

TDL Math:

Time & Mileage Calculations



Industry: Transportation, Distribution, & Logistics (TDL)

Content Area: Mathematics

Core Topics: Computing and converting time measurements, calculating mileage, solving multi-step word problems

Objective: Students will be able to convert standard times to 24-hour time, compute time worked, and use odometer readings to calculate mileage and solve transportation problems.

Materials included:

- Instructor's notes
- Scenario: Transportation Supervisor
- Student worksheets
- Quiz
- Answer Keys

According to the U.S. Department of Labor, employment for transportation supervisors is expected to grow approximately 9% between 2012 and 2022.* The transportation, distribution, and logistics (TDL) industry is comprised of a vast array of jobs, ranging from dock workers and delivery drivers to warehouse managers and logisticians. Mathematics and literacy skills are essential for students who plan to pursue a career in this field. TDL employees, including transportation supervisors, must have the ability to perform accurate mathematical calculations in their daily work.

* Source: U.S. Bureau of Labor Statistics | Division of Occupational Employment Statistics, <http://www.bls.gov/oes/current/oes531031.htm>

Instructor's notes:

- The purpose of this module is to help students develop and apply math skills in a TDL workplace setting. The learning activities were designed to be incorporated throughout multiple instructional periods as math concepts are taught in a TDL context.
- After completing the module, students should be able to:
 - Convert standard time into 24-hour time
 - Compute time and convert minutes to hours for employee time sheets
 - Use odometer readings to calculate mileage and miles per gallon
- **Setting the stage:** Provide students with background information about the typical responsibilities of a transportation supervisor. You may want to have students use the occupational outlook handbook, O*NET and/or other relevant websites to research the job responsibilities, educational/training requirements, salary, etc. for TDL positions that interest them. In addition, you could have students view videos depicting the typical work environment of a transportation supervisor. (See links below)

Bureau of Labor Statistics – Occupational Outlook Handbook:

<http://www.bls.gov/ooh/>

Occupational Information Network (O*NET)

<http://www.onetonline.org/link/summary/53-1031.00>

Transportation Supervisor video:

<https://www.youtube.com/watch?v=pVDAoYBIWIA>

- **For Activity 1:** Explain how to convert standard time to 24-hour time and how to compute time worked. Work the scenario examples with the class. Have students work the practice problems independently. Provide additional practice as needed. Have students complete **Worksheet 1**.
- **For Activity 2:** Explain how to calculate daily and weekly time worked to complete employee timesheets. Demonstrate how to convert minutes into hours and minutes. Work the scenario example with the class. Have students complete the practice problem independently. Provide additional practice as needed. Have students complete **Worksheet 2**.
- **For Activity 3:** Explain how to use odometer readings to compute mileage and miles per gallon (mpg). Work the scenario examples with the class. Have students complete the practice problems independently. Provide additional practice as needed. Have students complete **Worksheet 3**.
- **Assessment: Quiz – Time & Mileage Calculations**

Workplace Scenario:

You are a transportation supervisor for *BSP Warehouse & Distribution, Inc.* Your company provides storage and shipping services for several vendors throughout the Midwest. As the transportation supervisor, you complete the weekly timesheets for the truck drivers, mechanics, and other employees in your department. You are also responsible for maintaining mileage records and scheduling maintenance for the company's fleet of trucks.

Activity 1: Computing Time Worked

The truck drivers and other employees in your department use a time card to punch in and out on a time clock each day. At the end of the week, you use the time cards to calculate the time worked and complete each employee's weekly timesheet for the payroll department. The method you use to help you compute time worked is to convert the punch times to 24-hour time. Time in the 24-hour format does not use a.m. or p.m. If the time is a.m., it remains the same, except there are always four digits. For example, 5:00 a.m. in 24-hour time is 0500, read as o-five-hundred; 10:30 a.m. is 1030. After 12:59 p.m., times are converted by adding 12 to each hour. For example, 1:00 p.m. is 1300 (thirteen hundred), 3:00 p.m. is 1500 (fifteen hundred), and 7:30 p.m. is 1930 (nineteen thirty).

Example 1: Convert 7:47 a.m. and 5:15 p.m. and 11:45 p.m. to 24-hour time.

7:47 a.m. = 07:47 5:15 p.m. = 17:15 11:00 p.m. = 23:00

Practice 1: Convert the following times to 24-hour time:

4:52 a.m. = _____ 4:35 p.m. = _____ 9:22 p.m. = _____

Example 2a: On Monday, Sam clocked in at 7:09 a.m. and clocked out at 3:23 p.m. In hours and minutes, how much time did Sam work?

Step 1: Convert the times to 24-hour time: 7:09 a.m. = 07:09 3:23 p.m. = 15:23

Step 2: Subtract: 15:23

– 07:09

8:14 → Sam worked 8 hours and 14 minutes.

Example 2b: Kim clocked in at 7:43 a.m. and clocked out at 4:13 p.m. Compute Kim's work time.

Step 1: Convert to 24-hour time: 7:43 a.m. = 07:43 4:13 p.m. = 16:13

Step 2: Subtract: 16:13 → After borrowing: 15:73*

– 07:43

– 07:43

8:30 → Kim worked 8 hours and 30 minutes.

***Note:** In problem 2b, you cannot subtract 43 from 13; therefore, you will need to borrow from the hours. Remember, 1 hour = 60 minutes, so when you borrow, you will take 1 hour from the hours, and add 60 minutes to the minutes.

Practice 2: Carlos clocked in at 7:30 a.m. and clocked out at 4:06 p.m. Compute his work time.

Convert the following standard times to 24-hour time.

1. 8:30 a.m. = _____ 2. 6:15 p.m. = _____ 3. 9:47 p.m. = _____

Compute the time worked, in hours and minutes, for each of the following employees.

4. Juan clocked in at 6:47 a.m. and clocked out at 2:50 p.m.

5. Ivan clocked in at 7:02 a.m. and clocked out at 3:36 p.m.

6. Jim clocked in at 8:10 a.m. and clocked out at 4:03 p.m.

7. Marcus clocked in at 6:52 a.m. and clocked out at 3:06 p.m.

8. Tom clocked in at 6:33 a.m. and clocked out at 2:25 p.m.

9. Paula clocked in at 5:52 a.m. and clocked out at 2:10 p.m.

10. Julie clocked in at 7:15 a.m. and clocked out at 3:45 p.m.

Activity 2: Timesheet Calculations

Part of your job is to complete the timesheets for each of your employees every week. After you calculate the time worked each day, you add these daily amounts together to compute each employee's time for the entire week. You add the minutes and hours separately; if the total number of minutes is more than 60, you will need to convert the minutes into hours by dividing by 60.

Example:

You are completing a timesheet for Kim A. Calculate her time worked for each day and her total time for the week.

Step 1: Convert time clock times to 24-hour time and compute the hours for each day.

Step 2: Add the number of hours and the number of minutes she worked.

Step 3: Convert 125 minutes into hours and minutes: $125 \div 60 = 2$ hours and 5 minutes
Kim's total hours worked: 40 hours and 5 minutes

BSP Timesheet		Week ending: 3/13/2015	Employee: Kim A
Day	IN	OUT	Time Worked
Monday	7:25 a.m.	4:01 p.m.	8:36
Tuesday	7:18 a.m.	3:21 p.m.	8:03
Wednesday	7:38 a.m.	3:00 p.m.	7:22
Thursday	7:46 a.m.	3:36 p.m.	7:50
Friday	7:10 a.m.	3:24 p.m.	8:14
Total hours & minutes			38:125
Total time			40:05

Practice: Complete Juan's timesheet for the week. Use his time in/out to calculate his time worked for each day and his total time worked for the week.

BSP Timesheet		Week ending: 3/20/2015	Employee: Juan B
Day	IN	OUT	Time Worked
Monday	7:47 a.m.	3:55 p.m.	
Tuesday	7:30 a.m.	3:23 p.m.	
Wednesday	7:52 a.m.	3:54 p.m.	
Thursday	7:46 a.m.	3:42 p.m.	
Friday	7:08 a.m.	2:53 p.m.	
Total hours & minutes			
Total time			

Worksheet 2: Timesheet Calculations

Name _____

Calculate the daily time worked and the total weekly time on the following timesheets for the employees in your department.

BSP Timesheet		Week ending: 3/27/15	Employee: Ivan C
Day	IN	OUT	Time Worked
Monday	6:45 a.m.	2:57 p.m.	
Tuesday	6:52 a.m.	2:49 p.m.	
Wednesday	6:57 a.m.	3:01 p.m.	
Thursday	7:01 a.m.	2:58 p.m.	
Friday	6:49 a.m.	2:37 p.m.	
Total hours & minutes			
Total time			

BSP Timesheet		Week ending: 3/27/15	Employee: Jim D
Day	IN	OUT	Time Worked
Monday	7:00 a.m.	3:05 p.m.	
Tuesday	6:49 a.m.	3:00 p.m.	
Wednesday	6:53 a.m.	2:59 p.m.	
Thursday	6:42 a.m.	2:56 p.m.	
Friday	7:03 a.m.	3:01 p.m.	
Total hours & minutes			
Total time			

BSP Timesheet		Week ending: 3/27/15	Employee: Marcus E
Day	IN	OUT	Time Worked
Monday	7:59 a.m.	4:02 p.m.	
Tuesday	7:53 a.m.	3:46 p.m.	
Wednesday	7:57 a.m.	4:00 p.m.	
Thursday	8:00 a.m.	4:08 p.m.	
Friday	7:48 a.m.	3:56 p.m.	
Total hours & minutes			
Total time			

Activity 3: Using odometer readings

Another responsibility you have as the transportation supervisor is to maintain mileage records and schedule maintenance and safety inspections for the company's fleet of trucks. You use the odometer readings to compute the daily mileage and fuel usage for each truck.

Example 1: Truck 101 had a beginning odometer reading of 82957.6. When the driver returned to the warehouse at the end of the day, the odometer reading was 83293.8. How many miles was this truck driven?

To find the number of miles, subtract the beginning odometer reading from the ending odometer reading.

$$83293.8 - 82957.6 = 336.2 \text{ miles}$$

Practice 1: Use the odometer readings to compute the mileage for the following trucks.

Daily mileage record

Truck number	Beginning Odometer Reading	Ending Odometer Reading	Miles driven
102	42321.8	42743.2	
103	78356.7	78605.6	
104	62654.2	62917.8	

Example 2: Trucks receive oil changes approximately every 8000 miles. If truck 105 had an oil change at 62543 miles, when is it due for its next oil change? If the odometer reads 68549, how many more miles can the truck be driven before the next oil change?

$$62543 + 8000 = 70543$$

$$70543 - 68549 = 1994 \text{ miles}$$

Practice 2: Truck brakes are replaced every 20,000 miles. If the brakes were replaced on truck 106 at 42132 miles, when is it due for its next brake replacement? If the odometer reads 59682 miles, how many more miles can the truck be driven before it is due to have the brakes replaced?

Example 3: Truck 107 started with a full tank of fuel on Monday morning and the odometer reading was 85743. On Friday, it took 225 gallons of diesel fuel to fill the tank and the odometer reading was 87544. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

Subtract to find miles driven: $87544 - 85743 = 1801 \text{ miles}$

Divide to find miles per gallon (mpg): $1801 \div 225 = 8.0 \text{ mpg}$

Practice 3: Truck 108 started with a full tank of fuel on Monday morning and the odometer reading was 68254. On Friday, it took 283 gallons of diesel fuel to fill the tank and the odometer reading was 70377. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

Compute the miles driven and complete the daily mileage record for the following trucks.

1 – 3 Daily mileage record

Truck number	Beginning Odometer Reading	Ending Odometer Reading	Miles driven
201	47132.5	49545.1	
202	65637.3	67804.8	
203	72854.2	74426.4	

Answer the following questions about the trucks in your fleet.

4. Trucks receive oil changes approximately every 8000 miles. If truck 204 had an oil change at 53281 miles, when is it due for its next oil change? If the odometer reads 60738 miles, how many more miles can this truck be driven before the next oil change?

5. Trucks receive safety inspections approximately every 12,000 miles. If truck 205 had a safety check at 48267 miles, when is it due for the next safety inspection? If the odometer reads 59124 miles, how many more miles can this truck be driven before the next inspection?

6. Truck 206 started with a full tank of fuel on Monday morning and the odometer reading was 78467. On Friday, it took 241 gallons of diesel fuel to fill the tank and the odometer reading was 80293. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

7. Truck brakes are replaced every 20,000 miles. If the brakes were replaced on truck 207 at 62435 miles, when is it due for new brakes? If the odometer reads 79862 miles, how many more miles can the truck be driven before it is due to have the brakes replaced?

8. Truck 208 started with a full tank of fuel on Monday morning and the odometer reading was 56876. On Friday, it took 232 gallons of diesel fuel to fill the tank and the odometer reading was 58753. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

1. Calculate the daily time worked and the total weekly time on the following timesheet.

BSP Timesheet		Week ending: 3/27/15		Employee: Tom F	
Day	IN	OUT	Time Worked		
Monday	6:53 a.m.	3:22 p.m.			
Tuesday	6:49 a.m.	2:58 p.m.			
Wednesday	6:57 a.m.	3:14 p.m.			
Thursday	7:01 a.m.	3:03 p.m.			
Friday	6:38 a.m.	2:45 p.m.			
Total hours & minutes					
Total time					

2. Compute the miles driven and complete the daily mileage record for these trucks.

Daily mileage record

Truck number	Beginning Odometer Reading	Ending Odometer Reading	Miles driven
301	85221.4	85596.2	
302	71575.6	72001.3	
303	93824.5	94326.8	

3. Answer the following questions about the trucks in your fleet.

Trucks receive oil changes approximately every 7500 miles. If truck 304 received an oil change at 53218 miles, when is it due for its next oil change? If the odometer reads 60283 miles, how many more miles can this truck be driven before the next oil change?

Trucks receive safety inspections approximately every 15,000 miles. If truck 305 received a safety check at 45262 miles, when is it due for the next safety inspection? If the odometer reads 59424 miles, how many more miles can this truck be driven before the next inspection?

Truck 306 started with a full tank of fuel on Monday morning and the odometer reading was 86898. On Friday, it took 241 gallons of diesel fuel to fill the tank and the odometer reading was 89132. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

Practice Problems

Answer Key

Activity 1

Practice 1: 4:52 a.m. = 04:52 4:35 p.m. = 16:35 9:22 a.m. = 21:22

Practice 2: 16:06 → After borrowing: 15:66
 - 07:30 - 07:30

8:36 → Carlos worked 8 hours and 36 minutes.

Activity 2

Practice:

BSP Timesheet		Week ending: 3/20/2015		Employee: Juan B
Day	IN	OUT	Time Worked	
Monday	7:47 a.m.	3:55 p.m.	8:08	
Tuesday	7:30 a.m.	3:23 p.m.	7:53	
Wednesday	7:52 a.m.	3:54 p.m.	8:02	
Thursday	7:46 a.m.	3:42 p.m.	7:56	
Friday	7:08 a.m.	2:53 p.m.	7:45	
Total hours & minutes			37:164	
Total time			39:44	

Activity 3

Practice 1: $42743.2 - 42321.8 = \underline{421.4 \text{ miles}}$

$78605.6 - 78356.7 = \underline{248.9 \text{ miles}}$

$62917.8 - 62654.2 = \underline{263.6 \text{ miles}}$

Practice 2: $42132 + 20000 = \underline{62132}$

$62132 - 59682 = \underline{2450 \text{ miles}}$

Practice 3: $70377 - 68254 = \underline{2123 \text{ miles}}$

$2123 \div 283 = 7.50 \rightarrow \underline{7.5 \text{ mpg}}$

Convert the following standard times to 24-hour time.

1. 8:30 a.m. = 08:30 2. 6:15 p.m. = 18:15 3. 9:47 p.m. = 21:47

Compute the time worked, in hours and minutes, for each of the following employees.

4. Juan clocked in at 6:47 a.m. and clocked out at 2:50 p.m.

$$14:50 - 06:47 = \underline{8:03}$$

5. Ivan clocked in at 7:02 a.m. and clocked out at 3:36 p.m.

$$15:36 - 07:02 = \underline{8:34}$$

6. Jim clocked in at 8:10 a.m. and clocked out at 4:03 p.m.

$$16:03 - 08:10 = \underline{7:53}$$

7. Marcus clocked in at 6:52 a.m. and clocked out at 3:06 p.m.

$$15:06 - 06:52 = \underline{8:14}$$

8. Tom clocked in at 6:33 a.m. and clocked out at 2:25 p.m.

$$14:25 - 06:33 = \underline{7:52}$$

9. Paula clocked in at 5:52 a.m. and clocked out at 2:10 p.m.

$$14:10 - 05:52 = \underline{8:18}$$

10. Julie clocked in at 7:15 a.m. and clocked out at 3:45 p.m.

$$15:45 - 07:15 = \underline{8:30}$$

Worksheet 2: Timesheet Calculations**Answer Key**

Calculate the daily time worked and the total weekly time on the following timesheets for the employees in your department.

BSP Timesheet		Week ending: 3/27/15	Employee: Ivan C
Day	IN	OUT	Time Worked
Monday	6:45 a.m.	2:57 p.m.	8:12
Tuesday	6:52 a.m.	2:49 p.m.	7:57
Wednesday	6:57 a.m.	3:01 p.m.	8:04
Thursday	7:01 a.m.	2:58 p.m.	7:57
Friday	6:49 a.m.	2:37 p.m.	7:48
Total hours & minutes			37:178
Total time			39:58

BSP Timesheet		Week ending: 3/27/15	Employee: Jim D
Day	IN	OUT	Time Worked
Monday	7:00 a.m.	3:05 p.m.	8:05
Tuesday	6:49 a.m.	3:00 p.m.	8:11
Wednesday	6:53 a.m.	2:59 p.m.	8:06
Thursday	6:42 a.m.	2:56 p.m.	8:14
Friday	7:03 a.m.	3:01 p.m.	7:58
Total hours & minutes			39:94
Total time			40:34

BSP Timesheet		Week ending: 3/27/15	Employee: Marcus E
Day	IN	OUT	Time Worked
Monday	7:59 a.m.	4:02 p.m.	8:03
Tuesday	7:53 a.m.	3:46 p.m.	7:53
Wednesday	7:57 a.m.	4:00 p.m.	8:03
Thursday	8:00 a.m.	4:08 p.m.	8:08
Friday	7:48 a.m.	3:56 p.m.	8:08
Total hours & minutes			39:75
Total time			40:15

Compute the miles driven and complete the daily mileage record for the following trucks.

1 – 3 Daily mileage record

Truck number	Beginning Odometer Reading	Ending Odometer Reading	Miles driven
201	47132.5	49545.1	2412.6
202	65637.3	67804.8	2167.5
203	72854.2	74426.4	1572.2

Answer the following questions about the trucks in your fleet.

4. Trucks receive oil changes approximately every 8000 miles. If truck 204 had an oil change at 53281 miles, when is it due for its next oil change? If the odometer reads 60738 miles, how many more miles can this truck be driven before the next oil change?

$$53281 + 8000 = \underline{61281} \quad 61281 - 60738 = \underline{543 \text{ miles}}$$

5. Trucks receive safety inspections approximately every 12,000 miles. If truck 205 had a safety check at 48267 miles, when is it due for the next safety inspection? If the odometer reads 59124 miles, how many more miles can this truck be driven before the next inspection?

$$48267 + 12000 = \underline{60267} \quad 60267 - 59124 = \underline{1143 \text{ miles}}$$

6. Truck 206 started with a full tank of fuel on Monday morning and the odometer reading was 78467. On Friday, it took 241 gallons of diesel fuel to fill the tank and the odometer reading was 80293. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

$$80293 - 78467 = \underline{1826 \text{ miles}} \quad 1826 \div 241 = 7.57 \rightarrow \underline{7.6 \text{ mpg}}$$

7. Truck brakes are replaced every 20,000 miles. If the brakes were replaced on truck 207 at 62435 miles, when is it due for new brakes? If the odometer reads 79862 miles, how many more miles can the truck be driven before it is due to have the brakes replaced?

$$62435 + 20000 = \underline{82435} \quad 82435 - 79862 = \underline{2573 \text{ miles}}$$

8. Truck 208 started with a full tank of fuel on Monday morning and the odometer reading was 56876. On Friday, it took 232 gallons of diesel fuel to fill the tank and the odometer reading was 58753. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

$$58753 - 56876 = \underline{1877 \text{ miles}} \quad 1877 \div 232 = 8.09 \rightarrow \underline{8.1 \text{ mpg}}$$

1. Calculate the daily time worked and the total weekly time on the following timesheet.

BSP Timesheet		Week ending: 3/27/15		Employee: Tom F	
Day	IN	OUT	Time Worked		
Monday	6:53 a.m.	3:22 p.m.	8:29		
Tuesday	6:49 a.m.	2:58 p.m.	8:09		
Wednesday	6:57 a.m.	3:14 p.m.	8:17		
Thursday	7:01 a.m.	3:03 p.m.	8:02		
Friday	6:38 a.m.	2:45 p.m.	8:07		
Total hours & minutes			40:64		
Total time			41:04		

2. Compute the miles driven and complete the daily mileage record for these trucks.

Daily mileage record

Truck number	Beginning Odometer Reading	Ending Odometer Reading	Miles driven
301	85221.4	85596.2	374.8
302	71575.6	72001.3	425.7
303	93824.5	94326.8	502.3

3. Answer the following questions about the trucks in your fleet.

Trucks receive oil changes approximately every 7500 miles. If truck 304 had an oil change at 53218 miles, when is it due for its next oil change? If the odometer reads 60283 miles, how many more miles can this truck be driven before the next oil change?

$$53218 + 7500 = \underline{60718} \qquad 60718 - 60283 = \underline{435 \text{ miles}}$$

Trucks receive safety inspections approximately every 15,000 miles. If truck 305 had a safety check at 45262 miles, when is it due for the next safety inspection? If the odometer reads 59424 miles, how many more miles can this truck be driven before the next inspection?

$$45262 + 15000 = \underline{60262} \qquad 60262 - 59424 = \underline{838 \text{ miles}}$$

Truck 306 started with a full tank of fuel on Monday morning and the odometer reading was 86898. On Friday, it took 241 gallons of diesel fuel to fill the tank and the odometer reading was 89132. How many miles was the truck driven between fill-ups? Approximately how many miles per gallon did the truck average? Round to the nearest tenths place, if necessary.

$$89132 - 86898 = \underline{2234 \text{ miles}} \qquad 2234 \div 241 = 9.26 \rightarrow \underline{9.3 \text{ mpg}}$$