

# A Mathematical Trip In German

## Summary

Students read about an automobile trip and answer mathematical questions about the trip.

## Time Frame

8 class periods of 45 minutes each

## Group Size

Small Groups

## Life Skills

Thinking & Reasoning

## Materials

German/English dictionary  
basic calculator  
writing tools  
paper

## Background for Teachers

Students should be mathematically prepared to add, subtract, multiply, and divide decimal numbers; find time differences; and calculate rates.

Students should know how read aloud in German whole numbers from 1 to 50,000, decimal numbers with tenths and hundredths, and German currency.

## Intended Learning Outcomes

In answering questions students add, subtract, multiply and divide decimal numbers. They find time differences and calculate rates. They also learn differences between written numbers and units of measure in Germany and the U.S.A.

## Instructional Procedures

The following English narrative with mathematical questions is in in the same format as the German one used in this lesson. Students can practice their mathematical skills by reading this narrative and answering the questions which follow. The answers listed below should not be shown to the students until after they have answered the questions.

### **A Family Travels from Murray to Saint George**

John, Karen, and Sue travel with their parents from Murray to Saint George in their Dodge 'Caravan.' At the beginning the tank is full, the odometer reads 28,543 miles and the time is 9:30 a.m. Along the way at 12:45 p.m. they stop in Beaver at a filling station. The tank is filled with 9.2 gallons of gasoline, which costs 12.79. The fuel gauge reads full, the odometer reads 28,741 miles and the time is 1:15 a.m when they leave. As they at 2:45 p.m. arrive in Saint George, the tank is filled with 4.7 gallons of gasoline, which costs 1.49 per gallon. The fuel gauge reads full and the odometer reads 28,846 miles.

Questions:

How many miles did the van travel from Murray to Beaver ?

How many miles from Beaver to Saint George ?

What was the average speed from Murray to Beaver ?  
 What was the average from Beaver to Saint George ?  
 What was the cost of gasoline per gallon in Beaver ?  
 What was the average fuel consumption (mi. / gal.) from Murray to Saint George ?

Answers:

28,741 miles minus 28,543 miles equals **198 miles**.  
 28,846 miles minus 28,741 miles equals **105 miles**.  
 From 9:30 a.m. to 12:45 p.m. is 3 hours 15 minutes or 3.25 hours. 198 miles divided by 3.25 hours equals **60.9 miles per hour**.  
 From 1:15 a.m. to 2:45 p.m. is 1 hour 30 minutes or 1.50 hours. 105 miles divided by 1.50 equals **70.0 miles per hour**.  
 12.79 divided by 9.2 gallons equals **1.39**.  
 198 miles plus 105 miles equals 303 miles. 9.2 gallons plus 4.7 gallons equals 13.9 gallons. 303 miles divided by 13.9 gallons equals **21.8 miles per gallon**.

### Mathematical Procedures

Add, subtract, multiply, and divide decimal numbers

Find time differences

Calculate rates

Addition:	7 und 4 sind zusammen 11	( 7 + 4 = 11 )
Subtraction:	13 weniger 7 ist 6	( 13 - 7 = 6 )
Multiplication:	7 mal 3 gibt 21	( 7 x 3 = 21 )
Division:	24 durch 3 macht 8	( 24 ÷ 3 = 8 )
Time difference:	11 Uhr weniger 9 Uhr ist 2 Stunden	( 11 o'clock - 9 o'clock = 2 hours )
Rate calculation:	60 Kilometer durch 2 Stunden macht 30 Kilometer pro Stunde	( 60 km ÷ 2 hr = 30 km/hr )

Note: In expressing the addition of numbers, *zusammen* may be omitted. This word was used more in the past than it is now.

### Neue Wörter (new words)

das Benzin	gasoline
die Benzinuhr	fuel gauge
der Kilometerzähler	odometer
der Kraftstoffverbrauch	rate of fuel consumption
der Tank	fuel tank
die Tankstelle	filling station
anhalten	stop
ankommen	arrive
dauern	last
füllen	fill
zeigen	display
bis	until
durchschnittlich	on an average
ganz	entire
insgesamt	all together
pro	per
unterwegs	along the way
welch	which

**Eine Familie fährt von Hamburg nach Dortmund**

Uwe, Klaus, und Anna fahren mit ihren Eltern von Hamburg nach Dortmund in ihrem Volkswagen 'Sharan.' Am Anfang ist der Tank voll, der Kilometerzähler zeigt 37.662 Kilometer, und es ist neun Uhr dreißig. Unterwegs um elf Uhr halten sie in Hannover bei einer Tankstelle an. Man füllt den Tank mit 16,8 Liter Benzin, welches 25,87 DM kostet. Die Benzinuhr zeigt voll, der Kilometerzähler zeigt 37.822 Kilometer, und es ist elf Uhr zwanzig. Als sie um dreizehn Uhr zweiunddreißig in Dortmund ankommen, füllt man den Tank mit 21,5 Liter Benzin, das 1,50 DM pro Liter kostet. Die Benzinuhr zeigt voll und der Kilometerzähler zeigt 38.033 Kilometer.

English:

### A Family Travels from Hamburg to Dortmund

Uwe, Klaus and Anna travel with their parents from Hamburg to Dortmund in their Volkswagen 'Sharan.' At the beginning the tank is full, the odometer reads 37,662 kilometer and the time is 9:30 a.m. Along the way at 11:00 a.m. they stop in Hannover at a filling station. The tank is filled with 16.8 liters of gasoline, which costs 25.87 DM. The fuel gauge reads full, the odometer reads 37,822 kilometer and the time is 11:20 a.m. As they at 1:32 p.m. arrive in Dortmund, the tank is filled with 21.5 liters of gasoline, which cost 1.50 DM per liter. The fuel gauge reads full and odometer reads 38.033 kilometer.

#### Kulturelle Unterschiede (cultural differences)

	<u>U.S.A.</u>	<u>Germany</u>
Measure daily time with a	12-hour clock	24-hour clock
Separate hundreds and thousands in numbers with a	comma	period
Separate whole numbers from decimal fractions with a	period	comma
Measure travel distance in	miles	kilometers
Purchase gasoline by the	gallon	liter
Measure fuel useage in	miles per gallon	liters per 100 kilometer

#### Extensions

Man kann auch mit dem Zug oder mit dem Flugzeug von Hamburg nach Dortmund reisen. Man kann, zum Beispiel, mit dem Zug um 9:47 Uhr von Hamburg abfahren und um 12:34 Uhr in Dortmund ankommen. Mit dem Flugzeug kann man um 10:10 Uhr von Hamburg abfliegen und um 13:00 Uhr in Dortmund ankommen.

Fragen:

Wie lange dauert die Reise mit dem Zug ?

Wie lange dauert die Reise mit dem Flugzeug ?

Antworten:

Von 9:47 Uhr bis 12:34 Uhr ist 2 Stunden 47 Minuten.

Von 10:10 Uhr bis 13:00 Uhr ist 2 Stunden 50 Minuten.

#### **English:**

One can also travel by train or airplane from Hamburg to Dortmund. One can, for example, by train leave Hamburg at 9:47 a.m. and arrive in Dortmund at 12:34 p.m. By airplane one can leave Hamburg at 10:10 a.m. and arrive in Dortmund at 1:00 p.m.

Questions:

How much time does the trip take by train ?

How much time does the trip take by airplane ?

Answers:

From 9:47 a.m. until 12:34 p.m. is 2 hours 47 minutes.

From 10:10 a.m. until 1:00 p.m. is 2 hours 50 minutes.

[Deutsche Bahn](#)

**Deutsche Bahn ReiseService**

(German Railroad Travel Service)

[Lufthansa](#)

**Lufthansa**

(German Airlines)

### Assessment Plan

#### **Fragen:**

Wie weit ist es von Hamburg nach Hannover ?

Wie weit ist es von Hannover nach Dortmund ?

Wie weit ist es von Hamburg nach Dortmund ?

Wieviel kostet ein Liter Benzin in Hannover ?

Wieviel kostet das Benzin in Dortmund ?

Wieviel insgesamt kostet das Benzin ?

Durchschnittlich wie schnell fährt der Wagen von Hamburg nach Hannover ?

Durchschnittlich wie schnell fährt er von Hannover nach Dortmund ?

Wie lange dauert die ganze Reise ?

Wieviel ist der Kraftstoffverbrauch (Liter Benzin pro 100 Kilometer) des Wagens von Hamburg nach Hannover ?

#### **Questions:**

How far is it from Hamburg to Hannover ?

How far is it from Hannover to Dortmund ?

How far is it from Hamburg to Dortmund ?

How much does a liter of gasoline cost in Hannover ?

How much does the gasoline cost in Dortmund ?

How much all together does the gasoline cost ?

On an average how fast does the car travel from Hamburg to Hannover ?

On an average how fast does it travel from Hannover to Dortmund ?

How long does the entire trip last ?

What is the rate of fuel consumption (liters of gasoline per 100 kilometers) of the car from Hamburg to Hannover ?

#### **Antworten:**

37.822 Kilometer weniger 37.662 Kilometer ist **160 Kilometer**.

38.033 Kilometer weniger 37.822 Kilometer ist **211 Kilometer**.

160 Kilometer und 211 Kilometer sind zusammen **371 Kilometer**.

25,87 DM durch 16,8 Liter gibt **1,54 DM pro Liter**.

21,5 Liter mal 1,50 DM pro Liter gibt **32,25 DM**.

25,87 DM und 32,25 DM sind zusammen **58,12 DM**.

Von 9:30 Uhr bis 11:00 Uhr ist 1,5 Stunden. 160 Kilometer durch 1,5 Stunden gibt **107 Kilometer pro Stunde**.

Von 11:20 Uhr bis 13:32 Uhr ist 2,2 Stunden. 211 Kilometer durch 2,2 Stunden gibt **96 Kilometer pro Stunde**.

Von 11:00 Uhr bis 11:20 Uhr ist 0,33 Stunden. 1,50 und 0,33 Stunden und 2,20 Stunden sind zusammen **4,03 Stunden**.

16,8 Liter und 21,5 Liter sind zusammen 38,3 Liter. 38,3 Liter durch 371 Kilometer gibt 0,103 Liter pro Kilometer. 0,103 mal 100 Kilometer gibt **10,3 Liter pro 100 Kilometer**.

#### **Answers:**

37,822 kilometers minus 37,662 kilometers is 160 kilometers.

38.033 kilometers minus 37,822 kilometers is 211 kilometers.

160 kilometers plus 211 kilometers is 371 kilometers.

25.87 DM divided by 16.8 liter is 1.54 DM per liter.

21.5 liter times 1.50 DM is 32.25 DM.

25.87 DM plus 32.25 DM is 58.12.DM.

From 9:30 a.m. until 11:00 a.m. is 1.5 hours. 160 kilometers divided by 1.5 hours is 107 kilometers per hour.

From 11:20 a.m. until 1:32 p.m. is 2.2 hours. 211 kilometers divided by 2.2 hours is 96 kilometers per hour.

From 11:00 a.m. until 11:20 a.m. is 0.33 hour. 1.50 hours plus 0.33 hour plus 2.20 hours is 4.03 hours.

16.8 liters plus 21.5 liters is 38.3 liters. 38.3 liters divided by 371 kilometers is 0.103 liters per kilometer. 0.103 times 100 kilometers is 10.3 liters per 100 kilometers.

### Bibliography

Betteridge, Harold T., ed. Cassell's German and English Dictionary (Cassell, London, 1962)

Wahrig, Gerhard Deutsches Wörterbuch (Bertelsmann, Gütersloh, 1974)

### Authors

[Milton Beck](#)