



TEACHER WORKSHEET

CYCLE 3 • MATHEMATICS: DIMENSIONS AND MEASUREMENTS

SWIMMING EVENTS AT THE OLYMPIC GAMES

OVERVIEW

EDUCATIONAL OBJECTIVES:

- Use units of length and units of time to solve problems in everyday situations (swimming).
- Give meaning to the concept of “tenths” and “hundredths” of a second in units of time.
- Learn about professional swimmers in different swimming events.

SPECIFIC SKILLS:

- Compare, estimate, and measure geometric quantities with integers and decimals: length (perimeter), time.
- Use the vocabulary, units, and specific measuring instruments for physical quantities.
- Solve problems involving physical quantities using integers and decimals.

INTERDISCIPLINARY SKILLS:

- **History:**
Determine one’s place in time.
- **PE:**
Understand performance in the context of human performance.

- **Mathematics/numbers and calculations:**
Calculate with integers and decimals.

SCHEDULE FOR SESSIONS:

- Launch project.
- Read texts aloud as a class.
- Do activities in pairs: Problem-solving.
- Share with class and review.
- Extend activity.

DURATION:

- 2 sessions (2 × 45 minutes).

ORGANIZATION:

- Work in pairs, then share as a class.

→ OLYMPIC GAMES KEYWORDS:

**SWIMMING • SPORT • SPEED •
OLYMPIC POOL • SURPASSING ONESELF •
RECORD**



CONCEPTS ADDRESSED

SWIMMING AND HUMANKIND

People in Prehistoric times already knew how to swim, as some cave paintings depict, and in Greek mythology there are several references to swimming. In early 19th century Britain, competitive swimming first became popular, mainly with the breaststroke.

The earliest version of the crawl, which included a flutter kick, was inspired by a stroke used by indigenous people in South America. In the late 1880s, an Englishman named Frederick Cavill learned about the stroke while traveling the South Seas. He settled in Australia and went on to teach the stroke, which came to be known as the “Australian crawl”.



AN OLYMPIC HISTORY OF SWIMMING

Swimming was included in the first modern Games in 1896, with events in freestyle (crawl) and breaststroke. The backstroke was added in 1904. The butterfly stroke officially debuted at the 1956 Olympic Games in Melbourne, Australia.

Women's swimming became an Olympic discipline in 1912 at the Olympic Games in Stockholm, Sweden, and has been included in every edition ever since.

The men's and women's programs are nearly identical and feature the same number of events, with one difference—the freestyle distance is 800 meters for women and 1,500 meters for men.

Since 2008, at the Olympic Games in Beijing, China, the 10-kilometer open-water marathon has been part of the official men's and women's programs. At the 2016 Olympic Games in Rio de Janeiro, Brazil, French swimmer Marc-Antoine Olivier won bronze, while another French swimmer, Aurélie Muller, could have taken home silver but was disqualified for obstructing an Italian swimmer at the finish line.

MATH CONCEPTS

- **Relationships between units of length**
1 m = 10 dm = 100 cm = 1,000 mm = 0.1 dam = 0.01 hm = 0.001 km.
- **Decimal fractions** are fractions whose denominator is 10 or a power of 10. When a unit is divided into 10 equal parts, each part is called a tenth (1/10); when a unit is divided into 100 equal parts, it is called a hundredth (1/100); etc.
- **Decimal numbers** can be written as a decimal fraction or with a decimal point: 5/10 and 0.5 are two ways to write the same decimal number.
- **The perimeter** is the length of a shape's outline. It can be expressed in meters (or multiples and submultiples of meters). The perimeter of a square is calculated using a formula: $s \times 4$, where s is the side measurement. The perimeter of a rectangle is calculated using a formula: $(L + W) \times 2$, where L means length and W means width.

FUN FACT!

Swimming is one of the most watched Olympic sports in the world, along with athletics. Swimming also has the most events—with 16 men's events and 16 women's events, combining four strokes over various distances. Some events are freestyle (crawl, breaststroke, backstroke, or butterfly) and others require a specific stroke, such as the butterfly, backstroke, and breaststroke events over 100 and 200 meters.

FUN FACT!

American swimmer Michael Phelps holds the record for most medals ever won at the Olympic Games, with a total of 28 medals!



STUDENT WORKSHEET OVERVIEW

VOCABULARY:

Olympic discipline, Olympic event, record, Olympic-size swimming pool.

ACTIVITIES:

► ACTIVITY 1: MARATHON SWIMMING

Use decimal numbers in length measurement **9–10 yr** **10–11 yr** **11–12 yr**

Materials: Text-based questions

🔍 FIND OUT MORE:

Aurélie Muller's disqualification in the 10-kilometer open-water race at the Olympic Games in Rio in 2016.



► **ACTIVITY 2: AT THE RIO GAMES, TWO SWIMMERS MAKE HISTORY**

Use decimal numbers in time measurement 9–10 yr | 10–11 yr | 11–12 yr

Materials: Text-based questions

🔍 **FIND OUT MORE:**

History of electronic timekeeping systems.

► **ACTIVITY 3: OLYMPIC SWIMMING POOLS**

Calculate the perimeter of a shape using formulas (squares and rectangles) 9–10 yr | 10–11 yr | 11–12 yr

Materials: Text-based questions

🔍 **FIND OUT MORE:**

Why swimming 25 meters twice is not the same as swimming 50 meters once.



STUDENT WORKSHEET ANSWER KEY

► **ACTIVITY 1: MARATHON SWIMMING**

Use decimal numbers in time measurement 9–10 yr | 10–11 yr | 11–12 yr

- 1) 10,000 m = 10 km
- 2) The length can be broken down as follows:
1,500 m = 1 km + 500 m = 1.5 km
- 3) 1.5 km
- 4) 1.5 km = 1 km and 5/10 of a kilometer

► **ACTIVITY 2: AT THE RIO GAMES, TWO SWIMMERS MAKE HISTORY**

Use decimal numbers in time measurement 9–10 yr | 10–11 yr | 11–12 yr

- 1) The decimal time format 8:04.79 means 8 minutes, 4 seconds, and 79 hundredths of a second
1 minute = 60 seconds
8 minutes and 4 seconds = $480 + 4 = 484$ seconds
79 hundredths of a second = $79/100 = 0.79$ seconds
so 8:04.79 is 484.79 seconds
- 2) The decimal time format 4:26.36 means 4 minutes, 26 seconds and 36 hundredths of a second
1 minute = 60 seconds
4 minutes and 26 seconds = $240 + 26 = 266$ seconds
36 hundredths of a second = $36/100 = 0.36$ seconds
so 4:26.36 is 266.36 seconds
- 3) 4 minutes, 26 seconds and 36 hundredths + 1 second and 67 hundredths = 4 minutes, 27 seconds and 103 hundredths, or 4 minutes, 28 seconds and 43 hundredths, so 4:28.43
- 4) 58 seconds and 45 hundredths = 58.45 seconds
- 5) $58.45 + 0.30 = 58.75$ seconds



► ACTIVITY 3: OLYMPIC SWIMMING POOLS

Calculate the perimeter of a shape using formulas (squares and rectangles)

9–10 yr | 10–11 yr | 11–12 yr

1) Calculate the perimeter of a rectangular pool in meters:

$$P = (L + W) \times 2$$

$$P = (50 + 25) \times 2$$

$$P = 75 \times 2$$

$$P = 150$$

The pool's perimeter is 150 m.

2) Calculate the perimeter of each display board in decimeters:

$$P = s \times 4$$

$$P = 36 \times 4$$

$$P = 144$$

The perimeter of each board is 144 dm.

3) Calculate the total length of the protective covering needed in decimeters:

$$10 \times 144 = 1,440$$

$$1,440 \text{ dm} = 144 \text{ m}$$

144 m of protective covering should be used.



FIND OUT MORE

CNOSF EDUCATIONAL FILES

Cycle 3: "Sports stars and heroes"

10–11 yr: "The 1936 Olympic Games in Berlin"

9–10 yr: "Stadium history from ancient times to the present day"

Cycle 3: "Bobsleigh (dimensions and measurements)"

DIGITAL RESOURCES

Learn more about the Olympic Games:

<https://www.olympic.org/olympic-games>

Learn more about the relationship between time and sports:

The Olympic Museum's interactive online "Time and Sports" activity sheets:

<https://www.olympic.org/museum/visit/schools/teaching-resources/support-de-cours/time-and-sport>

Learn more about Olympic swimming events:

<https://www.olympic.org/international-swimming-federation>

Éduscol support document for mathematics in Cycle 3:

<http://eduscol.education.fr/cid101461/ressources-maths-cycle.html>

EXHIBITIONS FOR STUDENTS

The Olympic Museum in Lausanne, Switzerland

<https://www.olympic.org/museum>

(virtual tour available online)

Fair play: A touring exhibition on Olympism, available on loan (12 panels, 1.60 m × 50 cm).

Contact: academieolympique@cnosf.org

FURTHER READING FOR STUDENTS

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

ACTIVITIES FOR STUDENTS

End of unit: "It's your turn!"

Swimming" (and answer key)



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STUDENT WORKSHEET

CYCLE 3 • MATHEMATICS: DIMENSIONS AND MEASUREMENTS

SWIMMING EVENTS AT THE OLYMPIC GAMES

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VOCABULARY



OLYMPIC DISCIPLINE: An Olympic sport that involves one or more disciplines. E.g. diving is a swimming discipline.

OLYMPIC EVENT: A discipline composed of several events or competitions. Athletes are ranked and receive medals and diplomas in each event. E.g. the women's 10-meter platform is a diving event.

RECORD: An athletic achievement that surpasses what was previously achieved in a given area (*to break a record*).

OLYMPIC-SIZE SWIMMING POOL: A swimming pool that meets certain mandatory dimensions.



ACTIVITIES

▶ ACTIVITY 1: MARATHON SWIMMING

Read the following text and answer the questions:



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Swimming has been an Olympic sport since the first modern Games in 1896. The first swimming competitions were held in outdoor bodies of water. Today, competitions are held in a 50-meter-long pool, usually indoors (except in freestyle swimming).

At the Olympic Games in Beijing, China, in 2008, open-water

swimming made a comeback with a 10,000-meter swimming event known as "marathon swimming", in reference to marathon running.

At the Olympic Games in Rio de Janeiro, Brazil, in August 2016, the young French swimmer Marc-Antoine Olivier won the bronze medal with a time of 1 hour, 53 minutes, and 2 seconds. It was his first time competing in the Olympic Games. The Dutch swimmer Ferry Weertman took gold with a time of 1 hour, 52 minutes, 59 seconds and 8 hundredths. The event took place in the famous Copacabana Bay.



TIPS & TRICKS



When you read a problem statement, sometimes you feel like all the information is jumbled. **You get stuck** and feel like **you can't think clearly**. Don't panic! **Try to draw it out** by making a diagram, or a quick drawing.

Draw an X for a person, a rectangle for the swimming pool, a circle for another object... And write out the information given in the problem on your drawing. **Little by little, the calculation you have to do will take shape before your very eyes**. Try it!



1) Express the distance of marathon swimming in kilometers:

The longest Olympic event in an indoor pool is an individual swimming event—the men’s 1,500-meter freestyle. In 2016 in Rio, Italian swimmer Gregorio Paltrinieri won gold in the event with a time of 14 minutes, 34 seconds and 57 hundredths.

2) Express the distance of this men’s event in kilometers.
Use a conversion table if needed.

.....

3) Underline the integers in red and the tenths in green:

.....

4) Write the decimal number as a decimal fraction:

.....

● FIND OUT MORE:

The French swimmer Aurélie Muller, the reigning world and European champion at the time, finished second in the 10-kilometer open-water marathon at the Rio Olympic Games. Unfortunately, she was disqualified from taking home silver for obstructing an opponent at the finish line. So the Italian swimmer Rachele Bruni ended up in second place on the podium.

► ACTIVITY 2: AT THE RIO GAMES, TWO SWIMMERS MAKE HISTORY

Read the following text and answer the questions:

At the Rio Games in August 2016, there were a number of records set in women’s swimming and some athletes even made history, such as the American swimmer Katie Ledecky and the Hungarian swimmer Katinka Hosszú. Others are sure to follow!



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1. Katie Ledecky: 19 years old and a five-time medalist!

American swimmer Katie Ledecky won three gold medals at the Olympic Games in Rio in the

200-, 400-, and 800-meter freestyle. She even broke two world records, including her own record in the 800 meters with a time of 8 minutes, 4 seconds and 79 hundredths.

At the Olympic Games in Rio, she almost tied with fellow American Michael Phelps, who won six medals in swimming in Rio. He is the most successful athlete in the history of the Summer Games to date, having won 23 gold medals and stood on 28 Olympic podiums—an incredible record of achievements for the 31-year-old, who has since retired.

2. Katinka Hosszú: the “Iron Lady” of swimming finally wins gold!

Encouraged by her coach and husband, Hungarian swimmer Katinka Hosszú finally reached the Olympic podium at the Olympic Games in Rio! She won four medals—three gold, for the 200- and 400-meter medley and for the 100-meter backstroke, and one silver, for the 200-meter backstroke.

Her most spectacular win was without a doubt the 400-meter medley; the Hungarian swimmer finished with a time of 4 minutes, 26 seconds and 36 hundredths, beating the world record by 1 second and 67 hundredths. Her time in the 400-meter medley can also be written as 04:26.36.

The next day, she won gold in the 100-meter backstroke, claiming her second Olympic title, with a time of 58 seconds and 45 hundredths, or 58.45.

The American swimmer Kathleen Baker won the silver medal, finishing 30 hundredths of a second behind Hosszú.



1) What does the time format 8:04.79 mean? Write it in seconds using a decimal point:

.....
.....

2) Write Katinka Hosszú's 400-meter medley record in seconds using a decimal point:

.....

3) Calculate the women's 400-meter medley world record, broken by Katinka Hosszú in 2016. Write the time in minutes and seconds.

.....

4) Write Katinka Hosszú's time in 100-meter backstroke using a decimal point:

.....

5) Calculate Kathleen Baker's performance in the 100-meter backstroke, using a decimal point:

.....

🔍 FIND OUT MORE:

Competing swimmers have stopped their own clocks ever since the 1968 Olympic Games in Mexico City, Mexico. At the starting dive and push off, athletes touch a plate equipped with an electronic sensor using their feet. That's when the clock starts. At the end, they have to hit a plate on the edge of the pool to stop the clock. The system keeps the official time for their performance. Swimming is therefore the only sport where athletes stop their own clocks!

▶ ACTIVITY 3: OLYMPIC SWIMMING POOLS

Read the following text and answer the questions:

The first swimming competitions at the Olympic Games were held in outdoor bodies of water. Today, most events take place indoors, in a 50-meter-long pool.

Today's program includes the following disciplines: swimming (crawl, breaststroke, backstroke, and butterfly), water polo, diving, and synchronized swimming.

At the 2016 Olympic Games in Rio, swimming events were held at Olympic Aquatics Stadium in Barra Olympic Park.

Like all Olympic-size swimming pools, the pool had to meet certain criteria:

- Length: 50 m
- Width: 25 m
- Number of lanes: 8 + 2
- Lane width: 2.50 m
- Depth: 2 m minimum, 3 m recommended
- Volume: 2,500 m³ for a depth of 2 m, and 3,750 m³ for a depth of 3 m
- Water type: Fresh water
- Water temperature: 24–28 °C.



© DR

1) Calculate the perimeter of the Olympic-size swimming pool in Barra Olympic Park:

.....

.....

.....

Display boards installed in the stands have allowed spectators to see swimmers perform in real time since 1964.

Organizers want to install ten square-shaped display boards for a swimming event. Each display board measures 36 dm on each side. They would like to protect the border with a special protective covering.

2) Calculate the perimeter of each display board in decimeters:

.....

.....

3) Calculate the total length of protective covering needed for all ten display boards. Write your answer in meters.

.....

● FIND OUT MORE:

Swimming 25 meters twice is not the same as swimming 50 meters once. Turns (if well executed) give swimmers an advantage because they can push off the wall to save a few seconds. That's why a 25-meter-long pool cannot be used to certify records in swimming.



REVIEW

- There is a **relationship between units of length**:
 $1 \text{ m} = 10 \text{ dm} = 100 \text{ cm} = 1,000 \text{ mm} = 0.1 \text{ dam} = 0.01 \text{ hm} = 0.001 \text{ km}$
- Decimal fractions are **fractions whose denominator is 10** or a power of 10. When a unit is divided into 10 equal parts, each part is called a **tenth (1/10)**; when a unit is divided into 100 equal parts, it is called a **hundredth (1/100)**; etc.
- Decimal numbers can be written as a decimal fraction or with a **decimal point**: 5/10 and 0.5 are two ways to write the same decimal number.
- The **perimeter of a square** is calculated using the formula $s \times 4$, where s is the side measurement.
- The **perimeter of a rectangle** is calculated using the formula $(L + W) \times 2$, where L means length and W means width.



NOW, TAKE ACTION!

- **Use your head.** A lot of math problems can be solved without a formula, **just by using your head.** What matters is to always follow the same logic.
- **You use math without even realizing it.** Whether you do crafts or play sports, knowing how to measure length is a key skill. For example, if you want to cover a shoebox with wrapping paper, you have to cut a strip of paper the same length as... **the box's perimeter!** If you want to know how many kilometers you rode on your bike, you should **add up the meters**, which you can convert into kilometers... **Math is hiding everywhere!**



CYCLE PROGRESS WORKSHEET

CYCLE 3 • MATHEMATICS: DIMENSIONS AND MEASUREMENTS

SWIMMING EVENTS AT THE OLYMPIC GAMES

PROGRESS GUIDELINES FOR ACTIVITY 3:

Calculating perimeters

Students 9–10 years old should know how to calculate the perimeter of a polygon. Students 9–11 years old learn to use a formula to calculate the perimeter of a square and a rectangle.

Students 11–12 years old learn the formula used for the circumference of a circle.

For that age group, Activity 3 in the worksheet can be developed by asking students to calculate the perimeter of an oval stadium (instead of a rectangular pool), using the formula for calculating the circumference of a circle ($P = \pi \times \text{diameter}$).

Calculating area

Students 10–11 years old learn how to use formulas to calculate the area of a square ($A = s \times s$) and a rectangle ($A = L \times W$).

They also learn how to use standard units of area: multiples and submultiples of square meters, ares (equal to 100 square meters), and hectares (equal to 10,000 square meters).

Activity 3 in the worksheet could therefore be developed for students 10–11 years old by asking them to calculate the area of the swimming pool at Barra Olympic Park, using the formula ($A = L \times W$).

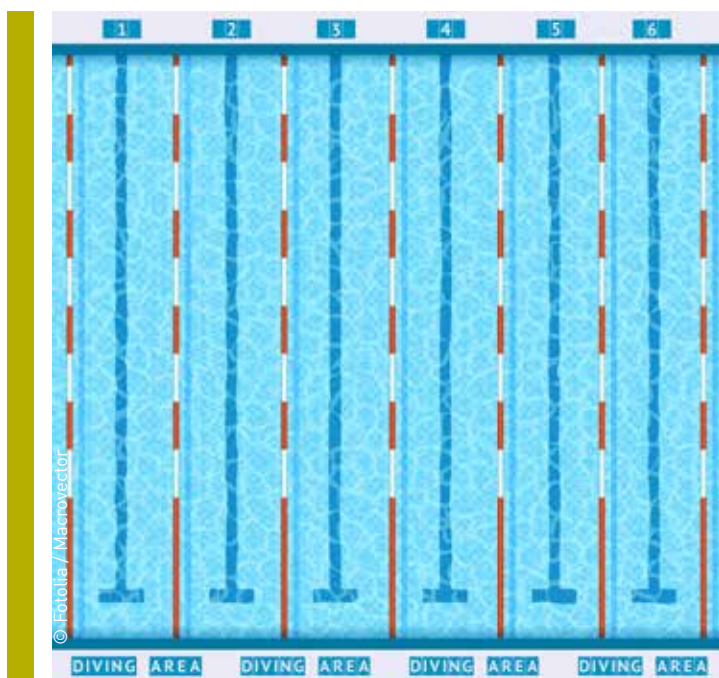
They could also express it in square meters.

Calculating volumes

With students 9–11 years old, the concept of volume is studied as an amount of space, using standard units: liters (L), and multiples and submultiples of liters.

Students 11–12 years old learn how to calculate the volume of a cuboid using a formula.

Activity 3 could be developed for that age group by asking students to calculate the volume of an Olympic-size swimming pool, using volume units ($1 \text{ L} = 1 \text{ dm}^3$; $1,000 \text{ L} = 1 \text{ m}^3$).





IT'S YOUR TURN!

CYCLE 3 • MATHEMATICS: DIMENSIONS AND MEASUREMENTS

SWIMMING EVENTS AT THE OLYMPIC GAMES

PUT YOUR KNOWLEDGE TO THE TEST

1 HOW LONG IS AN OLYMPIC-SIZE SWIMMING POOL?

- 20 meters 25 meters 50 meters

2 WHAT IS THE FORMULA FOR THE PERIMETER OF A SQUARE?

- $s \times s \times s \times s$ $s \times 4$ $s + 4$

3 TRUE OR FALSE? THE FRACTION $8/100$ CAN ALSO BE WRITTEN AS 0.08.

- True False

4 WHEN WAS THE FIRST TIME COMPETING SWIMMERS STOPPED THEIR OWN CLOCKS?

- The 1908 Olympic Games in London, England
 The 1932 Olympic Games in Los Angeles, California, United States
 The 1968 Olympic Games in Mexico City, Mexico

TEST YOUR KNOWLEDGE FURTHER

1 WHICH OF THE FOLLOWING SWIMMING EVENTS ARE NOT TIMED? (2 ANSWERS)

- Diving Marathon swimming Men's 1,500 meters
 Synchronized swimming Water polo

2 IN THE 1940S, BREASTSTROKE SWIMMERS REALIZED THAT THEY COULD GO FASTER BY BRINGING BOTH ARMS FORWARD OVER THEIR HEAD. WHAT STROKE DID THAT LEAD TO?

- The backstroke The front crawl The butterfly



IT'S YOUR TURN! ANSWER KEY

CYCLE 3 • MATHEMATICS: DIMENSIONS AND MEASUREMENTS

SWIMMING EVENTS AT THE OLYMPIC GAMES

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TEST YOUR KNOWLEDGE FURTHER

1 WHICH OF THE FOLLOWING SWIMMING EVENTS ARE NOT TIMED? (2 ANSWERS)

- Diving Marathon swimming Men's 1,500 meters

Diving (divers perform a series of moves for which they are awarded up to 10 points, based on form and technique).

- Synchronized swimming Water polo

Synchronized swimming (judging is similar to figure skating; judges award up to 10 points for artistic impression and technique).

2 IN THE 1940S, BREASTSTROKE SWIMMERS REALIZED THAT THEY COULD GO FASTER BY BRINGING BOTH ARMS FORWARD OVER THEIR HEAD. WHAT STROKE DID THAT LEAD TO?

- The backstroke The front crawl The butterfly

The butterfly, which was first officially used at the 1956 Games in Melbourne.



3 AT THE 2016 RIO OLYMPIC GAMES, SOME SWIMMING EVENTS STARTED ALMOST AT MIDNIGHT. SWIMMERS DID NOT GET TO SLEEP UNTIL 4 A.M.—THEY FIRST HAD TO RECOVER, ANSWER INTERVIEW QUESTIONS, UNDERGO DOPING TESTS, AND GET A MESSAGE. SOME FRENCH SPORTS CLUBS PLANNED SPECIAL TRAINING TO HELP SWIMMERS GET USED TO THE SCHEDULE. WHAT DID THAT TRAINING ENTAIL?

- Night training, to get the body used to a nightly schedule
- Sleepless nights, to get the body used to sleep deprivation
- 24/7 training, to ensure athletes would be ready at any time

4 IN ATHENS IN 2004, BEIJING IN 2008, LONDON IN 2012, AND RIO IN 2016, AMERICAN SWIMMER MICHAEL PHELPS WON FOUR CONSECUTIVE GOLD MEDALS IN THE 200-METER BUTTERFLY AND THE 200-METER MEDLEY. HIS WINS TIED HIM WITH ANOTHER ATHLETE WHO HAD WON FOUR CONSECUTIVE GOLD MEDALS FOR THE LONG JUMP. WHO WAS IT?

- Usain Bolt
- Jesse Owens
- Carl Lewis