

Exploring Time

About the Math 2.MD.7

Prior to second grade, students explored telling time with analog and digital clocks to the hour and half hour. Now they become more precise at telling time.

The key ideas focused on in this module include:

- telling and writing time to the nearest five minutes on a digital and analog clock
- understanding A.M. and P.M.

An analog clock is basically a circular number line. When students understand this concept, they notice that the 1–12 on the number line represent hours, while the sixty notches along the edge of the clock show minutes. The clock's hour hand works with twelve units (hours), while the minute hand works with sixty units (minutes).

Before moving to telling time to the nearest five minutes, students explore the idea of quarter hours. Folding a clock face into fourths, or quarters, and connecting this to their geometry investigations in which they split circles into fourths, provides insights into the language of telling time (see Figure 11.1). *Quarter after five* or *quarter of nine* become understandable terms. Students connect fifteen minutes to both *quarter after* and *quarter of*.

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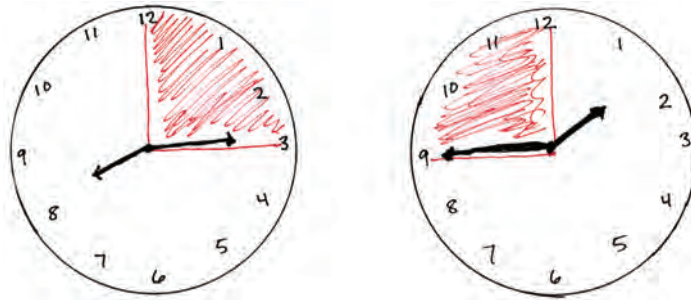


Figure 11.1 Students see quarters on the clock face similar to the quarters they see when partitioning circles in geometry.

See Math in Practice: Teaching First-Grade Math, Module 12 for ideas on teaching time to the hour and half hour.

Students make connections between representing time on digital and analog clocks, recognizing that on a digital clock, the hours are always to the left and the minutes to the right. Having students read and write times on both analog and digital clocks and having them show the time on one when given it on the other help familiarize them with both ways to represent time (see Figure 11.2).

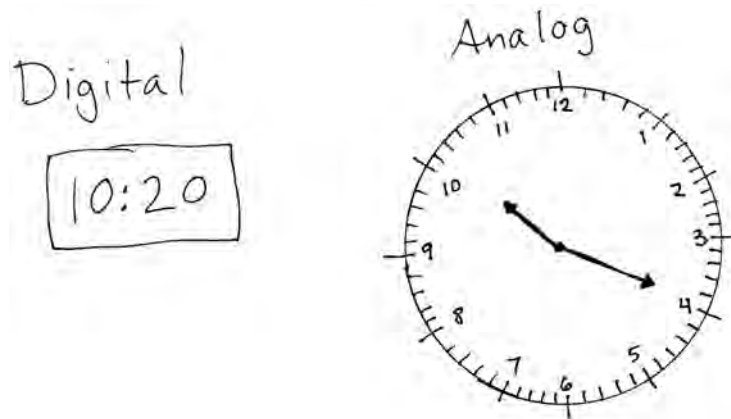


Figure 11.2 Posing a digital time and having students show the time on an analog clock, or vice versa, helps them make connections between these two representations of time.

When telling time to five minutes, students use their understanding of skip counting to determine how to say and write the time when looking at an analog clock. When the minute hand is pointing at the 5, it indicates twenty-five minutes, because each number on the clock face indicates the end of a 5-minute interval (see Figure 11.3). As students revisit the analog clock, think about it as a number line that is split into sixty units, and skip count by fives as they touch the numbers on the clock face, they are connecting number ideas to telling time.

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Figure 11.3 Students explore the numbers on the clock face as indicating intervals of five minutes and use skip counting to find the accurate time.

Reflecting on the idea that there are twenty-four hours in a day, but only twelve numbers on a clock face, helps our students understand the need for A.M. and P.M. Exploring examples of what we do during different times of day helps them make sense of the difference between 6:00 A.M. and 6:00 P.M.

Exploring the Progression

PREVIOUS	NOW	NEXT
Grade 1 Telling and writing time to the hour and half hour	Grade 2 Telling and writing time to the nearest five minutes; using A.M. and P.M.	Grade 3 Telling and writing time to the nearest minute; measuring time intervals in minutes; adding and subtracting time intervals in minutes

Learning Goals

I can tell time to the nearest five minutes.

I can tell the difference between A.M. and P.M.

Lessons in This Module

Telling Time

- Characteristics of an Analog Clock
- Make a Human Clock
- Telling Time to the Quarter and Half Hour
- Splitting the Clock
- Understanding A.M. and P.M.

Ideas for Instruction and Assessment

TELLING TIME

Students build on their understanding of time to the hour and half hour to now tell time to 5-minute intervals. Students explore the meaning of A.M. and P.M.

Characteristics of an Analog Clock SHOW IT!

This quick review helps determine what students know about telling time and precedes other lessons on telling time.

Display a model of an analog clock and review its parts with students.

What do you already know about the analog clock?

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Differentiation

If students are having trouble telling time to the hour, consider focusing only on the hour hand. Although we tend to rely on the hour hand to simply denote the hour and the minute hand to denote the minutes, a closer inspection of the hour hand shows that it can provide information about the approximate time, as students discover they can use just the hour hand to determine if the time is “about,” “a little past,” or “almost to” the nearest hour. Once students get the idea of telling time from the hour hand, the minute hand can be introduced. See Math in Practice: Teaching First-Grade Math, Module 12.

What do the numbers 1–12 represent?

What do the “hands” of the clock tell us?

Describe how the hands move as time passes.

Give each pair an individual clock with moveable hands. Have one partner start by showing 2:00. Their partner checks to be sure they agree. If they disagree, partners decide how they want to show it and then all pairs show their clocks to the teacher.

Where did you place the hour hand? Why?

Where did you place the minute hand? Why?

Have partners switch roles.

Show me 5:00.

Where did you place the hour hand? Why?

Where did you place the minute hand? Why?

Show me 4:30.

Where did you place the hour hand? Why?

Where did you place the minute hand? Why?

What is another way to say 4:30?

Why?

Have students use the clocks to practice showing other times with partners.

Make a Human Clock

SHOW IT

Students build the connection between a number line and an analog clock.

Begin this lesson by asking students how the analog clock is like a number line.

How is a clock like a number line? How is it different? Talk to your partner.

Invite twelve students to line up in the front of the classroom.

Give each one an index card with a number 1–12 and ask them to line up in order from 1–12.

How is our number line like a clock face?

What would these numbers represent on a clock?

What do you think we could do to turn our human number line into a clock?

Is our order important? Should we stay in the same order? Why?

Have the students form a circle. Be sure that the person holding the 6 card is across from the 12, and the 3 and 9 are across from each other.

Which number is halfway around our circle?

What do you say when the minute hand is on the six?

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This simple demonstration helps students visualize the clock face as a circular number line. Although they have not explored telling time to five minutes yet, they have explored telling time to the half hour and have talked about sixty minutes being an hour and thirty minutes as being half of an hour. This activity reminds them of those key ideas as they begin to explore time to 5-minute intervals.

Give each of the students a second index card that shows skip counting by fives, so the first student gets 5, the second 10, and so on.

Have students count by fives as you point to each person in the circle.

What is the last number?

If we were telling time, what would we be counting with these numbers?

Why do you say that?

Invite students to share ideas about how the clock face is a circular number line that can be counted by hours (1–12) or minutes (1–60).

How can we use our understanding of the number line to help us better understand the clock?

Telling Time to the Quarter and Half Hour

Students apply their understanding of the words quarter and half to tell time to the quarter and half hours.

Write the words *half* and *quarter* on the board or Math Talk chart.

Tell your partner what these words are. Have you seen these words before?

When? What do they mean?

Listen to students talk about the words *quarter* and *half*. Listen for connections to money, time, and geometry. Invite students to share their different thinking.

How many halves are in one whole?

How many half-dollars are in one dollar?

How many half hours are in one hour?

On an analog clock, display the time 3:00.

Tell your partner what time my clock says.

Model for students by beginning at 3:00 and moving the minute hand until it reaches 3:30.

Be sure to also move the hour hand to between the 3 and 4 to indicate half past 3:00.

When the minute hand points to the 6, how far around the clock has the minute hand traveled?

We say it is “half past the hour.” Why do you think we say that?

How many minutes have passed? How do you know?

How many minutes are in half of an hour?

I’ve shown 3:30 on my clock. What’s another way to say that?

Turn and talk to your partner. How does thinking about halves help you to understand this as half past three?

Where is the hour hand when it is 3:30? Explain.

It’s important to explicitly point out that both the hour and minute hands move, though at different rates. Students need to be aware of this when they read and show time on an analog clock.

Listen to students as they discuss geometry and the clock face.

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Move on to *quarter*, following a similar questioning pattern using the time 8:15 and introducing the term *quarter past*.

Then continue:

If the minute hand moves 15 more minutes, what time will it be?

Move the minute hand so the clock displays 8:30.

Some people call 8:30 “30 minutes before 9.” Does that make sense? Why?

What do you notice about the hour hand? Why?

If the minute hand moves 15 more minutes again, what time will it be?

Move the minute hand so the clock displays 8:45.

What do you notice about the hour hand?

How many more minutes are there before the next hour? How do you know?

What do we know about 15 minutes?

Some people call this time “a quarter to 9.” Does that make sense? Why?

Continue this pattern of questioning with other hours.

Have students show partners a time with 15-minute intervals and practice using the language *quarter after*, *half past*, and *quarter to*.

Have students answer the following questions in their journals:

How does our understanding of the word quarter help us tell time? How many minutes are in a quarter of an hour?

How many minutes are in half of an hour?

Differentiation

While students practice with partners, you might choose to work with a small group of students, supporting their use of the language. Help students make connections to quarters and halves within geometry.

SMP2, SMP4, SMP6, SMP7

Thinking Through a Lesson

Splitting the Clock

SHOW IT!

Students partition circles into halves and quarters, and then twelfths, as they create a clock face.

Provide each student with an 8-inch circle template. Have students cut their circle out.

What shape is the face of an analog clock? (It's a circle.)

We are going to use our circles to create a clock face. How many hours does our clock face display? (12.)

How many partitions should we make on our circle? (12.)

Begin by having students fold their circles in half and then open them back up.

How many parts do we have after folding our circle (two)?

What do we call two parts? (Halves.)

In first grade, students partitioned circles into two and four equal shares. Students will connect their understanding of geometry and circles to understanding time.

For more on partitioning shapes, see Module 15.

Although second-grade students do not need to master twelfths, they can apply their understanding of halves and quarters as they complete their clocks.

Have students place their circles so that the fold is vertical.

Let's begin labeling our clock face. Is there a clock in the classroom that we can use to help us?

Direct students' attention to an analog clock in the classroom.

What number goes at the top? (12.)

What number goes at the bottom? (6.)



Have students write 12 at the top of their circle and 6 at the bottom of their circle, but not too close to the edge.

Let's continue to partition our circle.

Have students re-fold their circle into halves and fold in half again, then open it back up.

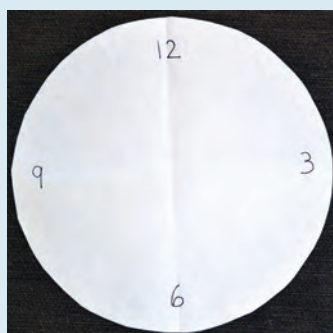
How many parts do we have now? (Four.)

When we split a circle into four parts, what do we call each part? (Fourths or quarters.)

When we tell time, we think of an hour being split into four sections. We call each one a quarter of an hour.

Turn and talk to your partner about what numbers we can add to our clock now. How do you know? (We can add 3 and 9, because when I look at a clock, I see the 3 on the right side and a 9 on the left side.)

Have students label the 3 and the 9 on their clock faces.



Let's partition our circle again. Re-fold your circle two times. Now we need to fold our quarter into thirds.

This is important, as students will also be labeling the minutes later on.

Make connections to the term quarters from students' experiences partitioning circles in geometry. Quarters might also be connected to the monetary term in which four quarters equal one dollar.

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Demonstrate to students how to fold the quarter into thirds, as in the picture below.

Because folding thirds can be challenging for this age, modeling is critical. As students are folding, circulate and support as needed.



After students have completed their folds, have them open their circles up again.

What do you notice? How many parts do we have? (Twelve.)

Fill in the missing hours and compare your clock face with your partner's.

What part of the clock have we shown? (Hours.)



Clocks usually show each number for the hours but not for the minutes. Why not? (There are sixty minutes—that's too many to label.)

What do we see on a clock that shows the minutes? (We see hash marks. Or, We see little lines.)

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Count by fives as you touch each number on the clock. What do you notice? (There are sixty minutes.)

Have students count by fives a second time, this time writing the numbers they skip count in smaller print around the outside edge and circling them.



Differentiation

If you have students who still need work on skip counting by five, do the counting all together now and then work with a small group later to strengthen this skill.

You may also opt to have students make hash marks to represent each minute. Model for students how to do this.

Ask students a series of questions related to their clock faces.

How many minutes are in one hour? (60 minutes.)

How many minutes are in half of an hour? How do you know? (30 minutes, because $30 + 30 = 60$. Or, 30 is halfway around the clock.)

When we partitioned the clock into fourths, how many minutes were in each fourth or quarter? How do you know? (There were 15 minutes; I counted 5, 10, 15. Or, I did $5 + 5 + 5$.)

How many groups of 5 minutes are in each quarter? How do you know? What do you notice on a clock that shows this? (There are 3 groups of 5 minutes; there are 3 sections.)

What number do you say when you touch 3? Why? (15; there are 15 minutes in a quarter hour.)

What number do you say when you touch 6? Why? (30; there are 30 minutes in a half hour.)

What number do you say when you touch 11? What does that mean when we read the time? (55; 55 minutes have passed.)

Have students slide their paper clocks into page protectors and use a wipe-off marker to show different times.

Show the time 3:05.

Talk to your partner about the hour and minute hands on the clock. Which one is shorter? Which one is longer?

Show 8:30.

Where should the hour hand point? Why? (It should point between the 8 and 9, because the time is halfway between 8:00 and 9:00.)

Pose a variety of other times.

Students take turns showing different times on their clocks to their partners, counting by fives aloud.

As students work with partners to display times to the nearest five minutes, pull a small group to the side to address any skip-counting support needed.

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Modify the times to 5-minute intervals as students are ready.

FORMATIVE ASSESSMENT

Have students show the time on each clock face and write two different ways they could say each time in words.

4:15

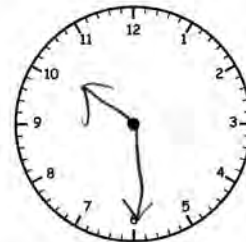
10:30

4:15



four fifteen
quarter after
4

10:30



tenthirty half past
ten

The student shows both times sufficiently on the analog clocks. On the top clock, the curved minute hand showing 4:15 indicates a self-correction on the part of the student, who curved it so it would point to the 3. The student correctly expresses 4:15 as *four fifteen* and then as *quarter after 4*. On the bottom clock, the hour hand points to the 10. Follow up by asking, "How much of the hour has gone by? Where would halfway between 10 and 11 be?" The student correctly expresses 10:30 as *ten thirty* and *half past ten*.

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Understanding A.M. and P.M.

Students build their understanding that there are twenty-four hours in one day and that our 12-hour analog clock can be used with A.M. and P.M. to identify the time of day.

When do you think a new day begins?

Display a clock face showing 12:00.

12:00 is midnight. It is the start of a new day.

How many complete hours are in one day?

How many hours does the clock face show?

How can we tell time with a clock that only has twelve hours, if we have twenty-four hours in a day?

Allow students to discuss the idea. Listen for students who might say that 2 twelves make twenty-four hours, or that we would have to have the clock go all the way around twice to go through a whole day.

What do you do at 8:00? (I have breakfast. Or, I go to bed.)

How can that be? Some people have breakfast at 8:00 and some go to bed? Does that make sense?

What do you do at 12:00? (I eat lunch. Or, I sleep.)

What's another way to say 12:00 when we are at school?

We use A.M. to label times between midnight and noon.

We use P.M. to label times between noon and midnight.

Tell your partner if you would do these activities in the A.M. or the P.M. Be sure to justify your thinking.

Eat breakfast

Go home from school

Watch the sunset

Put your pajamas on

Eat dinner

Watch the sunrise

Go to P.E. class

Do your homework

Have students share their thinking as a whole class.

Then pose different times, labeled A.M. or P.M., and have students identify what they might be doing at that time.

As an exit ticket, have students answer the following question:

Why is it important to identify A.M. or P.M.?

Common Error or Misconception

A.M. and P.M. can be challenging for students, particularly noon and midnight. Some students are confused as to when A.M. and P.M. start and stop. Remind students that the transition between A.M. and P.M. always occurs at 12:00.

Students will likely think a day begins in the morning or when the sun rises, or may be familiar with religious or other systems in which the day begins at other times such as sunset. Explain that in this system, people have agreed that the day will start at midnight.

Although not expected vocabulary for second grade, many students are curious what the abbreviations A.M. and P.M. stand for. Many will have an incorrect belief that A.M. stands for after midnight. Although this can be a useful way to remember, it is not factual. The abbreviations come from the Latin ante meridiem (before noon) and post meridiem (after noon).

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FORMATIVE ASSESSMENT

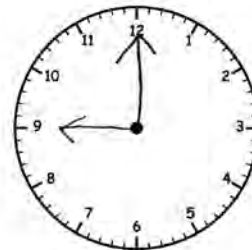
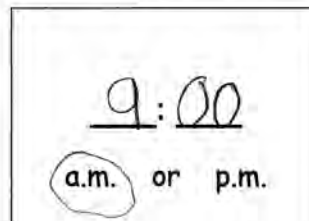
Give students the following three situations:

- the time I go to school
- the time I go to bed
- the time I eat lunch

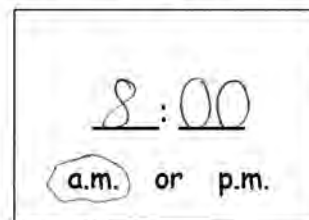
For each, have them show the time in both analog and digital form and indicate whether it would happen in the A.M. or P.M.

My Day

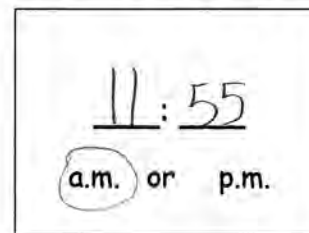
This is the time I go to school.



This is the time I go to bed.



This is the time I eat lunch.



This student demonstrates some understanding of representing both analog and digital time, but has some errors in the second and third clocks that should be addressed. In the second clock, the student shows 8 A.M. as the time I go to bed, which is unreasonable. It's possible that he simply circled the same thing for each response, but you'll want to ask questions (e.g., Do you wake up in the A.M. or the P.M.?) to check his understanding of A.M. and P.M. The third clock shows some misunderstanding about the time 11:55. He may need some additional support around the movement of the hour hand.

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Additional Ideas for Support and Practice

The following ideas extend students' understanding of telling time to the nearest five minutes and provide meaningful practice.

WHAT TIME IS IT?

Have students pick a time card, then show the time on a clock face.

They write what they do at that time of day and label their clock face with the time, including whether it is A.M. or P.M.

Then, they pick another time card and repeat.

RODEO TIME

Before Reading:

What is a rodeo? What might you see at a rodeo? (People ride bulls at a rodeo. Or, We might see horses and cowboys.)

Give students clocks with moveable hands.

During Reading:

Read *Rodeo Time* by Stuart Murphy.

As you read the story to the class, alternate between students reading the times on the pages or displaying the times on their clocks.

After Reading:

Go back through the clocks in the book and use them to explore the times.

Show the clock on page 9.

What time does the clock show? How do you know?

After getting lunch, Katie yells that, "It's way past 2:00!"

What time does the clock show on page 10?

How many minutes past 2:00 is it?

What's another way to say that?

Do you think it's 2:30 A.M. or P.M.? Why?

Show the clock on page 13.

What time did Katie and Cameron get to the holding pen?

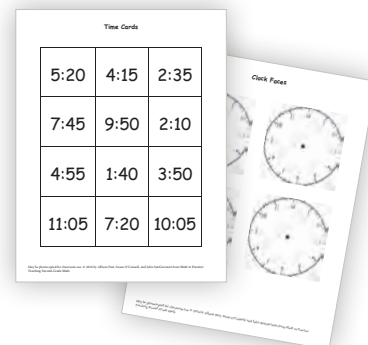
What time were they supposed to get there?

Were they early or late? Explain.

Show the clock on page 20.

Show me 4:45 on your clock.

What's another way to say 4:45?



Many class activities and centers require students to record times using an analog model. There are commercial ink stamps available that make recording in journals easier, or you might copy some clock faces from the template in the online resources and have students glue them into journals.

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For more ideas on integrating children's literature into math lessons, see Math in Practice: A Guide for Teachers, Chapter 2.

Differentiation

Clocks can be copied on different colors of paper. Blue clocks may show time to five minutes, while yellow clocks show time to the hour and half hour for students who may still need practice with those. Tell partners which color they are focusing on for the day. Blank clock face templates are provided in the online resources.

Similar questioning can be used on other pages where the clocks are shown and times are referred to.

TIME SCAVENGER HUNT

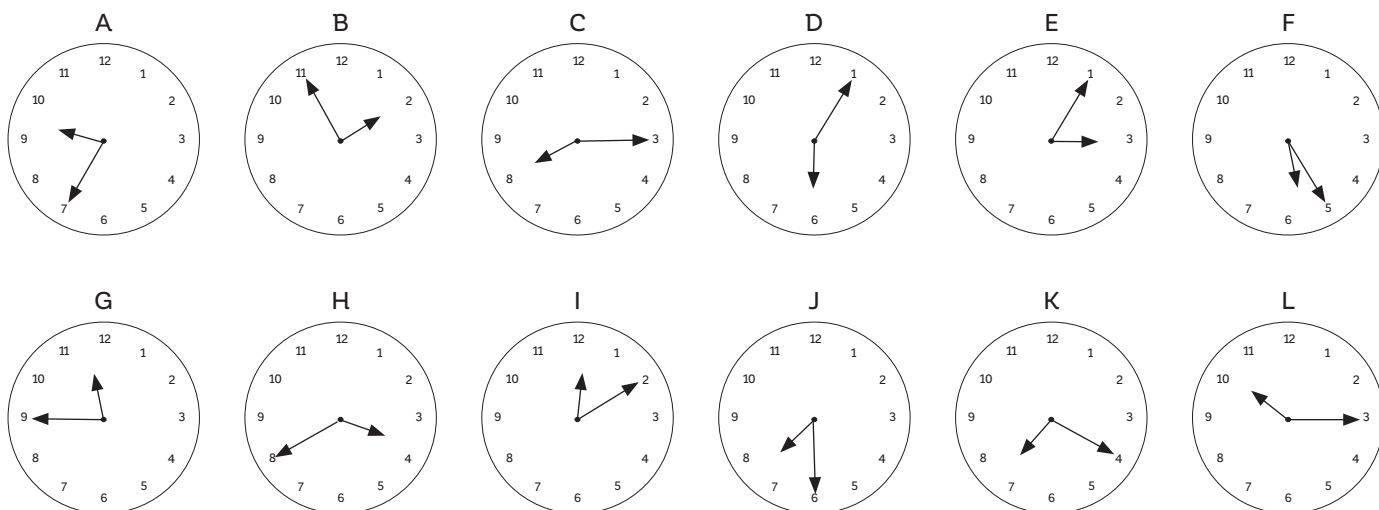
Tape twelve clock faces showing different times in various places on the classroom walls.

Students create a recording sheet by writing the letters A–L in a column on their papers.

Students then work with partners to find each clock and say the time to their partners.

Then, they record the time shown on the clock, in digital form, next to that letter on their recording sheets.

When students are done, have them share their times with the class.



TALK ABOUT IT/WRITE ABOUT IT 🗨️📝

Brendan said he ate breakfast at 7:30 P.M. Do you agree or disagree? Explain why.

Allison said she goes home from school at 3:00 P.M. Do you agree or disagree? Explain why.

Blake says she is sleeping at 12:00 A.M. Do you agree or disagree? Explain why.

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Students use clocks to show various times to the nearest five minutes.

TELLING TIME MEMORY

Students match cards with digital times and cards with corresponding analog times.

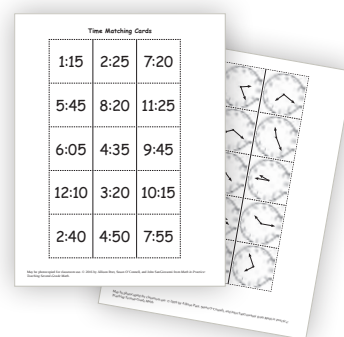
Copy each set of cards (analog and digital) on a different color of card-stock paper.

Have students lay the analog clock cards in three rows of five facedown, then lay the digital time cards in three rows of five facedown.

Have students turn over two cards to see if they match (one analog and one digital).

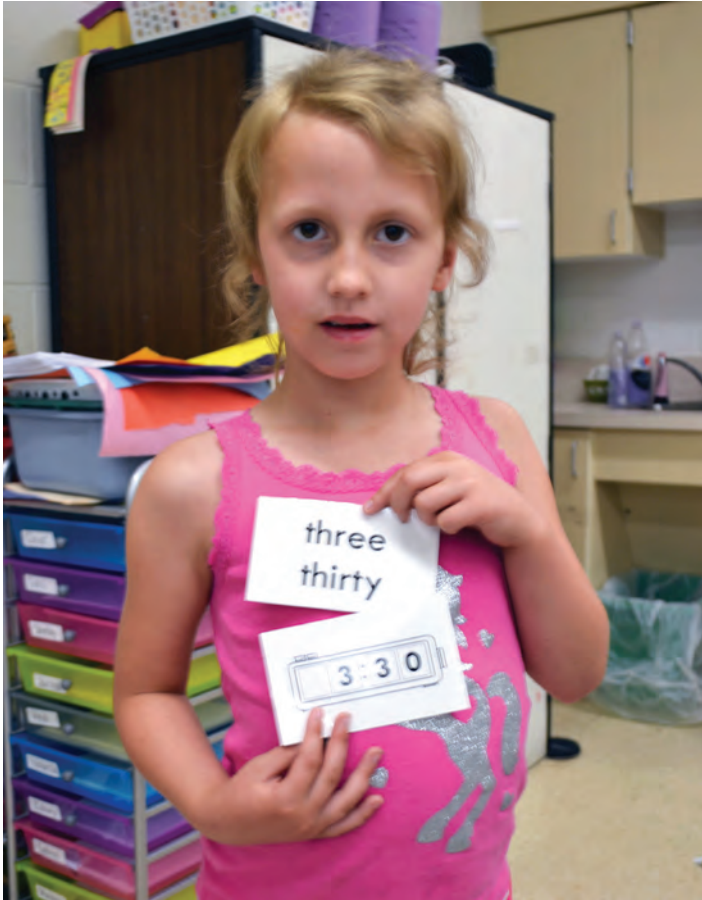
If the cards match, the student keeps the cards. If not, she returns them to their place on the desk.

The student who makes the most matches wins.



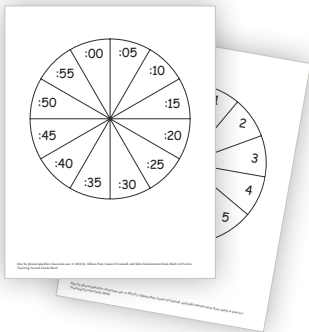
Differentiation

You could limit the number of cards to eight digital time cards and eight analog clock face cards. Or play a simple matching game in which students lay one set of cards (e.g., clock faces) face up, and then take turns picking a digital time card and finding its match.



For an added challenge, create a similar game that includes times written in word form.

Students match digital and analog times to the written form.



TIME SPIN

Students spin two spinners, one with hours (1–12) and one with minutes (00, 05, 10, 15 . . . 55).

Students record the time in their journals, in digital and analog time.

Variation: Include a third spinner with A.M. and P.M. Students write about what they might be doing at that time of day.

DAILY SCHEDULE SORT

Students create a daily schedule in their journals.

Record the times for various class events on strips.

Although most school schedules work for this activity, if your schedule has times to the minute (e.g., 1:23 P.M.) you may have to adjust the times to be the nearest five minutes.

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Sample Schedule

Morning Meeting	8:25 A.M.
Reading	8:45 A.M.
Math	10:15 A.M.
Writing	11:30 A.M.
Lunch	12:15 P.M.
Recess	12:45 P.M.
Music	1:15 P.M.
Science	1:45 P.M.
Dismissal	2:30 P.M.

Give each team a set of strips and have them work together to order them from earliest to latest in the day.

Then, have them record the various times on analog clock templates and glue them into their journals.

They can label each clock with the activity and the time in digital form.

Analog clocks do not appear in many places outside of school, because most clocks are computerized and show time in a digital format (e.g., cable boxes, microwaves, computers). Rather than posting the time in a digital form on your classroom schedule, consider showing it in an analog format. The more students see the time on analog clocks, the more comfortable they get with that representation of time.

Vocabulary

A.M.	o'clock
analog clock	P.M.
digital clock	quarter after
half past	quarter past
hour hand	quarter to
minute hand	

General Resources

8-Inch Circle Template
Additional Problems
Clock Faces

ONLINE RESOURCES

Resources for Specific Activities

Telling Time Memory Cards
Time Cards
Time Spinners

These resources are
available at



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