



# Capstone

Using the world of STEM to bring the Tour de France into focus.

## Concepts

Math: Proportions and Scale  
 Science: Weather and Climate

## Objective

Students will learn about the challenges a race course can present: gradient/slopes, curves/bends, terrain/surface. Students will use this knowledge to learn about the different stages and challenges of the Tour de France. Students will evaluate and present stages of the course with the least and greatest challenges using qualitative data and qualitative descriptions as a group.

Source: Tour de France

<https://www.letour.fr/en/overall-route>

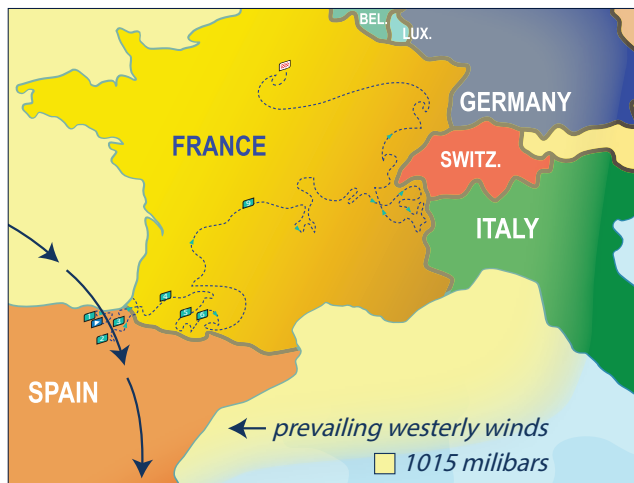


Photo: A.S.O.

## Standards

### Next Generation Science Standards Connections

**MS-ESS2-5:** Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.



### Common Core Math Standards

**CCSS.MATH.CONTENT.6.RP.A.1.A:** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

**CCSS.MATH.CONTENT.6.RP.A.1.C:** Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

**CCSS.MATH.CONTENT.8.F.B.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

## National Standards for K-12 Physical Education Connections

**Standard 1:** The physically literate individual demonstrates competency in a variety of motor skills and movement patterns.

**Standard 2:** The physically literate individual applies knowledge of concepts, principles, strategies, and tactics related to movement and performance.

**Standard 4:** The physically literate individual exhibits responsible personal and social behavior that respects self and others.

most challenging versus the easiest. Then ask students to imagine competing in a race in which they had to ride on a combination of surfaces for hours – or even days!

**Explain:** Explain to students they are going to learn about a race by exploring the 21 different stages: The Tour de France. Tell students they will be responsible for learning about the terrain, elevation, weather, and other challenges that each stage presents.

**Elaborate:** Have students work in small groups to acutely observe and learn about the different stages of this year's Tour de France. Then have students create a poster board presentation of each stage with a focus on answering the following questions in the table below:

- What stage is it?
- What is the route and where does it start and finish?
- What terrain are bikers/cyclists likely to experience?
- What is the distance of the route?
- What elevation changes should a rider expect?
- What weather patterns can riders expect during this time of year in France, and in turn, how can it affect a rider's performance?

*Teacher note: Assign each group 2-3 stages depending on the class size, providing students with a variety of terrains. On flat terrain, encourage students to research the specifics of the route the riders will see (water, bridges, historical landmarks, etc.).*

*The tables and graphics of the stages provided are from the 2023 Tour de France.*

## Sequence of Lesson



Have your students take this lesson's assessment prior to engaging by visiting: [STEMSports.com/assessments](https://STEMSports.com/assessments)

If you have limited digital capability, please email [Info@STEMSports.com](mailto:Info@STEMSports.com) to access the Assessment & Key.

**Engage:** Have students get on the bikes and explore riding on different surfaces/terrain, gradients/slopes, and curves/bends, as well as exploring areas with different elevations, if possible.

**Explore:** Ask students to consider which set of land conditions they found easiest to ride on. For example, flat pavement and hilly grass. Which set of land conditions did they find the

Stage	Route	Terrain	Distance	Climb
1	Bilbao to Bilbao	Hilly	182 KM	<b>Côte De Pike</b> Elevation starts at 173 m and climbs to 212 m over a 2000 m distance.
3	Amorebieta-Etxano to Bayonne	Flat	185 KM	None
6	Tarbes to Cauterets-Cambasque	Mountain/Hilly	145 KM	<b>Col du Tourmalet</b> Elevation starts at 866 m and climbs to 2115 m elevation
9	Saint-Leonard-De-Noblat to Puy De Dome	Mountain	184 KM	<b>Puy De Dôme</b> Elevation starts at 184 m and climbs to 1415 m over a 1300 m climb.

### Stage 1

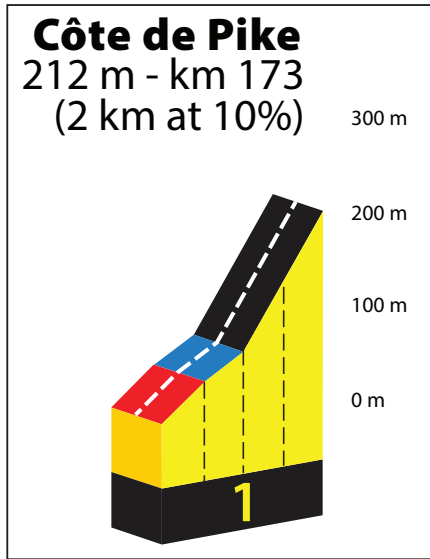


Photo: A.S.O.

### Stage 9

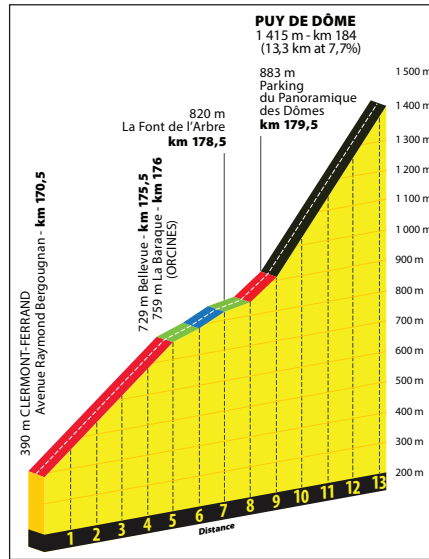


Photo: A.S.O.

### Stage 3



Photo: A.S.O.

### Stage 6

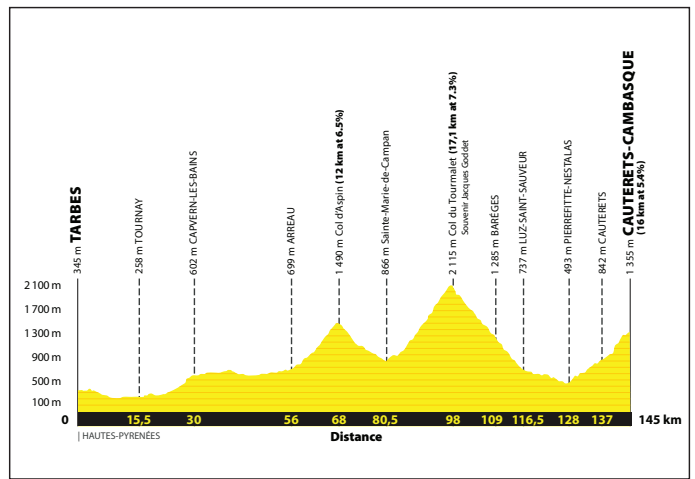


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### Stages 1-6

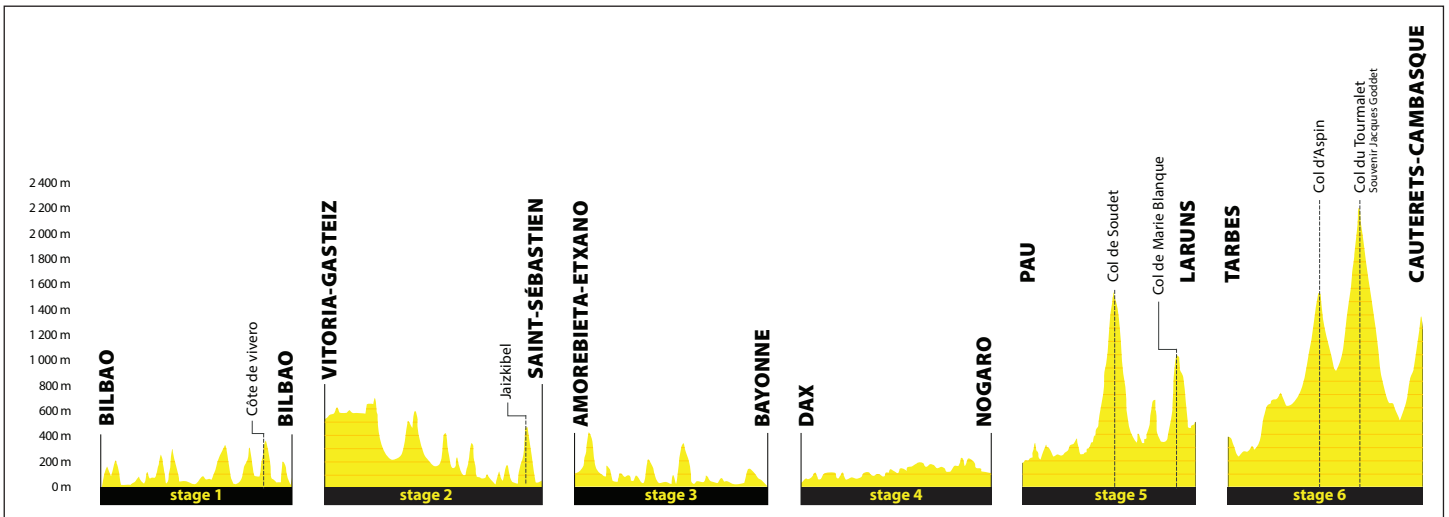


Photo: A.S.O.



**Evaluate:** Show students the examples of how a topographic map can be used to represent the change in distance (x - axis) and change in elevation (y - axis). Then have students create a topographic map of their stage using a poster board by way of hilly/mountainous terrain.

Depending on the severity of the terrain, students should focus on the “main climb” (Puy De Dome) or the entire stage (Cauterets-Cambasque) when sketching and constructing their topographic map.

*Teacher note: Students with a flat stage should incorporate a map of France that outlines their weather pattern this time of year and how it can disrupt the terrain, and consequently, a rider’s performance.*

**Extend:** As a class, organize your stage presentation in sequential order. Then have students do a gallery walk to learn about and experience the Tour de France. Then, require students to calculate the slope of the most difficult climbs (teacher can determine the number of climbs calculated) based on the topography maps their students have created. Have students use the formula below to calculate the slope:

$$\text{Slope} = \frac{\text{Change in y values}}{\text{Change in x values}} = \frac{\text{Change in elevation}}{\text{Change in distance}}$$

Based on the slope of the climb, which stage listed in the chart on page 86 is the most difficult in the Tour de France?