



# TEACHER WORKSHEET

CYCLE 3 • SCIENCE

## SPEED AT THE OLYMPIC GAMES

### OVERVIEW

#### EDUCATIONAL OBJECTIVES:

- Recognize an object's movement (trajectory and speed: units and orders of magnitude).
- Know a few standard speed units.
- Analyze rectilinear motion in which speed (absolute value) is constant or variable (acceleration, deceleration).

#### SPECIFIC SKILLS IN SCIENCE:

- Describe motion and identify the differences between circular and rectilinear motion.
- Develop and implement a system to understand the concepts of motion and measurement of an object's speed.

#### INTERDISCIPLINARY SKILLS:

- **PE:**
  - Understand performance in the context of human performance.
  - Try out social roles specific to various forms of physical activity and sports, and to the class (player, coach, referee, judge, observer, tutor, mediator, organizer, etc.).
- **Mathematics:**
  - Compare, arrange, and insert decimal numbers and understand inequalities.
  - Recognize and solve problems with proportions using the right method.
  - Units of length.
  - Standard units of measurement.
  - Distance between two points.

- **Art:**

- Understand how IT tools can be used to work with images and retrieve information for art projects.
- Identify different categories of images, how they were made, and how they were changed.
- Take viewers and the desired effect into account.

#### SCHEDULE FOR SESSIONS:

- Read texts and instructions aloud as a class.
- Do individual activities: Photo editing and problem-solving.
- Do activities in pairs: Measurements and video editing.
- Share with class and review.
- Extend activity.

#### DURATION:

- 3 sessions (45 minutes each).

#### ORGANIZATION:

- Work alone or in pairs, then share work as a class.

➔ **OLYMPIC GAMES KEYWORDS:**  
**OLYMPIC DISCIPLINE • RECORD •**  
**OLYMPIC EVENT**



## CONCEPTS ADDRESSED

### PROGRAM OVERVIEW

This part of the science curriculum aims to use examples from Summer and Winter Olympic events to introduce students to the nature of athletic movement.

Athletes strive to move faster (and also higher and further), and records set by top athletes should be analyzed and compared to the speeds of certain animals.

In Activity 2 students are asked to compare their performance to that of record-breakers.

The following vocabulary words should be familiar and mastered: running, skiing, sport, speed, distance, motion, trajectory, record, race, chronophotography, accelerated, decelerated, constant (i.e. always moving at the same speed).

### THE FIVE OLYMPIC SKIING EVENTS

#### • Alpine skiing

Skiing was once a basic means of transportation, but became a sport in the late 19th century. The first civilian competitions were held in the 1840s in northern and central Norway. The first national ski race was held in 1868 in Christiania (now Oslo), then the capital of Norway. Sondre Norheim won the race, which sparked a new trend. Decades later, skiing spread throughout Europe and the United States, where in winter miners held races for fun. The first slalom race was organized by Sir Arnold Lunn in 1922 in Mürren, Switzerland.

#### • Cross-country skiing

Cross-country skiing is the oldest type of skiing. It originally developed through the need to travel over snow-covered terrain, and became a sport in the late 19th century.

#### • Ski jumping

Ole Rye wrote the first page in the history of ski jumping in 1808 when he jumped 9.50 meters. But the father of ski jumping is actually considered to be the Norwegian skier Sondre Norheim. In 1866, he won the world's first ever ski jumping competition with prizes, in Ofte and Høydalsmo, Norway.

#### • Nordic combined

This sport combines ski jumping and cross-country skiing.

#### • Freestyle skiing

At the turn of the 20th century, skiers started doing aerial stunts in Norway, Italy, and Austria. Later, in the early 1920s, American freestyle skiers started doing flips. Then freestyle skiing really took off in the 1960s when social changes and freedom of expression, in addition to advances in equipment, led to newer and even more exciting techniques.

### FUN FACT!

Wooden planks of different shapes and sizes were found in peat bogs in Russia, Finland, Sweden, and Norway, which seems to indicate that skiing dates back to Prehistoric times! Some Neolithic carvings depict men on skis.





Freestyle skiing was originally known as “*hot dog*” skiing, a name that captured the new sport’s mix of moves, jumps, and adrenaline rush.

## PHOTOGRAPHY AND SKIING

During the second half of the 19th century, photography developed as both a profession and pastime through technological advances.

At the same time, physical activity was gaining popularity, and modern sports became a social phenomenon. Running, tennis, rugby, and football events multiplied and became ever-more popular. Sports soon caught the interest of experts in scientific photography. As early as the 1880s, the great French physiologist Étienne-Jules Marey used photography to study how athletes—his experimental subjects—moved. The fascination with speed, energy, and performance explain how scientific interest in sports and the dominant values of the Belle Époque period came together.

## STUDENT WORKSHEET OVERVIEW

### VOCABULARY:

Imprint, motion, trajectory, circular, rectilinear, any, chronophotography, acceleration, deceleration, Belle Époque.

### ACTIVITIES:

#### ▶ ACTIVITY 1: DIFFERENT WAYS TO MOVE ON SKIS

Describe motion and identify the differences between circular and rectilinear motion

9–10 yr | 10–11 yr | 11–12 yr

Materials: Photo and video

#### ▶ ACTIVITY 2: SPEED RECORDS AT THE OLYMPIC GAMES

Develop and implement a system to understand the concepts of motion and measurement of an object’s speed

9–10 yr | 10–11 yr | 11–12 yr

Materials: Texts and physical activities (have students run 100 meters)

#### ▶ ACTIVITY 3: WHEN SPEED CHANGES

Analyze rectilinear motion in which speed is constant or variable (acceleration, deceleration)

9–10 yr | 10–11 yr | 11–12 yr

Materials: Photography by Georges Demeny

### 🔍 FIND OUT MORE:

Work can be done in art, using a model.



## STUDENT WORKSHEET ANSWER KEY

### ▶ ACTIVITY 1: DIFFERENT WAYS TO MOVE ON SKIS

Describe motion and identify the differences between circular and rectilinear motion

9-10 yr | 10-11 yr | 11-12 yr

1) The imprint tells us the skier's movement.

- 2)
- Alpine skier •
  - Freestyle skier •
  - Cross-country skier •
- Straight line
  - Circle
  - Curve
- 

3)

Video link	Object	Trajectory type
<a href="https://www.youtube.com/watch?v=HM85HfYNVkl">https://www.youtube.com/watch?v=HM85HfYNVkl</a> 00:01:13-00:01:16	Curling stone	Rectilinear
<a href="https://www.youtube.com/watch?v=x12c0DVUB7U">https://www.youtube.com/watch?v=x12c0DVUB7U</a> 00:00:22-00:00:24	Ice skater in red	Rectilinear
<a href="https://www.youtube.com/watch?v=KK77jDwfd1M">https://www.youtube.com/watch?v=KK77jDwfd1M</a> 00:01:55-00:02:04	Bobsleigh	Rectilinear
<a href="https://www.youtube.com/watch?v=KK77jDwfd1M">https://www.youtube.com/watch?v=KK77jDwfd1M</a> 00:02:06-00:02:09	Bobsleigh	Circular
<a href="https://www.youtube.com/watch?v=MB-5_bgqRZU">https://www.youtube.com/watch?v=MB-5_bgqRZU</a> 00:01:14-00:01:32	Hockey puck	Any
<a href="https://www.youtube.com/watch?v=TbGh8AUytVQ">https://www.youtube.com/watch?v=TbGh8AUytVQ</a> 00:01:33-00:01:35	Snowboard-cross athlete	Circular
<a href="https://www.youtube.com/watch?v=yc67Zlj15wg">https://www.youtube.com/watch?v=yc67Zlj15wg</a> 00:01:48-00:01:52	Freestyle skier	Circular

### ▶ ACTIVITY 2: SPEED RECORDS AT THE OLYMPIC GAMES

Develop and implement a system to understand the concepts of motion and measurement of an object's speed

9-10 yr | 10-11 yr | 11-12 yr

1) The decameter

- 4)
- Panther •
  - Gazelle •
  - Chicken •
  - Elephant •
  - Snail •
- 8.3 m/s
  - 0.013 m/s
  - 16.7 m/s
  - 25 m/s
  - 4.2 m/s
-



### ▶ ACTIVITY 3: WHEN SPEED CHANGES

Analyze rectilinear motion in which speed (absolute value) is constant or variable (acceleration, deceleration) **9-10 yr** | **10-11 yr** | **11-12 yr**



- 1) For example, the red dots above.
- 2) Take point measurements and check the results obtained based on the size of the duplicate image.
- 3) The distance between two images increases.
- 4) The runner accelerates.



## FIND OUT MORE

### DIGITAL RESOURCES

Learn more about the Olympic Games:  
<https://www.olympic.org/olympic-games>

### FURTHER READING FOR STUDENTS

<http://www.lescleftsdelecole.com/Clefts-des-champs/Listes-de-lecture/Sport-et-olympisme>

### PHOTOGRAPHY AND SPORTS

<https://www.histoire-image.org/etudes/sport-photographie-scientifique>

### ACTIVITIES FOR STUDENTS

“It’s your turn! Speed at the Olympic Games”  
(and answer key)





# STUDENT WORKSHEET

CYCLE 3 • SCIENCE



## SPEED AT THE OLYMPIC GAMES

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### VOCABULARY



**IMPRINT:** A natural mark left by the pressure of a body in contact with a surface.  
E.g. footprints.

**MOTION:** The movement of a body, a change of position in space.  
E.g. the back-and-forth motion of a swing.

**TRAJECTORY:** The path followed by a moving body in air or space.

**CIRCULAR:** Having the form of a circle.

**RECTILINEAR:** Being or moving in a straight line.

**ANY:** One or some of a thing or number of things.

**CHRONOPHOTOGRAPHY:** The analysis of an object's motion through photography.

**ACCELERATE:** To increase the speed of a moving body.

**DECELERATE:** To reduce the speed of a moving body.

**BELLE ÉPOQUE:** The historical period that spans from the end of the 19th century to 1914, during which there were a number of technological, political, social, and economic advances.



### TIPS & TRICKS



To figure out the type of trajectory, **choose a point in the middle of the object** (the curling stone's center, the skier's stomach, etc.) and **locate its position in each frame** by scrolling through the footage in slow motion. **You can put a sticker** on that point on the computer screen or whiteboard to help you.



### ACTIVITIES

#### ► ACTIVITY 1: DIFFERENT WAYS TO MOVE ON SKIS

Look at the following pictures and answer the questions:



Alpine skier



Cross-country skier



Freestyle skier



1) What information is given by the imprint left by the skier in the snow?

.....  
.....

2) Match each skier to the correct ski trajectory:

- |                       |                 |
|-----------------------|-----------------|
| Alpine skier •        | • Straight line |
| Freestyle skier •     | • Circle        |
| Cross-country skier • | • Curve         |

3) At the Winter Olympic Games, athletes or objects in other sports may have very different trajectories.

Fill in the following table with the words **circular**, **rectilinear** or **any** (when you do not recognize the trajectory). Don't forget to base your answers off of the video clips!

Video link	Object	Trajectory type
<a href="https://www.youtube.com/watch?v=HM85HfYNVkl">https://www.youtube.com/watch?v=HM85HfYNVkl</a> 00:01:13–00:01:16	Curling stone	
<a href="https://www.youtube.com/watch?v=x12c0DVUB7U">https://www.youtube.com/watch?v=x12c0DVUB7U</a> 00:00:22–00:00:24	Ice skater in red	
<a href="https://www.youtube.com/watch?v=KK77jDwfd1M">https://www.youtube.com/watch?v=KK77jDwfd1M</a> 00:01:55–00:02:04	Bobsleigh	
<a href="https://www.youtube.com/watch?v=KK77jDwfd1M">https://www.youtube.com/watch?v=KK77jDwfd1M</a> 00:02:06–00:02:09	Bobsleigh	
<a href="https://www.youtube.com/watch?v=MB-5_bgqRZU">https://www.youtube.com/watch?v=MB-5_bgqRZU</a> 00:01:14–00:01:32	Hockey puck	
<a href="https://www.youtube.com/watch?v=TbGh8AUytVQ">https://www.youtube.com/watch?v=TbGh8AUytVQ</a> 00:01:33–00:01:35	Snowboard-cross athlete	
<a href="https://www.youtube.com/watch?v=yc67Zljl5wg">https://www.youtube.com/watch?v=yc67Zljl5wg</a> 00:01:48–00:01:52	Freestyle skier	

### 🔍 FIND OUT MORE: WHERE DOES SKIING COME FROM?

#### • Ancestral origins

Wooden planks of different shapes and sizes were found in peat bogs in Russia, Finland, Sweden, and Norway, which seems to indicate that skiing dates back to Prehistoric times!

Ski fragments found in Russia appear to date back to 7,000 or 8,000 B.C. It is now thought that skiing has been a part of life for populations in the north for several millennia.



• **Norwegian origins**

For centuries in snowy northern landscapes, skis have been essential to hunt and gather firewood in winter. The long distances between small, remote communities and the harsh winters have also made skiing a way to bring people together. “Ski” is a Norwegian word, derived from *skið*, a term used to refer to a piece of split wood.

► **ACTIVITY 2: SPEED RECORDS AT THE OLYMPIC GAMES**



**FUN FACT!** The world record in the men’s 100 meters is currently held by Jamaican sprinter Usain Bolt with a time of 9.58 seconds, which he set on August 16, 2009.

**Exercise 1**

**Time a 100-meter run:**

During P.E. class, measure the time it takes a classmate to run 100 meters. Start the stopwatch as soon as your teacher gives the starting signal (with a whistle or starting pistol) and stop it as soon as your classmate crosses the finish line.

**Exercise 2**

**Answer the four questions below:**

- Which measuring instrument should be used to measure a distance of 100 meters in a stadium?
 

<input type="checkbox"/> A graduated ruler	<input type="checkbox"/> A tape measure	<input type="checkbox"/> A decameter
--	---	--------------------------------------
- 100-meter run time:  
 Student 1: ..... Student 2: .....
- On the graduated line below, mark Usain Bolt’s record, your performance, and that of your classmates. To help you:   = 1 second.

**◆ FIND OUT MORE: WAY TO GO!**

You’ve been a good sport, even though you’re still far from record-breaking speeds. Some of you were faster than others, but that doesn’t matter because as French Baron Pierre de Coubertin, the creator of the modern Olympic Games, used to say: “The important thing is to take part.”





4) When Usain Bolt set his record, he ran 10.44 meters in 1 second. That means he had a speed of 10.44 m/s (meters per second).

Match each animal to its maximum speed:

- |            |             |
|------------|-------------|
| Panther •  | • 8.3 m/s   |
| Gazelle •  | • 0.013 m/s |
| Chicken •  | • 16.7 m/s  |
| Elephant • | • 25 m/s    |
| Snail •    | • 4.2 m/s   |

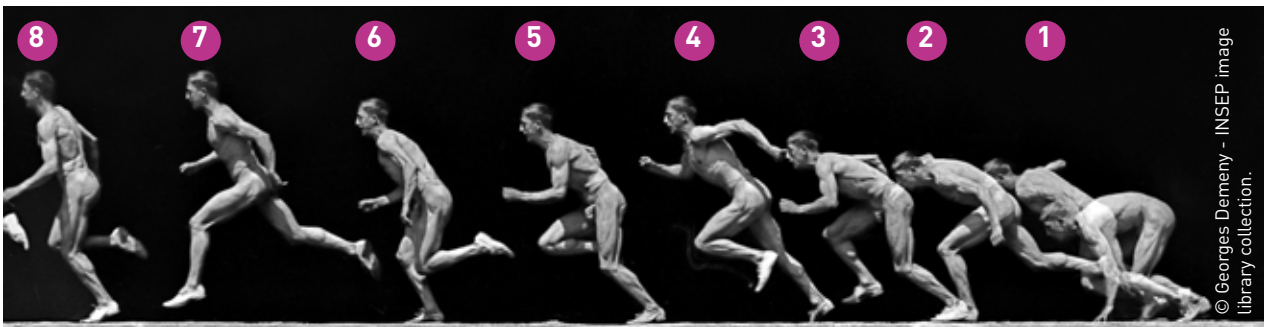
### 🔍 FIND OUT MORE: WHY ARE STARTING PISTOLS NO LONGER USED FOR RACES IN TRACK AND FIELD?

For several years now, an electronic system has been used to give the starting signal in track and field. The initial “bang” used to be from a revolver, and the cartridge was filled with powder, which created a cloud of white smoke. But the system could be dangerous and wasn’t fair—the athletes who were the furthest away heard the shot slightly after those who were close by. Today’s starting signal keeps things fair. An electronic device gives the signal, which is heard through a loudspeaker on the starting block behind each athlete at the same time.

### ▶ ACTIVITY 3: WHEN SPEED CHANGES...

Look at the picture below and answer the questions:

1) In the chronophotograph, choose a body part (head, shoulder, right or left foot, etc.) and put a red dot on that spot in each numbered position.



2) Measure the distance between the first position and the second, the second and the third, and so on... and fill in the following table:

Between positions	Distance (in cm)
1 and 2	
2 and 3	
3 and 4	
4 and 5	
5 and 6	
6 and 7	
7 and 8	



3) How does the distance you measured change?

.....  
.....

4) The same amount of time elapsed between each image, so did the runner...?

- Decelerate       Accelerate       Run at a constant speed

**🔍 FIND OUT MORE: CREATE A PAINTING BASED ON THE ARTWORK BELOW**



***Sintesi plastica  
dei movimenti di una donna***  
Luigi Russolo, 1912



**REVIEW**

- Athletes and the equipment they sometimes use for Olympic events may have a **rectilinear** (moving in a straight line) or **circular** (moving in a circle or curve) **motion**.
- Olympic 100-meter sprinters run at speeds high above average.
- When an athlete moves, he or she can **accelerate** (increase speed) or **decelerate** (reduce speed).



**NOW, PUT YOUR THINKING CAP ON!**

- When you take part in an athletic event, what is your goal? Do you hope to break your personal record? Compare yourself to your peers? Reach the level of your favorite athletes? Have fun with your friends? Be part of a team? What motivates you?



# CYCLE PROGRESS WORKSHEET

CYCLE 3 • SCIENCE



## SPEED AT THE OLYMPIC GAMES

### Activity 1

The trick to determine trajectory does not have to be given to students 10–12 years old.

### Activity 2

- Following the activity, studying speed-unit conversions from m/s to km/h is an option for students 11–12 years old, after distance and time units have been studied.
- The activity can be an opportunity to address proportion by doubling the distance covered, and to show that proportion does not apply to athletes (the record for the 200 meters is 19.92 seconds). That work can be reserved for students who quickly reach end-of-cycle objectives, as part of differentiated learning.
- The activity can be adapted to Alpine skiing for students located in mountainous areas or those who play winter sports during the school year.

### Activity 3

A question can be added to ask students to draw pictures of objects that move slowly and/or at a constant speed.





**3 SKELETON IS A SPORT THAT INVOLVES:**

Skiing

Sliding

Skating

**4 WHAT IS THE SPEED OF SOUND IN AIR?**

5 m/s

340 m/s

5,000 m/s



# IT'S YOUR TURN! ANSWER KEY

CYCLE 3 • SCIENCE

## SPEED AT THE OLYMPIC GAMES

### PUT YOUR KNOWLEDGE TO THE TEST

**1 WHERE WERE THE FIRST SKI COMPETITIONS HELD?**

Finland

Norway

Sweden

**2 WHERE WAS USAIN BOLT BORN?**

The United States

Jamaica

Canada

**3 WHAT IS USED TO MEASURE TIME?**

A thermometer

A chronometer

A decameter

**4 HOW FAST DID USAIN BOLT RUN WHEN HE SET HIS RECORD?**

10.44 km/h

10.44 m/s

10.44 m/h

**5 DOES THE PICTURE ON THE RIGHT SHOW MOTION THAT IS DECELERATED OR ACCELERATED?**

Decelerated

Accelerated



### TEST YOUR KNOWLEDGE FURTHER

**1 WHAT IS THE FASTEST RECORDED SPEED REACHED BY A SKIER?**

500 km/h

255 km/h

100 km/h

**2 WHICH OF THE EVENTS AT THE WINTER OLYMPICS ARE TIMED?**

Cross-country skiing

Figure skating

Ski jumping

Snowboarding

Alpine skiing



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