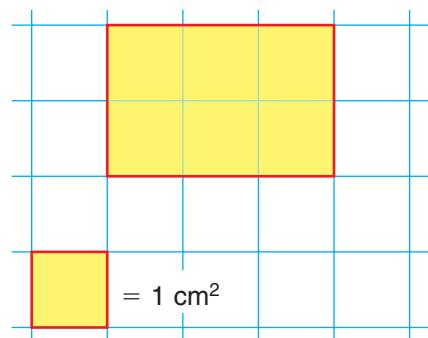
$= 1\ cm^2$

One face of a Base Ten unit cube has an area of $1\ cm^2$.
You can cover a shape with unit cubes,
then count the cubes to find the area in square centimetres.

My fingerprint has an area of about 1 square centimetre. I can use my fingerprint as a benchmark to estimate the area of this square. I think about how many of my fingerprints will fill the square.

Practice

1. Name 2 different benchmarks you could use to estimate area in square centimetres. Explain your choices.

2. Use one of your benchmarks.
   Estimate the area of each object in square centimetres.
   Then use a transparent 1-cm grid to find the approximate area.
   a) the top of a calculator   **b)** the cover of a small book

3. Roland drew this robot's head on 1-cm grid paper.
   a) What is the area of the head?
   b) What is the area of one robot eye?
      Its nose? Its mouth?
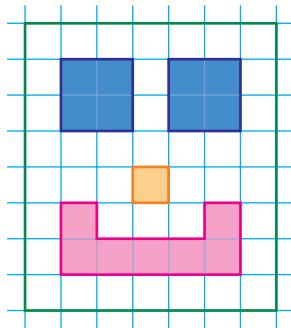
4. Draw your own shape on the lines of 1-cm grid paper.
   Find the area of your shape. Explain your strategy.

**5.** Use 1-cm grid paper. Draw a rectangle with each area.
   a) 8 cm^2 **b)** 24 cm^2 **c)** 16 cm^2 **d)** 18 cm^2

6. Look at this rectangle.
   Use 1-cm grid paper.
   a) Draw a rectangle with a greater area.
   b) Draw a rectangle with a lesser area.
   c) Double the length and width of the
      rectangle you drew for part b.
      Draw a new rectangle. Record its area.
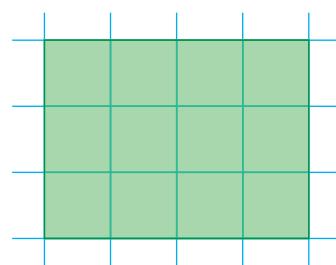
7. You will need 1-cm grid paper, a number cube
   labelled 1 to 6, and 2 different colour crayons.
   Outline a 10 by 10 square on the grid paper.
   Take turns to roll the number cube.
   The number you get is the area in
   square centimetres you colour on the grid.
   For example, if you roll a 3, you colour in:

   or   but not
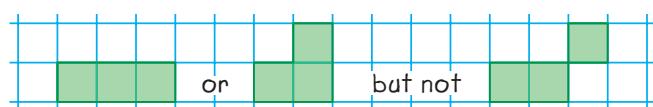
   Continue to play until you have filled the 10 by 10 square.
   Count the squares to find who coloured in the greater area.

Reflect

   Draw a rectangle on 1-cm grid paper.
   Find its area.
   Explain your strategy.

Estimating and Measuring Area

Explore .... 👥

You will need cardboard or plastic polygons and 1-cm grid paper.
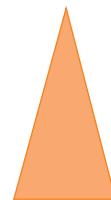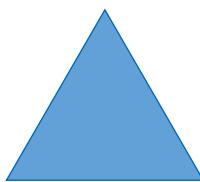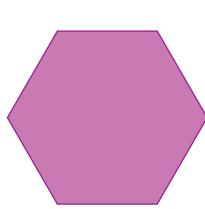
Choose 3 polygons.

➤ Choose a benchmark for square centimetres.
Use your benchmark to estimate the area of each polygon.

➤ Trace each polygon onto 1-cm grid paper.

➤ Count squares and parts of squares to find an approximate area.
Record the approximate area of each tracing.

> 2 half squares make
> 1 whole square.

Show *and* Share

Share your strategies for counting part squares.
What do you do when part of a square is
greater than $\frac{1}{2}$ a square? Less than $\frac{1}{2}$ a square?
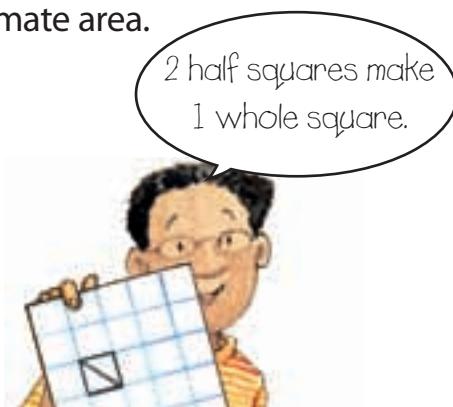
Math Link

Social Studies

Patchwork quilts were an early form of recycling.
They were made from leftover fabric and pieces cut
from old clothing.
How many squares are on this patchwork quilt?
How can you find out without counting every square?
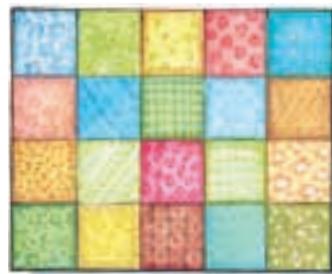
This triangle is drawn on 1-cm grid paper.
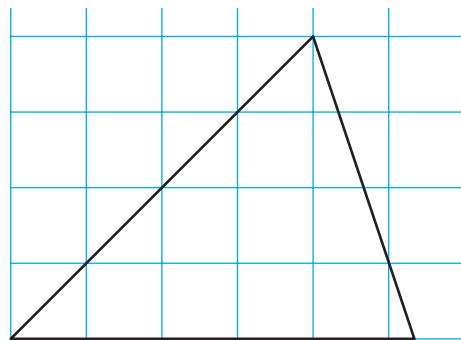
Here is one way to find the
approximate area of this triangle.
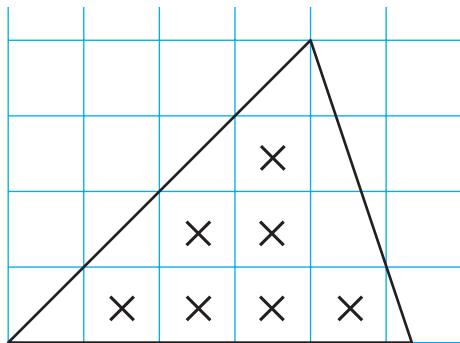
Count the whole squares.
There are 7 whole squares.
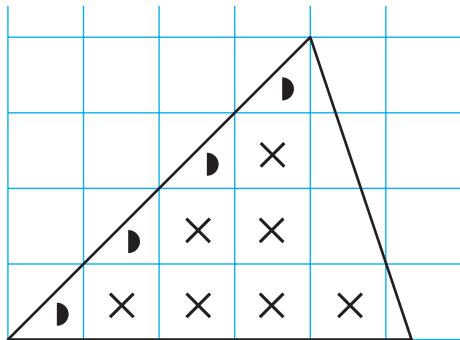
Put half squares together to count
as whole squares.
There are 4 half squares.
4 half squares = 2 whole squares
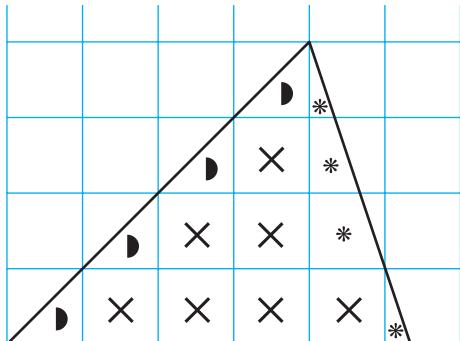
For parts of squares that are not half squares:
If the part is greater than $\frac{1}{2}$ a square,
count it as 1 square.
If the part is less than $\frac{1}{2}$ a square, ignore it.
There are about 2 more squares.

Find the total number of squares:
$7 + 2 + 2 = 11$
The area of the triangle is about 11 cm^2.

1. Find the approximate area of each polygon.

a)
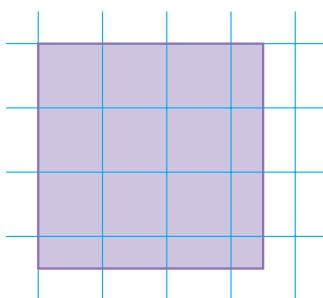
b)
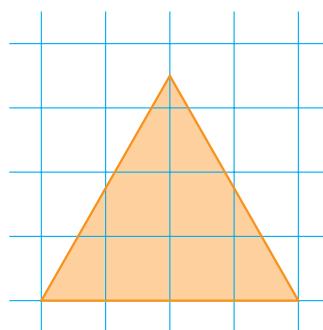
c)
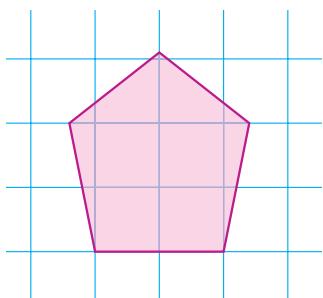
2. Order the polygons in question 1 from greatest to least area.

3. Use 1-cm grid paper. Draw a polygon with each area.
   a) about 10 cm^2 **b)** about 12 cm^2 **c)** about 19 cm^2

4. Use 1-cm grid paper.
   Draw 3 different polygons with an area of about 15 cm^2.

5. Draw this face on 1-cm grid paper.
   Find the area of each part of the face.
   a) one eye
   b) the nose
   **c)** the mouth
   d) the whole face
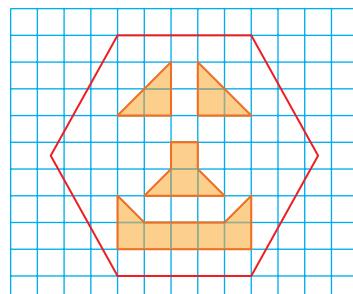
6. Copy this polygon onto 1-cm grid paper.
   Explain how you would find the
   approximate area of this polygon.
   Show your work.
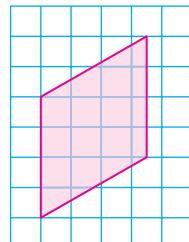
Reflect

You have estimated area and measured area.
When might an estimate be good enough?
When might you need to know the area precisely?
Write about your ideas.

Finding Area in Square Metres

Explore ★★★

You will need newspapers, tape, scissors, and a metre stick.

➤ Use the materials above to make a square with side length 1 m for each group member.

➤ Estimate the areas of different parts of your classroom or school. Then use your metre squares to find the areas.

➤ Record your results.

Show *and* Share

What did you do when the area was not an exact number of metre squares? Show how you can order the areas you measured from least to greatest.

Connect

Each square you made has an area of one **square metre**. You write one square metre as 1 **m²**.

You can use square metres to measure the area of a large surface, such as a soccer field.

> This table top has an area of about one square metre. I can use it as a benchmark to estimate the area of a large surface. I think about how many of it will cover the surface.

LESSON FOCUS | Use a square metre to find the area of a region.

159

You can use grid paper to model a large area.
On this grid, the area of 1 small square represents 1 m².

9 m

← represents 1 m²

6 m
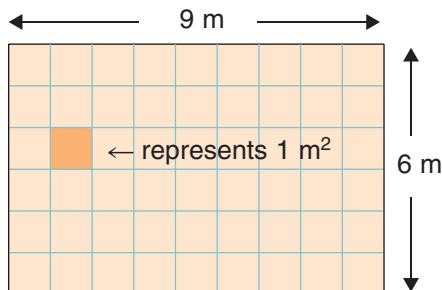
This is a model of the floor of a gymnastics centre. It is 6 m wide and 9 m long.
The model has 6 rows of 9 squares.

$6 \times 9 = 54$

The area of the floor is 54 m².

Practice

1. Name a benchmark you could use to estimate area in square metres. Explain your choice.

2. Which unit – square centimetre or square metre – does each benchmark represent?
   a) a Smartie
   b) a sidewalk square
   c) a calculator key
   d) a table top
   e) your front tooth
   f) a small button

3. Work with other students to build a rectangle with each area. Use grid paper to draw a model of each rectangle.
   a) 12 m²
   b) 9 m²
   c) 14 m²

4. Find the area of each rectangle.

← represents 1 m²

a) 3 m, 2 m

b) 5 m, 3 m

**c)** 3 m, 3 m

d)

e)

f)
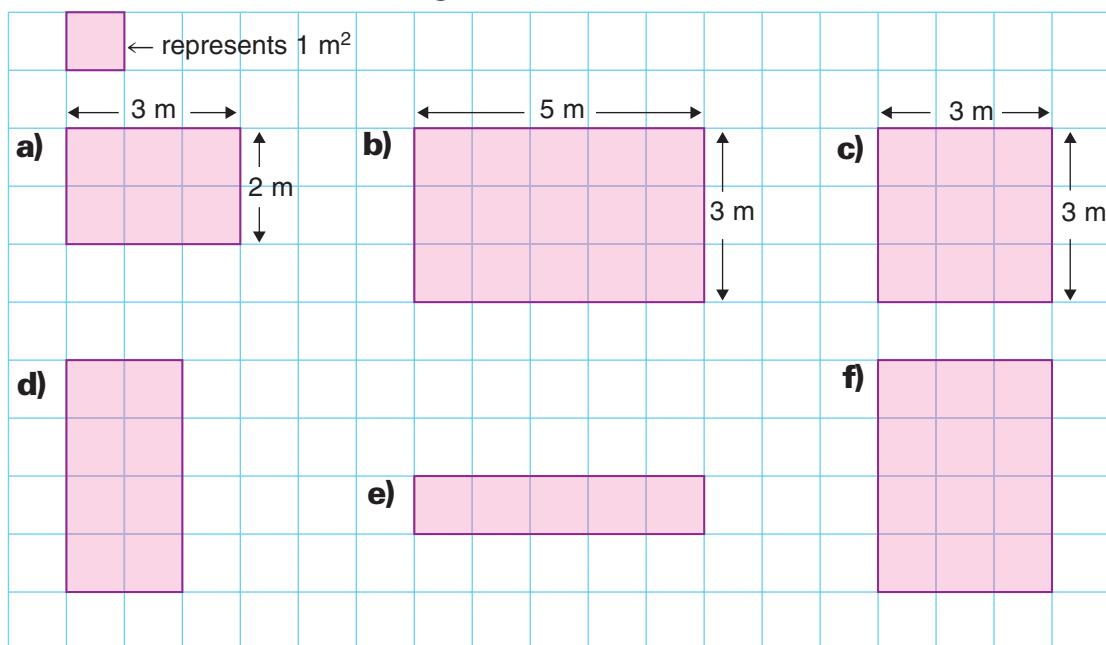
5. In question 4, which rectangle would need the most paint to cover it? The least paint to cover it?

6. The area of a rectangular garden is 24 m^2. The garden is 6 m long.
   a) How wide is the garden?
   b) Draw a model of the garden on 1-cm grid paper.

7. Which benchmark would you use to estimate the area of each item? Explain your choice.
   a) a classroom wall   **b)** a page of your math book
   c) a photograph   **d)** a flower garden
   e) a kitchen floor   **f)** a table tennis table

8. Which measurement unit would you use to find the area of each item in question 7?

9. Here is a map of the playground at Peekaboo Day Care Centre.

← represents 1 m^2
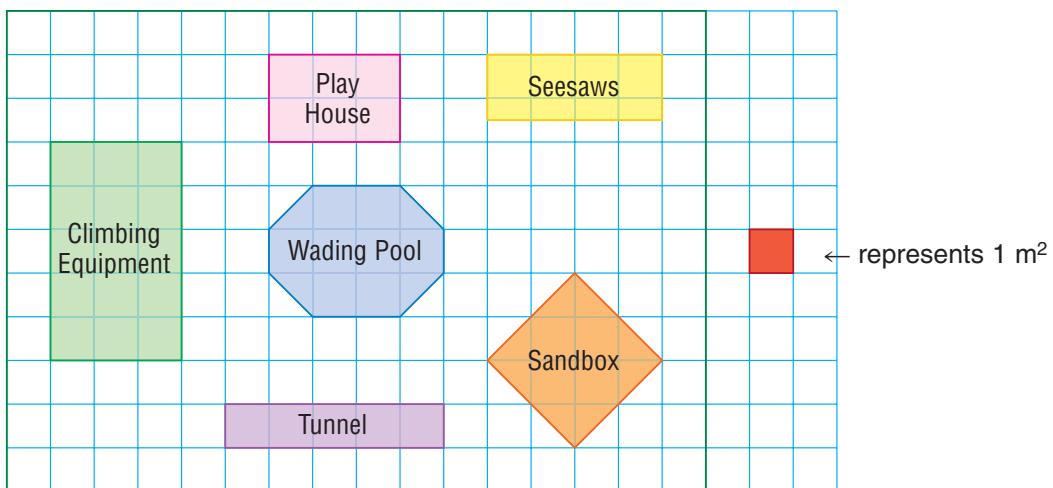
   a) Find the area of each section of the playground. Record your work in a table.
   b) Which section of the playground has the least area? The greatest area? How do you know?
   Show your work.

Reflect

How do you decide whether to use square centimetres or square metres to find the area of a surface? Use numbers, pictures, or words to explain.

12

Strategies Toolkit

Explore

Zoe bought 4 large squares of plywood to make the floor of a pen for her rabbits. She arranges the squares so that whole sides are touching. Find all possible shapes for the floor of the pen.

Show *and* Share

Explain how you solved the problem.

Connect

Brad has twelve 1-m squares of plywood to make the floor of a pen for his dog.
Brad wants to make a rectangular pen.
How many different rectangular floors can Brad make?
How much fencing would each pen need?

Strategies

- **Make a table.**
- **Use a model.**
- **Draw a picture.**
- **Solve a simpler problem.**
- **Work backward.**
- **Guess and test.**
- **Make an organized list.**
- **Use a pattern.**

What do you know?
- The pen will be made with 12 squares.
- The pen must be a rectangle.

Think of a strategy to help you solve the problem.
- You can **draw a picture**.
- Use grid paper.

- How many different rectangles can you draw with 12 squares?
- How did you find the length of fencing for each pen?

- Did you find all the possible rectangles? How do you know?
- How could you solve the problem a different way?

Practice

1. Suppose Zoe bought only 3 squares of plywood for the floor of her rabbit pen.
   a) How many different shapes could she make the pen?
   b) How much fencing would she need for each pen?

2. Calvin arranges 6 matching square concrete slabs to make a patio.
   Use grid paper.
   Draw all the possible patios Calvin could make.

3. Raji has 13 matching square concrete slabs.
   She wants to make a rectangular patio.
   a) Draw Raji's patio.
   b) Is there more than one possible patio? Explain.

Reflect

Use words, pictures, or numbers to explain how you can draw a picture to solve a problem.

Exploring Rectangles with Equal Areas

Explore

You will need 48 Colour Tiles or congruent squares, and grid paper.
Each tile or square represents 1 m².

Ms. Daisy is planning a rectangular garden for her backyard.
The garden will have an area of 48 m².

➤ Use the tiles or squares to find all the possible rectangles that Ms. Daisy can make.
➤ Draw a model of each rectangle on grid paper.

Show *and* Share

How many different rectangles did you find?
Tell what you know about the area of each rectangle.
Which rectangle would you recommend to Ms. Daisy?
Explain your choice.

Connect

Different rectangles can have equal areas.
Each rectangle below has area 12 m².

= 1 m²
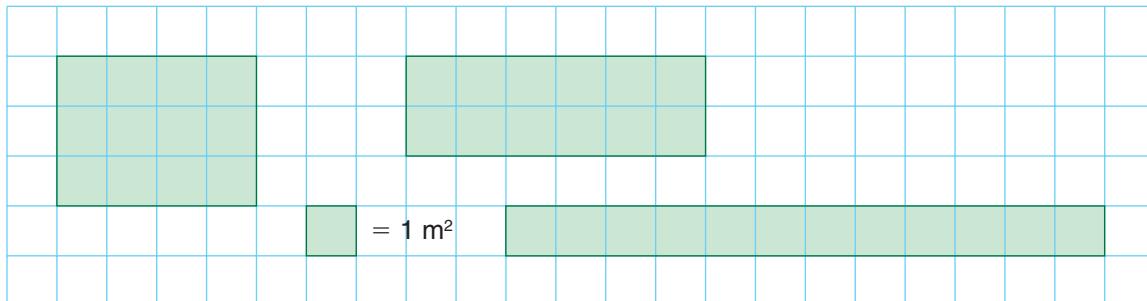
Use Colour Tiles or congruent squares when they help.

1. Use 1-cm grid paper. Draw all possible rectangles with each area.
   a) 1 cm²   b) 7 cm²   c) 24 cm²   d) 16 cm²
   e) 13 cm²   f) 6 cm²   g) 15 cm²   h) 20 cm²

2. Copy each rectangle onto 1-cm grid paper.
   • Find the area of each rectangle.
   • Draw a different rectangle with the same area.

   a)   b)   c)

   d)   e)   f)
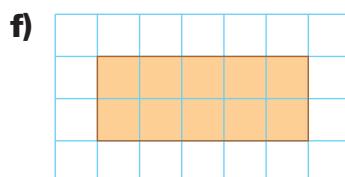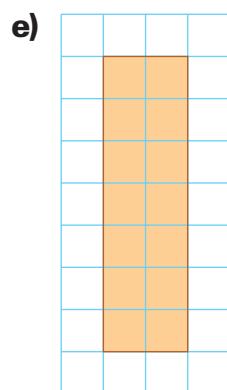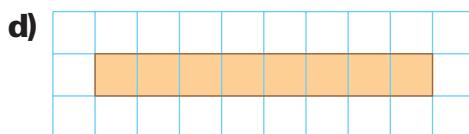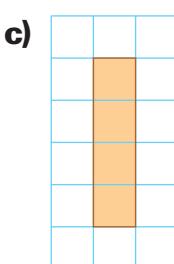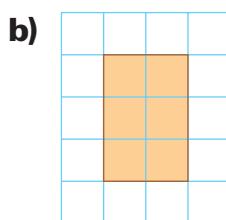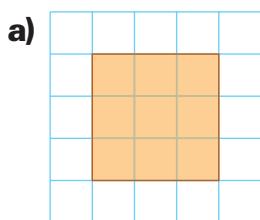
3. Mrs. Patel's rectangular patio has area 18 m².
   Draw a model on grid paper to show what you think
   Mrs. Patel's patio looks like. Explain your decision.

4. The area of a rectangular garden is 36 m².
   Draw models of all the possible rectangles for the garden.
   Have you drawn all the possible rectangles? How do you know?

Reflect

How can you use multiplication facts to sketch all possible
rectangles with area 40 cm²?

Show What You Know

1

1. Write each date in metric notation.
  a) November 23rd, 2008   **b)** February 8th, 1941   **c)** March 11th, 2007

2. Write each date using words and numbers.
  a) 1999 12 07   **b)** 2002 04 17   **c)** 1866 12 25

3. Rana wrote her birthday as 09 03 93.
  a) When might her birthday be?
  b) Rana said that her birthday was the first day of school.
      Write Rana's birthday in metric notation.

2
3
5

4. Write each time in two ways.

  a)   **b)**   **c)**   **d)**
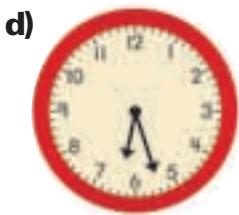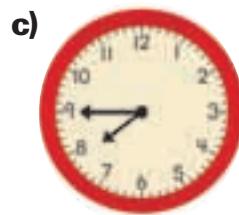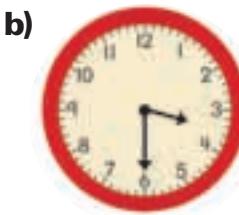

5. Draw a digital clock to show each time.
  a) quarter past 3   **b)** half past 10
  c) two fifty-three   **d)** quarter to 4

4

6. Dennis played basketball for 40 minutes.
  He started to play at 3:15.
  Draw a digital clock to show what time he stopped.

7. The movie started at 4:20 p.m.
  a) Sami was 10 minutes late. What time did he arrive?
  b) Sofia was 7 minutes early. What time did she arrive?

6

8. Write each time using the 24-hour clock.
  a) 9:43 A.M.   **b)** 8:24 P.M.   **c)** 4:25 A.M.

9. Write each time using the 12-hour clock.
  a) 05:15   **b)** 14:20   **c)** 23:42

7

10. Use red and blue Pattern Blocks.
   a) Make a design with area 20 green Pattern Blocks.
   b) Make a design with area between 4 and 6 yellow Pattern Blocks.
   Colour triangular dot paper to show your designs.

8

11. The area of a rectangle is 18 square units.
   The rectangle has 3 rows of squares.
   How many squares are in each row?
   How do you know?

9

12. Use 1-cm grid paper.
   Draw a rectangle with each area.
   a) 21 cm^2 **b)** 25 cm^2 **c)** 30 cm^2

10

13. Find the approximate area of this polygon.
   Explain your strategy.
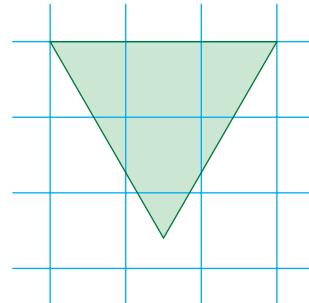
11

14. The area of a rectangular garden is 27 m^2.
   The garden is 9 m long.
   a) How wide is the garden?
   b) Draw a model of the garden
      on 1-cm grid paper.

15. Which benchmark would you use to
   estimate the area of each item?
   Explain your choice.
   a) a page of your favourite book
   b) an ice rink
   c) the school parking lot
   d) your hand print

13

16. Use 1-cm grid paper.
   Draw all the possible rectangles with
   each area.
   a) 2 cm^2 **b)** 14 cm^2 **c)** 8 cm^2

U N I T

4 Learning Goals

☑ read and record time using analog and digital clocks
☑ read and record calendar dates
☑ estimate and measure area
☑ construct rectangles for a given area

Design a Playground

The Little Owl Daycare Centre needs a new playground.
Design the playground.

Here are the guidelines:
- The playground has the shape of a rectangle.
- It has sections for 4 or 5 pieces of equipment.
- The sections are far enough apart to make sure the children are safe.
- You may include other features in your playground.

➤ Use grid paper to draw a plan for your playground.

➤ Let the area of one grid square represent 1 m².

➤ Make a table to go with your plan. The table should show the area of each section.

➤ Explain your plan.

Reflect on Your Learning

What have you learned about telling time?
How do you find the area of a shape?
Use words, pictures, or numbers to explain.

The Icing on the Cake

You will need Snap Cubes.

My piece has icing on three faces.

My piece has icing on one face.

My piece has icing on two faces.

Part 1

➤ Use Snap Cubes to model different-sized, square, one-layer "cakes."
Start with a 2 by 2 square.
Make larger and larger squares.

➤ Imagine that the top and sides are covered in icing.
Each Snap Cube represents one piece of cake.

➤ For each cake, how many pieces have icing on one face?
How many pieces have icing on two faces? Three faces?
Record your work in a table.

Size of Cake	Number of Pieces	Number of Faces with Icing		
		3 Faces	2 Faces	1 Face
2 by 2	4			

Part 2
➤ What patterns can you find in the table?
➤ What do you notice about the numbers of pieces that have icing on three faces?
➤ One cake has 16 pieces with icing on two faces. How many pieces are there in the whole cake?
➤ Suppose you made a 10 by 10 cake. How many of each kind of piece would there be?

Display Your Work

Make a poster display to show all the patterns you found.

Take It Further

Model rectangular cakes with 24 Snap Cubes.

➤ How many different cakes can you model using all 24 cubes?
➤ How many cakes have pieces with icing on four faces?
➤ Which cake has the greatest number of pieces with icing on one face? Two faces? Three faces?
➤ Write about what you found out.