

Measuring Elapsed Time

Common Core Standard:

Solve problems involving measurement and estimation of intervals of time

3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriately tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

Student Outcomes:

- I can tell time to the hour, half hour, quarter hour and to the nearest minute.
- I can see that a minute hand moves forward one tick every minute and it moves forward one clock number every 5 minutes. I know that $5 \times 12 = 60$ minutes in an hour.
- I can solve elapsed time problems to the nearest hour, to the half hour, to the nearest five minutes, and to the nearest minute.
- I can solve real life problems involving elapsed time on a number line.
- I can measure and label time intervals in hours, five minutes and minutes on a number line.
- I can draw a number line and solve elapse time problems finding Start Time, Change in Time, or End Time.
- I can use a clock to understand AM time begins at midnight (12:00) to 11:59 (one minute before noon) and PM goes from noon (12:00 to 11:59 (one minute before midnight).

Materials:

- Large Analog clock on wall in view of students
- Digital Clock
- A large demonstration clock with moveable hands
- Small analog clocks with movable hands for students (Students may also make clocks using paper plates)
- Word problems that include elapse time
- Paper for drawing number lines
- Rulers for drawing number lines
- Handouts

Advance Preparation:

- Students tell time to an hour, half hour, quarter hour, ten minutes, five minutes, and one minute on a digital or analog clock.
- Students have experiences using a number line for solving addition, subtraction.

Elapsed Time:

- Ask students if they know a math word to describe an amount of time that has passed. If no one knows, introduce the word, **elapsed** time. Ask students to discuss the definition of elapsed time. (The difference between two times; time passes or goes by)
- Use a calendar to help students make sense of elapsed time. Example: How long until Thanksgiving?
- Incorporate real world examples of elapsed time into the students' daily routines on a regular basis. Example: It is now 9:00. How much longer unit lunch, math, gym, etc.?
- Explain to the students that moving the hands on the clock is a good strategy for working with elapsed time.
- Focus on elapsed time using clocks (a review for some students).
Suggestion: Set two clocks to 4:00. The first clock shows the "start" time. Ask a student to move the second clock slowly from 4:00 to 4:30. The first clock shows the start time and the second clock will move to show the end time.
- Using the second clock, ask students to count by fives as you move the minute hand from 4:00 to 4:30. Explain that the elapsed time is 30 minutes or a half hour. (Focus on the idea of elapsed time as passing by or goes by)
- Elapsed time is the time or difference between a beginning time and an ending time.
- Students learn to solve elapsed time problems to the nearest hour, then to the nearest five minutes, and then to the nearest minute.
- Using a number line to solve elapsed time problems, students make a visual representation of their thinking. This strategy works for the student who can tell time fluently and also for remedial students.
- Ask students if the elapsed time is longer than an hour. How can you prove your answer? (Students could count backwards by fives with the minute hand using the first clock to find the beginning time.) If some students are confused, repeat this activity by setting the clocks to a new start time. Move the hour hand or minute hand (or both) to the end time. Then have students count backwards to find the beginning time.)

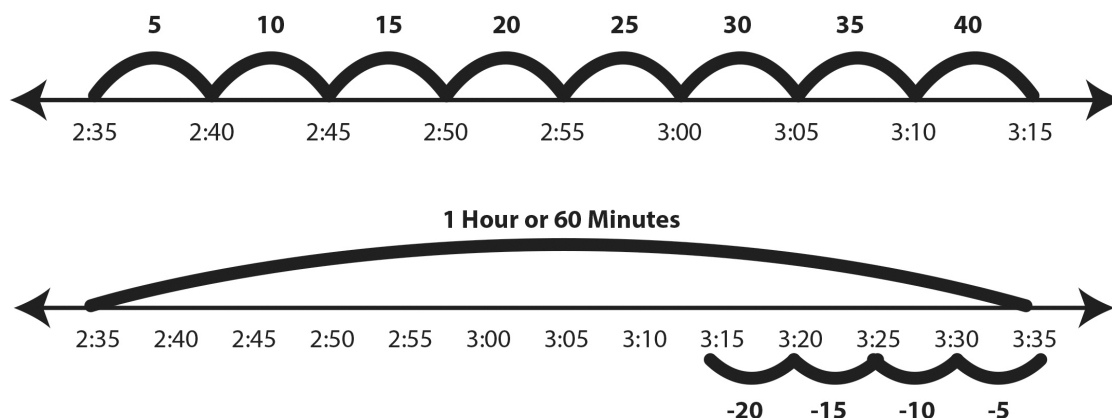
Example: Present the problems below to the class. Each student should use a number line to solve the problems.

- Sydney left school at 2:35 p.m. She arrived home at 3:15. How long did it take Sydney to get home? Sydney found the answer by counting by 5s. Sydney started at 2:35 and counted to 2:40 which is five minutes and then she continued counting by 5s. 2:45, 2:50, 2:55, 3:00. That's 25 minutes. Then she continued counting 3:05; 3:10, 3:15. That is 15 more minutes. Carla added $25 + 15 = 40$ minutes. Students need to understand when starting at 2:35 and go to 2:40 that is 5 minutes. Time has to pass before it can be counted.

Sydney's brother Will solved the problem a different way. Will added one hour to 2:35 to get 3:35 and counted backwards. (3:30, 3:25, 3:20, 3:15) Will said Sydney got home 20 minutes less than 1 hour, which is also 40 minutes. Sydney did not start at 3:35, but Will began there and counted backwards.

- Introduce finding elapsed time on a number line. Demonstrate on the document camera or board to show how to organize elapsed time on a number line.

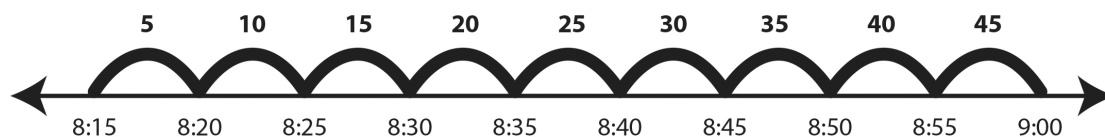
- Below is a number line to show that Carla left school at 2:35 and arrived at 3:15.



Sydney got home 20 minutes less than 1 hour
 60 minutes minus 20 minutes equals 40 minutes

Jack left home at 8:15 a.m. and rode his bicycle to his friend's house. He arrived at 9:00 a.m. Ask: How much time did it take Jack to arrive at his friend's house?

Ask several students to explain how the number line can be used for finding elapsed time.



Ask: How is the number line similar to the clock?
 How do you find elapsed time using a number line?

Questions to Pose:

Before:

- Explain what you know about finding time on an analog clock?
- Give examples of where or when you need to find the correct time.

During:

- Are you counting by interval of an hour, 5 minutes or other chunks such as 10 minutes, 15 minutes?
- If the clock is set at 5:35, what are two ways to tell the time?
- Describe how you solved an elapsed time problem on a number line.

After:

- Describe and share your solutions for solving elapsed time problems.
- How does a number line help you solve problems using elapsed time?
- Describe types of elapsed time problem that are more difficult?

Possible Misconceptions/Suggestions:

Possible Misconceptions	Suggestions
Student confuses hour hand, and minute hand on a clock. Student may not know how to solve problems on a number line.	Student needs practice with a clock that has an hour hand and a minute hand. Provide examples of real life meaning for time. Support students to connect multiplication when measuring 5 minutes, 10 minutes, etc. Solve simple elapse time problems using a number line. Begin only with hours. Next move to 5 minute intervals. Next combine hours and minutes.

Special Notes: Students have difficulty reading a clock. Finding time is difficult and abstract for many students.

Solutions: Provide students with daily opportunities to find the time for lunch, music, gym, using computers, etc. Students solve simple elapsed time problems on number lines.

For Teacher: <http://learnzillion.com/lessonsets/173-solve-elapsed-time-word-problems>

Elapsed Time

<http://mravery.edublogs.org/2011/01/07/elapsedtime/>

NAME: _____ DATE: _____

Josh needs to keep a journal for school that tells how long certain events took. He remembers when he started and finished each one but isn't sure how long they took. Help him figure out how long each took using the number lines.

- **FOOTBALL GAME: 3:30 p.m. – 5:55 p.m.**



- **JESSICA'S BIRTHDAY PARTY: 12:10 p.m. – 4:50 p.m.**



- **DAY OF SCHOOL: 8:15 a.m. – 2:40 p.m.**



- **DRIVE TO GRANDPARENTS: 11:23 a.m. – 6:07 p.m.**



Keeping Time in Historical Boston

NAME: _____ DATE: _____

The third grade class is going on a field trip to visit historical areas in Boston. During their field trip they are going to visit four different locations.

ATTRACTION	ARRIVE	LEAVE
Freedom Trail	8:30 am	10:40 am
Paul Revere's House	10:50 am	
Old North Church		1:45 pm
New England Aquarium Whale Watch	2:15 pm	3:35 pm

Using the chart above to answer the questions below. Use a clock as needed. Be prepared to explain to others how you decided on the correct time. Show your solution for each problem on a number line.

1. How much time does the class have to visit the Freedom Trail? _____

Show your strategy on a number line.



2. What time will the class leave Paul Revere's house if they plan to visit one hour and 15 minutes? _____

Show your strategy on a number line.



Keeping Time in Historical Boston

NAME: _____ DATE: _____

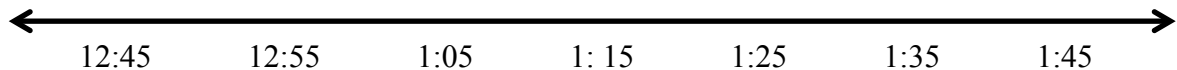
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New England Aquarium Whale Watch	2:15 pm	3:35 pm

Use the chart above to answer the questions below. Use a clock as needed. Be prepared to explain to others how you decided on the correct time. Show your solution for each problem on a number line.

3. The students left the Old North Church at 1:45pm. They visited the church for 50 minutes. What time did the students arrive at the church? _____

Show your strategy on the number line.



4. The students arrived at the Aquarium at 2:15 pm. They left the Aquarium at 3:35pm. How long did the students visit at the aquarium? _____

Show your strategy on a number line.



Elapsed Time Problems

NAME: _____ DATE: _____

Solve problems involving addition and subtraction of time intervals by representing the problem on a number line. You might practice on blank paper and then copy your number line below the question.

Solve all problems using a number line. Draw and label times on your number line.

1. Carl gets to school at 7:45 am and leaves school at 2:45 pm. How long is Carl at school.

Show your strategy using a number line.

Record and label your answer: _____

2. Matthew went to the store to buy a video game. He left his house at 4:15 p.m. He returned home at 4:50 p.m. How long did it take Matt to buy a video game and return home?

Show your strategy using a number line.

Record and label your answer: _____

3. Amy went to soccer practice at 10:30 a.m. She returned home at 1:25 p.m. How long was Amy at soccer practice?

Show your strategy using a number line.

Record and label your answer: _____

ELAPSED TIME PROBLEMS PAGE 2

4. Jeff left to go to the swimming pool at 7:55 a.m. He arrived home at 3:45 p.m. How long did Jeff stay at the swimming pool?

Show your strategy using a number line.

Record and label your answer: _____

5. Susan's Dad started cooking lasagna at 5:31 pm. It took 52 minutes for the lasagna to cook. How long did the lasagna cook? Remember to start counting from 5:31 by 1s to get to 5 minutes intervals.

Show your strategy using a number line.

Record and label your answer: _____

6. Mason's birthday party began at 5:15 p.m. and ended at 6:52 p.m. How long did the party last?

Show your solution on a number line.

Record and label your answer: _____

7. A baker put a cake in the oven at 4 p.m. The cake should bake for 45 minutes. When should the baker take the cake out of the oven?

Show your solution on a number line.

Record and label your answer: _____

ELAPSED TIME PROBLEMS PAGE 3

8. Marcus left school at 3:15 p.m. on the school bus. He arrived at his home 47 minutes later. What time did Marcus get home?

Show your solution on a number line.

Record and label your answer: _____

9. Bill left home at 3:27 p.m. to walk to his friend's house. It took Bill 23 minutes to arrive at his friend's house. What time did Bill arrive?

Show your solution on a number line.

Record and label your answer: _____

10. Daniel began cutting grass on Saturday morning at 9:38 a.m. He finished the entire yard by 11:43 a.m. How long did it take Daniel to mow the grass?

Show your solution strategy on a number line.

Record and label your answer: _____

More Elapsed Time Problems

NAME: _____ DATE: _____

1. Explain or show how you determined the time Marta started the race. Use what you know about elapsed time in your explanation.

Marta ran in the Boston Marathon and finished in 2 hours and 35 minutes. She crossed the finish line at 1:15pm.

What time did Marta begin the race? _____

Explain or show how you know the time Marta began the race?

2. Jordan, a new student, joined the class. Jordan asked: “What is elapsed time? What do I need to know about elapsed time?”

Write your response to Jordan.

3. Choose the best answer.

Mason’s birthday party lasted from 1:50 P.M. to 3:40 P.M. How long did the party last?

- A: 1 hour and 50 minutes
- B: 2 hours and 50 minutes
- C: 2 hours and 10 minutes
- D: 1 hour and 10 minutes

Explain how you know you selected the correct answer.

Solving Elapsed Time Problems

NAME: _____ DATE: _____

1. How long does it take to fly from Syracuse to Orlando?

I located the board in the airport where departure time and arrival time for flights are posted.

Departure Time		Arrival Time	
Syracuse	8:00 A.M.	Orlando	11:10 A.M.

Remember to count the hours by 1s.
Count the minutes by 5s and 1s.

Show your solution on a number line.

What is the time of flight from Syracuse to Orlando? _____

Use what you know about elapsed time to explain why your answer is correct.
Use numbers and/or words in your explanation.

2. Max started his homework at 4:30 pm. He finished his homework at 5:20 pm.

How long did Max work on his homework? _____

Show your solution on a number line.

Use what you know about elapsed time to explain why your answer is correct.
Use number and/or words in your explanation.

SOLVING ELAPSED TIME PROBLEMS PAGE 2

3. Sarah and her friends arrived at the movie at 7:15 pm. They stood in line for 18 minutes to buy tickets.

What time did they get their tickets to get inside the movie? _____

Show your solution on a number line.

Use what you know about elapsed time to explain why your answer is correct.
Use number and/or words in your explanation.

4. Ryan worked for 4 hours and 20 minutes raking leaves for his neighbors. Ryan started work at 3:35 p.m.

What time did Ryan stop raking leaves? _____

Show your solution on a number line.

Use what you know about elapsed time to explain why your answer is correct.
Use number and/or words in your explanation.

SOLVING ELAPSED TIME PROBLEMS PAGE 3

5. It is really hot and Katie and Marta are going to go to the water slide. The girls arrived at 10:45 and stayed for 2 hours and 25 minutes.

What time did the girls leave the water slide? _____

Show your solution on a number line.

Use what you know about elapsed time to explain why your answer is correct.
Use number and/or words in your explanation.

6. Marcy ran in the Boston Marathon and finished in 2 hours and 35 minutes. She crossed the finish line at 1:20.

What time did Marcy begin the race? _____

Explain how you determined the time Marcy started the race. Use what you know about elapsed time in your explanation. Use words, numbers, and/or symbols in your explanation.

Show your solution on a number line.

Use what you know about elapsed time to explain why your answer is correct.
Use number and/or words in your explanation.

SOLVING ELAPSED TIME PROBLEMS PAGE 4

7. Tom scored a touchdown at 7:48 P.M. Steve intercepted a pass and scored a touchdown 11 minutes later.

What time did Steve score the second touchdown? _____

Show your solution on a number line.

Use what you know about elapsed time to explain why your answer is correct.
Use number and/or words in your explanation.

<http://www.timeanddate.com/clocks/free.html>



Measuring Time

Common Core Standard:

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3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriately tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

Student Outcomes:

- I can see that the hour hand is shorter and the minute hand is longer on an analog clock.
- I can see that a clock is split up into 12 sections and each section is worth 5 minutes
- I can see that the hour hand moves forward one clock number every hour.
- I can see that a minute hand moves forward one tick every minute and it moves forward one clock number every 5 minutes.
- I know that when the minute hand completes one trip around the clock, one hour has passed.
- I can determine the number of minutes in hours and half hours.
- I can count by fives after the hour and before the hour.
- I can state a time on a clock and also show a time using both analog and digital clocks.
- I can determine start time and end time to the hour and nearest minute on digital and analog clocks.
- I can tell experiences about time such as when to arrive at school and when to go to soccer practice.
- I understand that we measure time using seconds, minutes, hours, days, weeks, months, years, etc.

Materials:

- Large Analog clock on wall in view of students
- A large demonstration clock with moveable hands
- Timer
- Small analog clocks with movable hands for students (Students may also make clocks using paper plates)
- Blank Clock (handout)
- Word problems that include time
- Blank clock face
- Handouts

Advance Preparation:

- Students tell time to an hour and half hour on a digital or analog clock.
- Students can count to 60 by ones, showing minutes; by fives showing 5 minutes intervals, and 10s showing 10, 20, to 60 minutes on a clock.
- Students tell and record time in hours and half-hours using analog and digital clocks.
- Students share start times and end times of favorite TV programs, games, etc.

Directions:

Note: Time is more abstract and is often taught as a rote skill. Students may have limited clock experiences. Sequencing of events, duration and relationships of time periods, basic units of time, and identifying important times are mathematically challenging ideas that students must struggle to make sense. Many students may link those ideas to their own direct experiences.

Telling time is an important skill for students to learn. Reading a clock face accurately, finding and understanding the passage of time, sequencing events, duration of time periods, relationships among time periods, knowing basic units of time and identifying important times and how long until or since they happen. Using adding and subtracting time problems going over an hour span is difficult for students.

- Students will need clocks. If small clocks are not available, students can make clocks using paper plates.
- Ask students how many numerals are on the face of a clock?
- Students may have a great deal of difficulty understanding that the numbers on the clock represent both the hour and the minute.
- Students need to know the hour hand is shorter; the minute hand is larger.
- Review time with students to the nearest hour, nearest half hour and the nearest minute. Provide opportunities for students to find the time the class goes to lunch, music, home, etc.)
- AM time is from midnight (12:00) to 11:59 (one minute before noon). At noon, it becomes PM, and PM time is from noon (12:00) to 11:59 (one minute before midnight).
- Examples: Ask students to find the following different times on their clocks. Ask students to take turns explaining how he/she found the time on the clock. (Teacher should adjust times based on the knowledge of students.) (3:12; 2:05; quarter to six; 12:55; 5:35; 11: 50 etc.)
- As a class, focus on counting by 5s from 10:15 to 10: 35. If you start reading at 1:40 and read for 25 minutes, what time will you stop? Again, ask students to count by 5s, to find the end time.
- Ask If I start practicing soccer at 8:45 and I practice for 35 minutes, what time will is my practice over? Again, ask students to count by 5s. (Some may need many examples.)
- Write 2:12 where students can see the time. Ask students to show the time on their clock. Ask: How did you know where to put the small hand? Where to put the large hand?
- Ask students to set their clocks at 12:25. Some people call this 12:25. What might others say for the time? (25 minutes after 12) What might people say for 12:50? (ten minutes before 1)

Personal Benchmarks for One-Second and One-Minute: Enclosed is a handout describing ideas to support students in developing benchmarks for one second and one minute. Teachers have lots of ideas of ways to modify the activity based on students' experiences.

Questions to Pose:

Before:

- Have you had experiences finding time on an analog clock? Explain what you know.
- How would you describe the differences between an analog clock and a digital clock?
- Which hand on the clock is the hour hand? Explain how you know.
- What is difficult about finding time?

During

- Describe the differences between the hour hand and the minute hand on a clock.
- Describe how you count by interval of 5s. Are you able to count by 10 minute intervals?
- When do you need to know what time it is?

After

- How would you describe the time of a second and the time of a minute?
- If you spend 75 minutes watching a movie, what is another way you can write 75 minutes?
- What strategies do you use when finding the time on a clock?

Possible Misconceptions/Suggestions:

Possible Misconceptions	Suggestions
Students confuse the hands on a clock. Students are confused with the numbers on a clock representing hours and minutes.	Students need daily opportunities to tell time on a clock – using minute hand and hour hand. Use a clock on paper. Students might have clocks that show hours. Students later place marks to show seconds between the hour. Students write on the outside of the clock. 5, 10, 15, 20 etc. This show that each number on a clock stand for 5 minutes. Between numbers 12 to 1 as 1, 2, 3, 4, 5, and from 1 to 2 as 6, 7, 8, 9, 10 etc. (These number represent 60 minutes in one hour. Later students see the 5s on a clock using multiplication.

Special Notes: Many students only see analog clocks in school. They can read time from digital clocks, phones, computers, etc.

Solutions: Students need daily experiences telling time using an analog clock. There should be an analog clock in every classroom. Time should be included daily and throughout the year. Students figure out how long to lunch, gym, etc. Students need many opportunities to count by 5s.

Personal Benchmarks for One-Second and One-Minute Ideas for Teachers

One purpose of this activity is to give all students opportunities to develop personal benchmarks for one-second and for one-minute time spans.

Goal: Students will develop personal referents for one second and for one minute.

Students will see the relationship between seconds and minutes.

Ask students:

1. What can you do in one second? (Possible ideas: Blink your eye, clap once, jump, pick up your pencil, snap your fingers once, etc.)
2. Work with partners/small groups to make a list of what you can do in one second. Share ideas.
3. Using a stopwatch or a timer with a second hand, time 10 students. Each student will do something for one second. After each student completes his/her task, 10 seconds should have passed. This activity can be repeated, including more students.
4. Ask the class to watch the second hand and count, as a class, how many times it moves while traveling all the way around the clock. After several repetitions, students should notice that it always takes sixty seconds. Be sure students understand that 60 seconds is also one minute.
5. What can you do in one minute? (60 seconds). Ask students for ideas. Have the entire class experience some one-minute activities. Students might put their heads on their desk and raise their hand when they think one minute has passed; snap their fingers, jumping jacks, hop on one foot, stand up and sit down, walk around the room, running in place, write their name over and over, etc.
6. How many X's can you write in one minute? Ask students to predict. Teacher records the guess for each student.
7. Teacher will time the students for one minute. Teacher tells students they will write as many X's as they can in one minute. Teacher tells students when to start and when to stop.
8. Each student compares their estimate to the number of Xs they recorded. Allow time for discussion.
9. Students should understand that a minute is a standard measurement unit and therefore always equal the same number of seconds.
10. Students should realize that one revolution around the clock face takes sixty minutes or one hour.

Match the Time

NAME: _____

DATE: _____

Students may work in pairs:

	Match the Answers
1. The time between 2:45 and 3:00.	
2. The time recess starts on Monday to the time recess starts on Tuesday.	
3. The time between 7:30 and 8:00.	
4. The time at 11:15.	
5. The time it takes for the minute hand to move from the 3 on the clock to the 4.	
6. The time it takes for the second hand to move around the clock once.	
7. The time it takes for the minute hand to move around the clock once.	

Answers

1 day
1 hour
1 minute
1 quarter hour
1 half hour
quarter after 11
5 minutes

Favorite Shows

NAME: _____

DATE: _____

Favorite Television Shows: Provide TV schedules. Students may know schedules or find schedules in the newspaper or TV guide. Students might also look up TV schedules on the Internet.

TV Program	Start Time	End Time	How Long Did the Program Last? (minutes and hours)

Geoff watched a Scooby Doo movie. The movie started at 4:00 pm and ended at 5 pm. There were three 5 minute ads during the movie. How much time did Geoff actually watch the movie?

Work with a partner or a small group to write one or more problem using elapsed time. Solve your problem using a number line. Be prepared to share with the class.

Telling Time

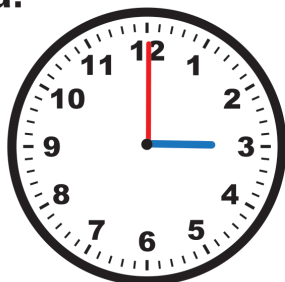
Super Teacher Worksheets - www.superteacherworksheets.com

NAME: _____

DATE: _____

Write the time shown.

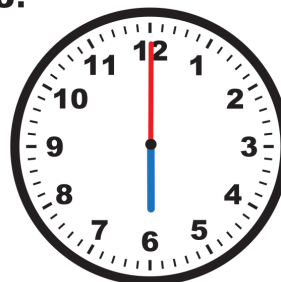
a.



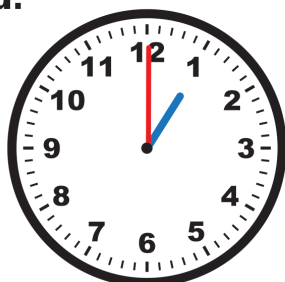
b.



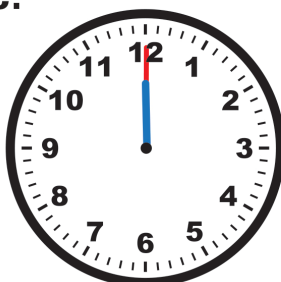
c.



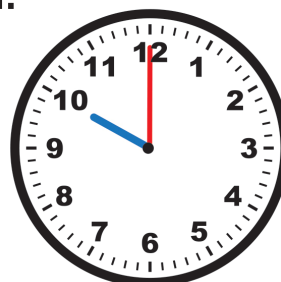
d.



e.



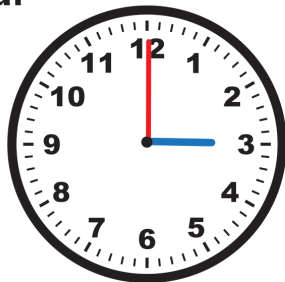
f.



Telling TIME

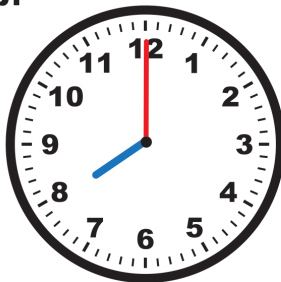
ANSWER KEY

a.



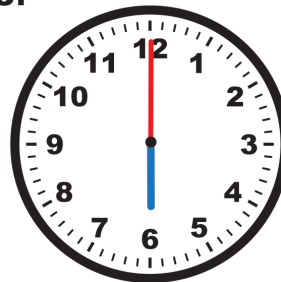
3:00

b.



8:00

c.



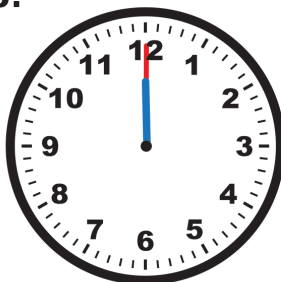
6:00

d.



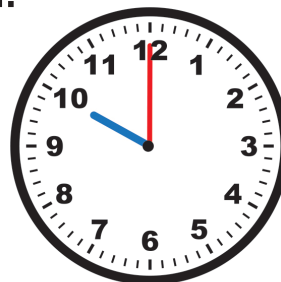
1:00

e.



12:00

f.



10:00

Telling Time to the Nearest Quarter Hour

Super Teacher Worksheets - www.superteacherworksheets.com

NAME: _____

DATE: _____

Write the time shown on each clock. Write it the “regular way” and the “smart way.” The first one has been done for you.

a.



2:15

Quarter After 2

b.



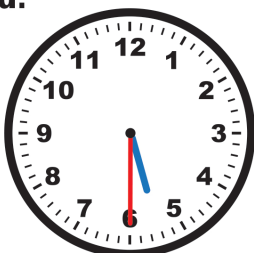
____ : ____

c.



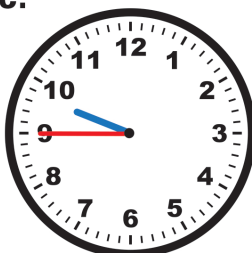
____ : ____

d.



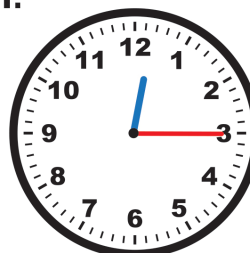
____ : ____

e.



____ : ____

f.



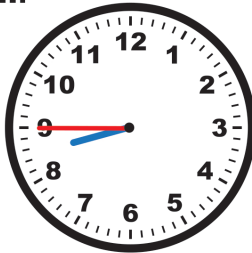
____ : ____

g.



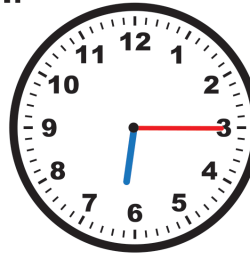
____ : ____

h.



____ : ____

i.

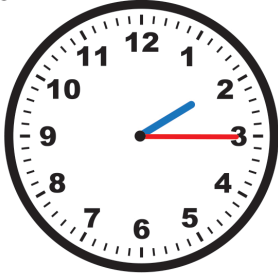


____ : ____

Telling Time to the Nearest Quarter Hour

ANSWER KEY

a.



2:15

Quarter After 2

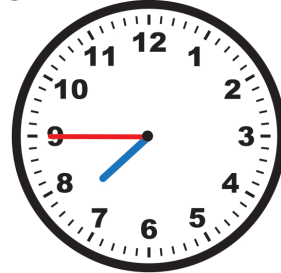
b.



4:30

Half Past 4

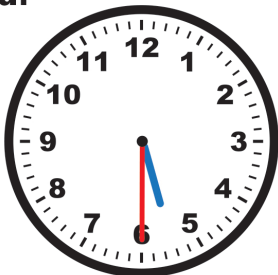
c.



7:45

Quarter to 8

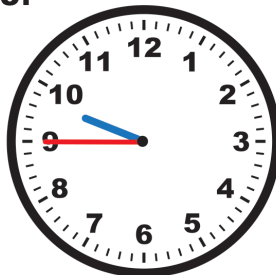
d.



5:30

Half Past 5

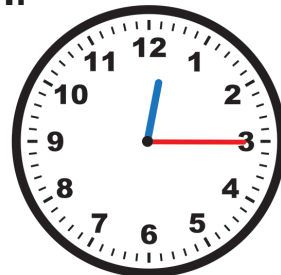
e.



9:45

Quarter to 10

f.



12:15

Quarter After 12

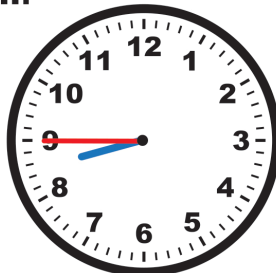
g.



1:45

Quarter to 2

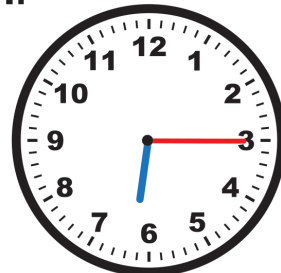
h.



8:45

Quarter to 9

i.



6:15

Quarter After 6