UNIT 3

Measuring the World

Model Presentation 3

CD-17

"Measuring Temperature"

Let's practice the following presentation.

Slide 1

1

Measuring Temperature

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Opening—Greeting
Hello, everyone. I'm Keiko Yamamoto. I'm a student at Tozai University.

Slide 2

2

Introduction

- What is a thermometer?
- How were the standard temperature scales made?

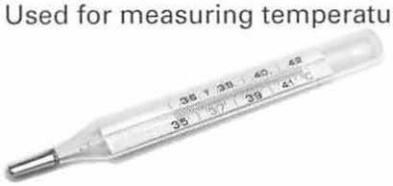
Introduction
Today I'm going to talk about what a thermometer is and how the standard temperature scales were made in modern history.

Slide 3

3

What is a thermometer?

- Named from two Greek words
  "thermo"—heat
  "meter"—to measure
- Used for measuring temperature



Body (1)
The name comes from two Greek words. "Thermo" means heat and "meter" means to measure. The temperature of water can be determined by measuring the height of the liquid in the thermometer.

Slide 4

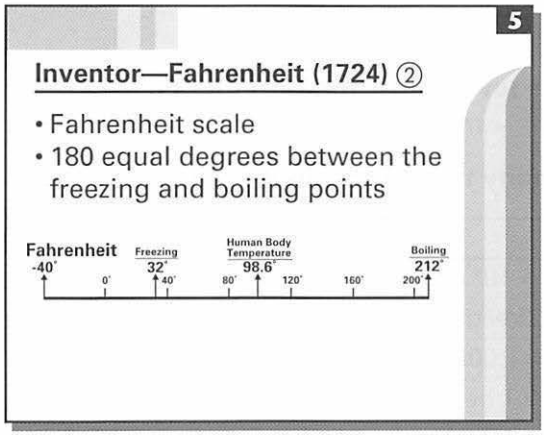
4

Inventor—Fahrenheit (1724) ①

- Mercury thermometer
- Freezing point < boiling point

Body (2)
In 1724 a German physicist, Gabriel D. Fahrenheit, placed a bulb thermometer in freezing water and marked the height of the column of mercury on the glass. He then placed the thermometer in boiling water and marked the new higher height.

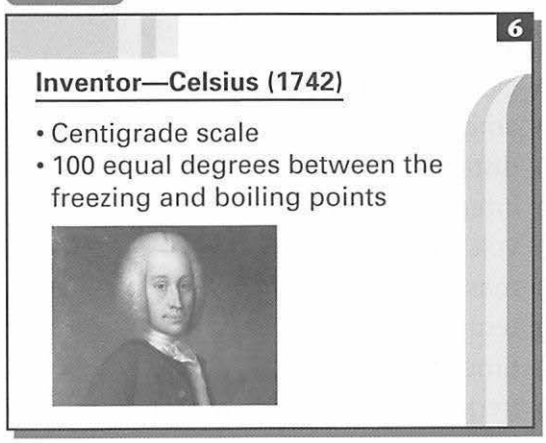
Slide 5



Body (3)

The two marks on the thermometer were separated by 180 equal units, or **degrees**, of temperature. This became known as the Fahrenheit scale.

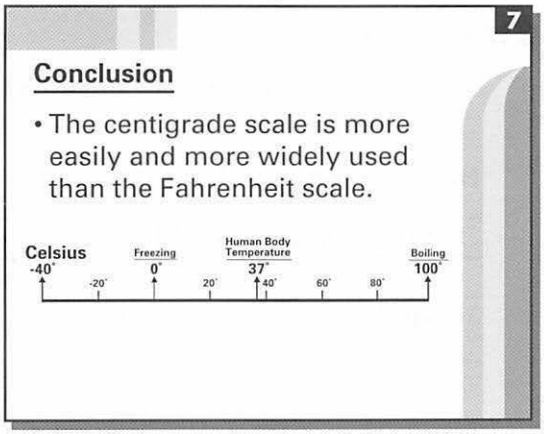
Slide 6



Body (4)

In 1742 Anders Celsius also used the freezing and boiling points of water. However, as the two points are separated by 100 equal **degrees** of temperature, he named this new scale the centigrade scale.

Slide 7



Conclusion

The centigrade scale is much easier to use than the Fahrenheit scale, and today almost all countries in the world use it.

Closing—Thanks

That's the end of my presentation. Thank you.

NOTES

physicist「物理学者」 **mercury**「水銀」

Useful Words & Phrases

■ Measuring

The International System of Units (SI) uses seven basic measurements:

• ampere • candela • kelvin • kilogram • meter • mole • second

Here are some prefixes that you will see many times in various measurements:

Prefix	Abbreviation	Meaning	Typical usage
giga	G	x 10^9	1 gigahertz = 10^9 cycles per second
mega	M	x 10^6	1 megaton (strength of an explosive) = 10^6 tons
kilo	k	x 10^3	1 kilogram = 1,000 g (grams)
deci	d	x 10^{-1}	1 decibel = 0.1 bel
centi	c	x 10^{-2}	1 centimeter = 0.01 m (meter)
milli	m	x 10^{-3}	1 milliampere = 0.001A (ampere)
micro	μ	x 10^{-6}	1 microvolt=10^{-6} V (volt)
nano	n	x 10^{-9}	1 nanosecond = 10^{-9} s (second)
pico	p	x 10^{-12}	1 picofarad =10^{-12} F (farad)

Exercise A

Match each unit of measurement to what it measures.

Measurement	Measures
1. meter (m)	**a)** electric current
2. gram (g)	**b)** amount
3. second (s)	**c)** distance
4. ampere (amp/A)	**d)** intensity of light
5. kelvin (K)	**e)** voltage
6. mole (mol)	**f)** mass
7. candela (cd)	**g)** temperature
8. hertz (Hz)	**h)** time
9. volt (V)	**i)** frequency

Exercise B

Using the table above, write out these expressions.

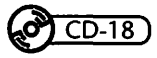
Example: 2 μm = two micrometers = two times ten to the power of minus six meters

1. 5 ns = five _____ = five times _____ seconds

2. 8 MA = eight _____ = eight times _____ amperes

3. 7 kHz = seven_____ = seven times _____ hertz

Exercise C



Listen and complete the following sentences.

1. The building was [1]_____ m [2]_____, [3]_____ m wide and [4]_____ m [5]_____.
2. The internal resistance of this battery is [6]_____ [7]_____.
3. The train was traveling at a velocity of [8]_____ [9]_____/[10]_____.
4. The whisper was measured at [11]_____ [12]_____.
5. The pressure exerted on the pavement by the truck was [13]_____ [14]_____.
6. The temperature of the oil was 130° [15]_____.

Now, take turns reading the sentences to each other.

Exercise D

Make sentences from the following scrambled words and phrases. Begin the first word in each sentence with a capital letter.

Example: the output / is / voltage / of / 100 volts / the generator / .
→ The output voltage of the generator is 100 volts.

1. is equal / 1,000 grams / a kilogram / to / .
→ _____
2. be / 3 x 10^6 volts / written / three megavolts / could / as / .
→ _____
3. two-dimensional / is / and / measured / in / area / be / square / meters / can / .
→ _____
4. one / about / 30 / light / centimeters / in / nanosecond / travels / .
→ _____

Now, work with a partner and check your answers. Take turns reading the sentences to each other.

Language Skills

Listening Practice CD-19

Listen to a presentation on SI units of measurement, and fill in the following transcript.

Did you know that scientists use only seven fundamental units of measurement? These units of measurement can be used to measure anything in the various fields of physics. For mechanics there are the meter, the [1)]_____ and the second. For electrical current there is the [2)]_____. For temperature there is the [3)]_____. For the amount of a substance there is the [4)]_____. And for intensity of light there is the [5)]_____. These seven units can be used to measure the behavior of materials as well. For example, magnetic field strength is measured as amperes per meter. Acceleration is meters per second squared. Force is mass times distance over time squared. But who decides how long a meter is, how heavy a kilogram is, how long a second is and so on? This is the job of the International Bureau of Weights and Measures in France. For example, the Bureau defines a meter by how far light travels during one 299,792,458th of a second. Yes, that's one 299,792,458th of a second. The Bureau's definition of a second is also very exact. A second is 9,192,631,770 periods of vibration of the cesium 133 atom. These fundamental units of measurement are extremely important in the scientific world.

NOTES

International Bureau of Weights and Measures「国際度量衡局」

Homework

Make an outline of the body of this presentation. Use three slides.

Key: ① Scientists use seven units of measurement.
② They can also be used to measure the behavior of materials.
③ What is the job of the International Bureau of Weights and Measures in France?

Pronunciation Practice CD-20

1. Mark rising (↑), falling (↓) or listing (→) intonation in each blank.

i) Did you know that scientists use only seven fundamental units of measurement? ( )

ii) For mechanics ( ) there are the meter ( ), the kilogram ( ) and the second ( ).

iii) But who decides how long a meter is ( ), how heavy a kilogram is ( ), how long a second is ( ) and so on? ( )

Now, repeat the sentences. Be sure to make appropriate pauses.

2. Listen. Write down the numbers you hear. Then read them aloud. CD-21

i) the year [ ] the year [ ]

ii) [ ] [ ]

iii) [ ] [ ]

UNIT 4

What Makes It Happen?

Model Presentation 4

CD-22

"The Internal Combustion Engine"

Let's practice the following presentation.

Slide 1

1

The Evolution of Engines

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Opening—Greeting
Good afternoon. I'm Maki Saito. I'm a first-year student at Tozai University.

Slide 2

2

Introduction

- Modern engines have become more powerful and more efficient.

—How is this possible?

Introduction
Modern engines have become more powerful and more efficient than the ones in the early 20th century. I'll explain how this is possible.

Slide 3

3

1. Intercooler

- Cooler air means greater expansion.
- The greater the expansion, the greater the power.

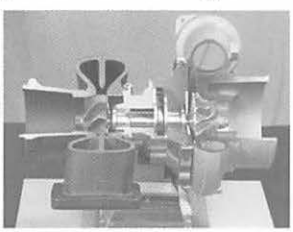
Body (1)
First, the incoming air is cooled in an intercooler **because** cool air expands more during combustion than hot air. The greater the expansion, the greater the power delivered by the engine.

Slide 4

4

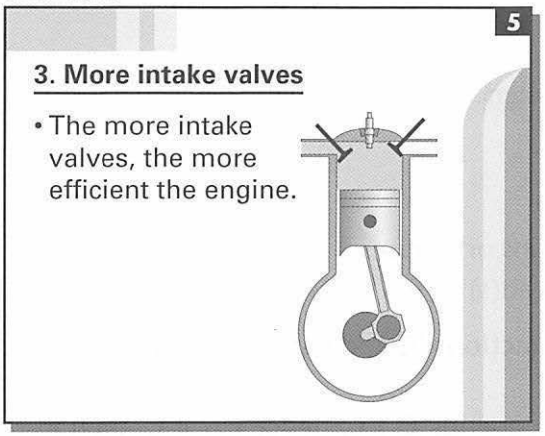
2. Turbochargers

- The more fuel, the more powerful the engine.



Body (2)
Second, turbochargers pressurize the incoming fuel-air mixture. More fuel in the combustion chamber makes a more powerful engine.

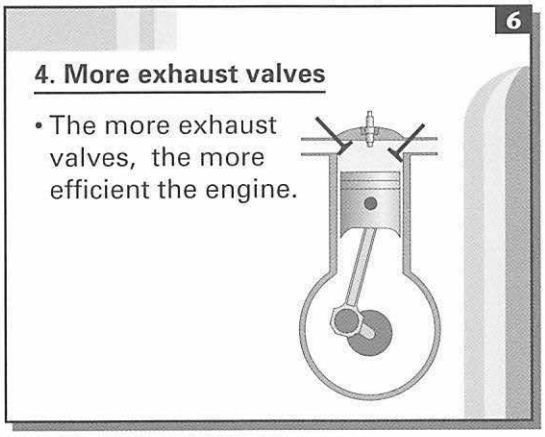
Slide 5



Body (3)

Third, using more intake valves decreases the time needed to fill the cylinder. This speeds up the intake cycle and makes the engine more efficient.

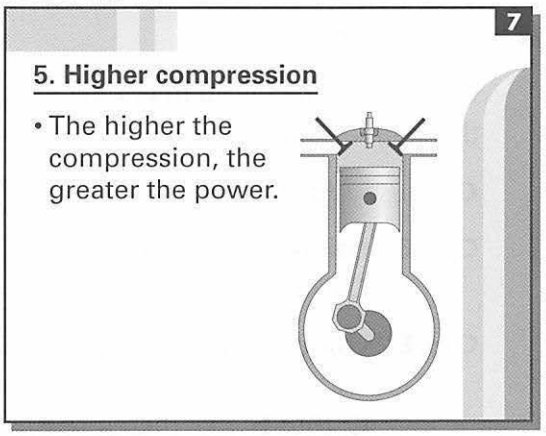
Slide 6



Body (4)

Fourth, using more exhaust valves makes the exhaust cycle smoother and quicker. The faster the exhaust cycle, the more quickly the intake cycle can begin. More cycles per minute **result in** a more efficient engine.

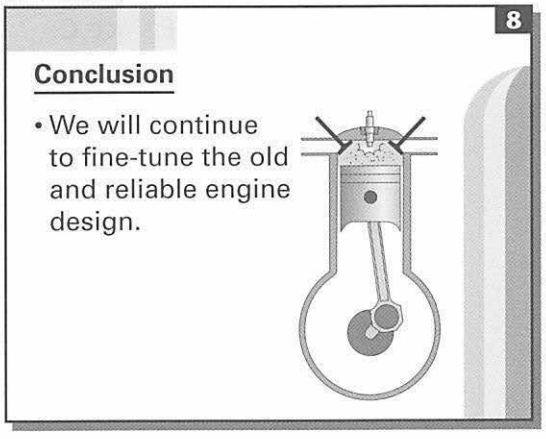
Slide 7



Body (5)

Fifth, higher compression results in a stronger explosion. **Consequently**, more power is transferred to the crankshaft, although there is a limit.

Slide 8



Conclusion

Thus, we will continue to fine-tune the old and reliable engine design that we use today.

Closing—Thanks

Thank you for your attention.

NOTES

intercooler「中間冷却器，インタークーラー」 **deliver**「(力を) 出す (= produce)」 **pressurize**「加圧する」 **fuel-air mixture**「(空気と燃料の) 混合気」 **combustion chamber**「燃焼室」 **intake valve**「吸気弁」 **exhaust valve**「排気弁」 **compression**「圧縮」 **crankshaft**「クランク軸」 **fine-tune**「微調整する」 **reliable**「信頼性のある」

■ Cause & Effect

Cause and effect is an important concept in science. There are many ways to describe this relationship.

C: Cause / **E:** Effect

C → E **Using verbs** (C and E should be nouns or phrases.)
C cause(s) **E**. / **C** produce(s) **E**. / **C** lead(s) to **E**. / **C** result(s) in **E**.

C → E **Using conjunctive adverbs or conjunctions** (C and E should contain a subject and predicate.)
C; thus **E**. / **C**; therefore **E**. / **C**; consequently **E**. / **C**; hence **E**. / If **C**, then **E**.

E → C **Using verbs** (E and C should be nouns or phrases.)
E is caused by **C**. / **E** is produced by **C**. / **E** results from **C**.

E → C **Using phrases** (E and C should be nouns or phrases.)
E is due to **C**. / **E** is because of **C**.

E → C **Using conjunctions** (E and C should contain a subject and predicate.)
E because **C**. / **E** since **C**.

Exercise A CD-23

Make sentences from the following scrambled words and phrases. Begin the first word in each sentence with a capital letter.

1. to ignite / the spark plug / causes / the fuel-air mixture / .

2. due to / the combustion chamber / the valves being closed / is / sealed / .

3. compressed / the fuel-air mixture / will / the piston / then / moves / up / the cylinder, / be / if / .

4. leads / the piston's up and down movement / of / the crankshaft / to / the rotation / .

5. oil / in the engine burning oil / in the combustion chamber / results / .

Now, work with a partner and check your answers. Take turns reading the sentences to each other.

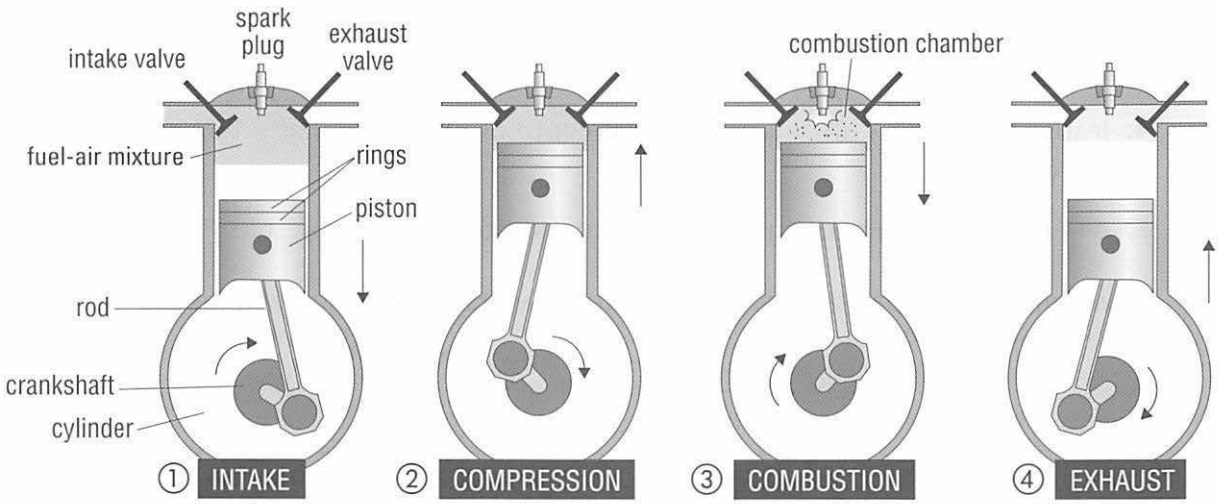
NOTES

ignite「点火する」 **seal**「密閉する」

Listening Practice

CD-24

Listen to the presentation on the internal combustion engine. Then, fill in the following transcript.



Hello. We have all heard the smooth, purring sound of a well-tuned engine. But in fact, that smooth-sounding engine is making hundreds of explosions every second! Most car engines use a four-stroke combustion cycle to convert gasoline into motion. The four strokes are illustrated in the diagram. They are: the intake stroke, the compression stroke, the combustion stroke and the exhaust stroke. I'll now explain the four strokes in more detail. During stroke 1—or the intake stroke—the piston starts at the top, the intake valve opens, and the piston moves [1)]_____. As the piston moves down, the mixture of fuel and air enters the engine. Only the tiniest drop of gasoline is mixed into the air. Stroke 2 is called the compression stroke. During this stroke the piston moves [2)]_____ the cylinder. Because both valves are [3)]_____, the fuel-air mixture is compressed in the cylinder. This compression makes the explosion of the mixture more powerful. Picture 3 shows the third stroke. This stroke is often called the combustion stroke. During this stroke both valves are [4)]_____. The spark plug emits a spark, and as a result the fuel-air mixture ignites. The gasoline in the cylinder explodes, and consequently the piston is driven down. Picture 4 represents the exhaust stroke, or fourth stroke. In this stage, the piston is driven to the top of the cylinder. The exhaust valve

5)_____ and the exhaust leaves the cylinder to go out of the tail pipe. The engine is now ready for the next cycle.

NOTES

internal combustion engine「内燃機関」

Homework

Make an outline of the body of this presentation. Use one slide for each stroke.

Key: ① strokes – intake, compression, combustion, exhaust
② intake / exhaust valve – open / close
③ piston – up / down
④ fuel-air mixture
⑤ spark

Pronunciation Practice CD-25

1. Listen. Mark the pauses in each sentence. Use slashes (/) to show the pauses. Then repeat the sentences. Be sure to make appropriate pauses.

i) But in fact, that smooth-sounding engine is making hundreds of explosions every second!

ii) They are: the intake stroke, the compression stroke, the combustion stroke and the exhaust stroke.

iii) This stroke is often called the combustion stroke.

iv) The spark plug emits a spark, and as a result, the fuel-air mixture ignites.

v) Picture 4 represents the exhaust stroke, or fourth stroke.

2. Listen and repeat. Pay special attention to the underlined parts. CD-26

- <u>l</u>ight / <u>r</u>ight
- <u>cl</u>osed / <u>cr</u>ocodile
- ex<u>pl</u>osion / com<u>pr</u>ession

UNIT 5

What's the Difference?

Model Presentation 5

CD-27

"The Three Main Types of Bridges"

Let's practice the following presentation.

Slide 1

1

Three Types of Bridges

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Opening—Greeting

Good morning. My name is Kenji Tanaka. I'm a freshman at Tozai University.

Slide 2

2

Introduction

- Three types of bridges:
  beam bridge
  arch bridge
  suspension bridge

—How are they different?

Introduction

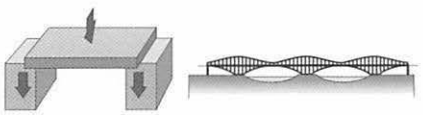
Today I'm going to talk about the three main types of bridges and the **differences** between them.

Slide 3

3

Beam bridge

- Horizontal
- Supported by only two piers
- Maximum span—70 m



Body (1)

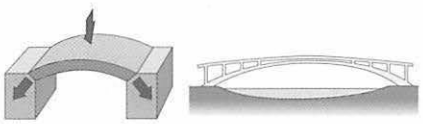
The first type is the beam bridge. It is horizontal. The weight of the beam and the deck is supported by only two piers. The maximum span is **the shortest** of the three bridges—70 meters.

Slide 4

4

Arch bridge

- Semicircular arch helps dissipate the weight
- Durable
- Maximum span—300 m



Body (2)

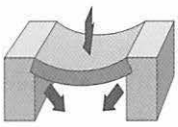
Second, let's look at the arch bridge. **Unlike** the beam bridge, it is semicircular. The arch allows it to dissipate the weight of the bridge very effectively into the earth, so it lasts for a long time. The maximum span is 300 meters, **longer than** the beam bridge.

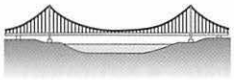
Slide 5

5

Suspension bridge

- Most modern
- Uses cables, towers and anchorages
- Maximum span—2,100 m





Body (3)

The third is the suspension bridge. It is **the most modern** bridge design. It uses cables which are strung through two tall towers and run between two anchorages. The cables transfer the weight of the deck to the towers, which in turn transfer it to the ground and the anchorages. The maximum span is 2,100 meters, **the longest** of the three.

Slide 6

6

Conclusion

- Based on the obstacle, the budget, the span and the traffic, engineers will choose one of them.

Conclusion

Based on the obstacle, the budget, the span and the traffic, engineers will choose any of the types of bridges mentioned above when designing a bridge.

Closing—Thanks

~~That's all I want to say today.~~ Thank you.

NOTES

beam bridge「桁橋」 **horizontal**「水平の」 **beam**「橋桁」 **deck**「橋の上面」 **pier**「橋脚」 **span**「支間（橋を下から支える橋脚間の距離）」 **arch bridge**「アーチ橋」 **semicircular**「半円の，アーチ型の」 **dissipate**「分散する」 **suspension bridge**「吊り橋」 **string**（過去・過去分詞形 strung）「吊るす」 **anchorage**「アンカーブロック，アンカーレイジ（レッジ）」 **obstacle**「障害物」

Useful Words & Phrases

■ Comparing & Contrasting

We use adjectives to describe objects.

Adjective	Comparative form	Superlative form
long	longer	the longest
wide	wider	the widest
well-designed	better-designed	the best-designed
cost-efficient	more cost-efficient	the most cost-efficient
expensive	more expensive	the most expensive
spacious	more spacious	the most spacious

Here are some useful words to compare and contrast objects and ideas.

i) Comparing two things: • also • too • similar to • like • the same as • as . . . as • both

ii) Contrasting two things: • different from • unlike • although • but • while • whereas • however • on the other hand

Exercise A

Complete the following sentences. Use a form of the adjective in parentheses. If you like, you can replace "x, y, z" with the names of real cars.

1. X is the _____ _____ car on the market at the moment.
(popular)

2. Y is the _____ car on the market, although it is also the _____ _____.
(fast / expensive)

3. While Z is the _____ _____ car available today, it is also the _____.
(compact / slow)

4. Z is _____ and _____ _____ than X. On the other hand,

X is _____ to maintain than Z.
(long / spacious / easy)

5. X is _____ _____ to drive than Z, as is Y.
(enjoyable)

6. Z emits _____ pollutants than X.
(few)

Exercise B

CD-28

Listen and make sentences from the following scrambled words and phrases. Begin the first word in each sentence with a capital letter.

1. a bicycle, / the bicycle / although / is / is faster / than / than / a car / the car / more efficient / .

2. Bridge A spans a river, / Bridge B / a road / whereas / spans / .

3. of / is / the DVD / as / the price / that of the video / the same / .

4. tapes, / a laser light / CDs / are / unlike / read / using / .

5. the ISS / has / like / no / other space stations, / propulsion system / .

Now, work with a partner and check your answers. Take turns reading the sentences to each other.

Exercise C

CD-29

Work with a partner. Compare the cars.

Examples

A: Which is faster, the Artemis or the Pegasus?
B: The Pegasus is faster than the Artemis.

A: Which is the most powerful of the three cars?
B: The Pegasus is the most powerful of the three, because it has the largest engine.

	Artemis	Pegasus	Super Wagon
			
Engine size	2.5 liters	3.5 liters	2.0 liters
Number of cylinders	8	12	6
Fuel economy	20 mpg*	20 mpg	25 mpg
Max speed	150 mph	180 mph	125 mph
Air resistance**	0.4	0.31	0.5
Price	$29,000	$50,000	$19,000

* miles per gallon
** drag coefficient

Listening Practice CD-30

Listen to the presentation on three famous bridges, and fill in the following transcript.



Good morning. Today I'm going to talk about three important bridges in the world. The first bridge I'm going to introduce is the Royal Gorge Bridge in Colorado, America. The main span of the bridge is 268 meters long, and the deck of the bridge is supported by two supports on either side of the gorge. These supports hold the deck 320 meters above the Arkansas River. These supports are 46 meters high from top to bottom. 1)_____ famous bridge is the Akashi Kaikyo Bridge in Japan. The main span is 1,991 meters. 2)_____ the Royal Gorge Bridge, the Akashi Kaikyo Bridge has two supports. These supports are 298 meters high. 3)_____ the American bridge was built in 1929, the Japanese bridge was completed in 1998. The Akashi Kaikyo Bridge is 35.5 meters wide, which is much wider than the Royal Gorge Bridge. Finally, I am going to talk about the 4)_____ bridge in the world. The Millau Bridge is in France, and it spans a river valley. It has seven supports and a total length of 2,460 meters. It is 32 meters wide. The deck of the bridge is 270 meters above the valley floor. In addition, the tallest support of the Millau Bridge is an amazing 343 meters high. The Millau Bridge is the 5)_____ bridge of the three as it was completed in 2004. I showed you the differences between these three famous bridges.

Homework

1. Complete the following table. Use the presentation to find the necessary information.

Name	Royal Gorge Bridge	Akashi Kaikyo Bridge	Millau Bridge
Country	USA	Japan	
Span		1,991 m	2,460 m
Height of the deck	320 m	—	270 m
Highest support	46 m		
Number of supports			
Year completed			2004
Width	—	35.5 m	

2. Make an outline of the body of the presentation. Use three slides.

Pronunciation Practice

1. Listen. Mark whether the presenter has a happy, cheerful voice.

i) "I'm glad to be here today."

ii) "Thank you for your attention."

iii) "Are there any questions?"

iv) "Thank you for your question."

v) "That's right. We can do that!"

Now, repeat the sentences.

2. Listen and pay special attention to the difference between /b/ and /v/. 

Then, repeat.

i) The Millau Bridge is in France, and it spans a river valley.

ii) The deck of the bridge is 270 meters above the valley floor.