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**LESSON 24 Solving Problems with Time** CCSS: 3.MD.1

**1 Introduction**

Solve problems using time to find how much time has gone past, or the **elapsed time**. You can also find the time something started or ended.

Yuri left for school at 8:15 A.M. It took him 25 minutes to get to school.

Add to find what time Yuri got to school.

$$\begin{array}{r} 8:15 \leftarrow \text{Start Time} \\ +0:25 \leftarrow \text{Time Interval} \\ \hline 8:40 \leftarrow \text{End Time} \end{array}$$

Yuri arrived at school at 8:40 A.M.

Yuri left his friend's house at 4:12 P.M. and arrived home at 4:58 P.M.

$$\begin{array}{r} 4:58 \leftarrow \text{End Time} \\ -4:12 \leftarrow \text{Start Time} \\ \hline 0:46 \leftarrow \text{Time Interval} \end{array}$$

It took Yuri 46 minutes to get home from his friend's house.

A number line can help you solve problems with time.

**Elapsed time** is also called a **time interval**.

Remember that the times between midnight and noon are A.M. times. The times between noon and midnight are P.M.

You will also use subtraction to find the start time when you know the end time and the elapsed time.

**Think About It**

What time does your school start in the morning? What time do you leave your house to go to school? Find the amount of time that goes by from the time you leave your house to the time your school starts. Why is this important to know?

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## Objective

To find elapsed time, start times, and end times in word problems

## 1 Introduction

Review start times, stop times, and time intervals. Students should recognize that the interval is the amount of time that has passed. Work through the examples on the page together. Students should understand that adding an amount of time to a start time results in an end time and that subtracting one time from another results in an amount of time called an interval. Discuss how a number line can help them find a time interval or a start or end time.

## Think About It

Students should recognize that to find the time interval, they need to subtract the time school starts from the time they leave the house, e.g.,  $8:00 - 7:40 = 0:20$ , or 20 minutes. They may indicate that it is important to know how long it takes in order to allow enough time to get where they are going.

**2 Focused Instruction** Lesson 24

Use subtraction to find the time something started when you know the time it ended and how much time passed. Use addition to find the end time when you know the time something started and how much time passed.

► Astrid finished her homework at 6:55 P.M. She had worked on her homework for 40 minutes.

What time did Astrid finish? 6:55

How much time had elapsed since she started? 40 minutes

Is the time she started before 6:55 or after 6:55? before

Do you need to use subtraction or addition to find the time Astrid started her homework? subtraction

Use the correct operation to find the time she started her homework.

$$\begin{array}{r} 6:55 \\ -0:40 \\ \hline 6:15 \end{array}$$

What time did Astrid start her homework? 6:15

As soon as she finished her homework, Astrid practiced piano for 25 minutes.

What time did Astrid start practicing her piano? 6:55

How long did she spend practicing? 25 minutes

What operation should you use to find the time Astrid finished practicing piano? addition

Use the correct operation to find the time she finished practicing piano.

$$\begin{array}{r} 6:55 \\ +0:25 \\ \hline 6:80 \rightarrow 7:20 \end{array}$$

What time did Astrid finish practicing piano? 7:20

When you add or subtract across an hour, you may need to regroup 60 minutes as 1 hour or 1 hour as 60 minutes.

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## Common Core State Standard

**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.

## Vocabulary

**elapsed time:** an amount of time that has passed between a start time and an end time; time interval

**2 Focused Instruction**

Students subtract an amount of time from an end time in order to find the time the event started. The questions help students recognize this as a subtraction problem and guide them in setting up the problem to find the start time. Students then find an end time by adding a time interval of 25 minutes to a start time. Students must recognize that the end time for doing homework is Astrid's start time for practicing piano.

Next, students use a number line marked with amounts of times to find an end time that is more than one hour beyond the start time. Guide students in finding the time for each interval and labeling it on the number line.

Conclude the Focused Instruction section by having students complete the table, finding the end, start, or elapsed time given the information in each case.

**2 Focused Instruction** Lesson 24

**Time lines, or number lines, can also help you solve problems with time.**

► Troy and Aamir met at the playground at 10:10 a.m. They played for 65 minutes. Use a number line to find the time that the boys finished playing.

What time did the boys start playing? 10:10  
Where is this time on the number line? at the left end

The number line shows marks for 10 minutes. Write the actual time under each mark on the number line above.

What time did the boys finish playing? 11:15

There are 60 minutes in an hour.

**Use what you know about time to fill in this table.**

Start Time	End Time	Elapsed Time
11:14	11:47	33 minutes
8:00	9:02	1 hour 2 minutes
9:27	6:08	41 minutes

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**3 Guided Practice**

Students should complete the Guided Practice section on their own. Offer assistance as needed, pointing out the reminder and hint boxes along the right side of the page.

**3 Guided Practice** Lesson 24

**Solve the following problems.**

1 Bryan worked on a science project from 10:07 a.m. to 10:49 a.m. How many minutes did he work on his project?

Should you add or subtract to find the elapsed time?

Answer 42 minutes

2 Baz got to the library at 7:45 a.m. He read the sign on the library. How long will he have to wait before the library opens?

**PUBLIC LIBRARY Daily Hours 9 A.M.–6 P.M.**

Answer 1 hour 15 minutes

3 The elementary music program began at 7:00 p.m.

**Part A** The first half of the program ended at 7:46. There was a 12-minute break before the second half started. What time did the second half start? Show your work.

$$\begin{array}{r} 7:46 \\ +0:12 \\ \hline 7:58 \end{array}$$

Answer 7:58

**Part B** The second half of the program lasted 38 minutes. How long was the entire elementary music program? Show your work.

$$\begin{array}{r} 7:58 \\ +0:38 \\ \hline 7:96 \rightarrow 8:36 \end{array} \qquad \begin{array}{r} 8:36 \\ -7:00 \\ \hline 1:36 \end{array}$$

Remember to include the break as part of the program.

Answer 1 hour 36 minutes

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**Connections to Standards for Mathematical Practice**

- Make sense of problems and persevere in solving them.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.

**4** Independent Practice

Lesson 24

Solve the following problems.

- 1 Lexi left to go to the park at 3:15 P.M. She got to the park at 3:42 P.M. How long did it take Lexi to get to the park? **DOK 2**  
**3.MD.1**

Answer 27 minutes

- 2 Paul finished cleaning his room at 4:50 P.M. after working on it for 43 minutes. What time did Paul start cleaning his room? **DOK 2**  
**3.MD.1**

- A 4:17 P.M.
- B 4:53 P.M.
- C 4:43 P.M.
- D 4:07 P.M.**

- 3 Colby began making lunch at the time shown on the left. He finished at the time shown on the right. **DOK 2**  
**3.MD.1**



Start



End

How long did it take Colby to make lunch? Show your work.

$$\begin{array}{r} 12:15 \\ -11:56 \\ \hline \end{array} \rightarrow \begin{array}{r} 11:75 \\ -11:56 \\ \hline 0:19 \end{array}$$

Answer 19 minutes

**4** Independent Practice Answer Rationales

- 1 Subtract the start time from the end time to find the time interval.

$$\begin{array}{r} 3:12 \\ 3:42 \\ -3:15 \\ \hline 0:27 \end{array}$$

So it took Lexi 27 minutes to walk to the park.

- 2 To find the start time, subtract the time interval, or how long Paul worked on cleaning his room—43 minutes—from the end time of 4:50 P.M.

$$\begin{array}{r} 4:10 \\ 4:50 \\ -0:43 \\ \hline 4:07 \end{array}$$

So Paul started cleaning his room at 4:07 P.M. Choice D is correct.

- 3 The first clock shows 11:56. The second clock shows 12:15. Subtract the start time from the end time to find the time interval. Regroup 1 hour as 60 minutes. Colby spent 19 minutes making lunch.

**Extension Activity**

Have students schedule an ideal day of activities, designating two of the following for each activity: the start time, the time interval, and the end time. Then have each student write three word problems based on the schedule, one to find end time, one to find the time interval, and one to find start time. Have them show how to solve each problem. Collect the problems and share particularly interesting ones with the class to solve.

4 The student should draw a time line to find the end time of a time interval: when Deb finished exercising. Students should start with the start time, 11:11, at the beginning of the time line and plot points until they reach the time interval of 39 minutes and the end time of 11:50. The sample time line answer shows one way to plot time increments; this may vary, but it ultimately should show evenly spaced intervals that end with the correct end time of 11:50.

5 The student should find the time interval, or how long Dion read his book. Subtract the start time from the end time to find the time interval.

$$\begin{array}{r} 12:00 \\ -10:10 \\ \hline \end{array} \rightarrow \begin{array}{r} 11:60 \\ -10:10 \\ \hline 1:50 \end{array}$$

So Dion read his book for 1 hour 50 minutes. Choice C is correct.

6 Rachel's flight took longer. Subtract the start times of each flight from the corresponding end times. Jerome's flight took  $4:05 - 1:45 = 2:20$ , or 2 hours 20 minutes. Rachel's flight took  $11:35 - 9:00 = 2:35$ , or 2 hours 35 minutes. So Rachel's flight was 15 minutes longer than Jerome's.

7 Students should find the missing value in each row. To find the elapsed time, they should subtract the start time from the end time. To find the start time, they should subtract the elapsed time from the end time. To find the end time, they should add the elapsed time to the start time. Norah spent  $4:13 - 3:55 = 0:18$ , or 18 minutes on math homework. She started her reading homework at  $4:45 - 0:30 = 4:15$ . She finished her spelling homework at  $4:47 + 0:24 = 5:11$ . Norah spent  $5:22 - 5:14 = 0:08$ , or 8 minutes on science homework.

Lesson 24

**4 Independent Practice**

4 Deb started exercising at 11:11 A.M. She exercised for 39 minutes. Use the time line to find what time Deb finished exercising. **DOK 3**  
**3.MD.1**

Start 11:11      11:21      11:31      11:41      11:50

Answer 11:50

5 Dion started reading a book at 10:10 A.M. He stopped reading at 12:00 noon. How long did Dion read? **DOK 2**  
**3.MD.1**

A 50 minutes  
B 1 hour 40 minutes  
**C 1 hour 50 minutes**  
D 2 hours 10 minutes

6 Jerome flew from Dallas, Texas, to Chicago, Illinois. He left Dallas at 1:45 P.M. and arrived in Chicago at 4:05 P.M. Rachel also flew from Dallas to Chicago. She left Dallas at 9:00 A.M. and arrived in Chicago at 11:35 A.M. Whose flight took the longer amount of time? Explain. **DOK 2**  
**3.MD.1**

Rachel's flight took longer. I subtracted the time each flight left from the time each flight arrived. Rachel's flight was 2 hours 35 minutes. Jerome's was 2 hours 20 minutes.

7 Norah has homework in different subjects. Complete the table to show the start time, end time, or elapsed time for each subject's homework. **DOK 2**  
**3.MD.1**

Subject	Start Time	End Time	Elapsed Time
Math	3:55	4:13	<b>18 minutes</b>
Reading	<b>4:15</b>	4:45	30 minutes
Spelling	4:47	<b>5:11</b>	24 minutes
Science	5:14	5:22	<b>8 minutes</b>

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## 4 Independent Practice

Lesson 24

- 8 Liam is taking a train to visit his grandparents. The train schedule below shows the trains that leave from Liam's town. All the trains stop in the town where his grandparents live.

**DOK 3**  
**3.MD.1**

TRAIN SCHEDULE	
Train Number	Departs
245	7:30 A.M.
119	8:45 A.M.
21	9:45 A.M.
1010	12:15 P.M.

- Part A** Liam wants to get to his grandparents' town close to 10:30 A.M. The trip takes 1 hour 30 minutes. What train should Liam take?

Answer 119

- Part B** It takes Liam 1 hour 20 minutes to get ready and get to the train. If he starts getting ready at 7:15 A.M., will he be able to catch the 8:45 A.M. train? Explain.

Yes, Liam will have enough time. He must leave at 8:45. He  
needs 1 hour 20 minutes to get ready:  $8:45 - 1:20 = 7:25$ .  
He has to start getting ready no later than 7:25, so 7:15  
gives him 10 extra minutes.

**8 PART A** Liam should take train 119, leaving at 8:45. The trip to his grandparents' town is 1 hour 30 minutes. Add 1:30 to the trains' departure times. Train 245 arrives at 9:00:  $7:30 + 1:30 = 8:60 = 9:00$ . This is much earlier than 10:30. Train 119 arrives at 10:15:  $8:45 + 1:30 = 9:75 = 10:15$ . This is very close to 10:30. The other two trains will not get there until much after 10:30.

**PART B** To find out whether Liam will have enough time to catch his train, add Liam's getting-ready time of 1 hour 20 minutes—the time interval—to his start time of 7:15 A.M. in order to get 8:35. This time is 10 minutes before the 8:45 train. So Liam will be able to catch the train and have 10 extra minutes.

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