

Physics of Sports

Lesson 2: Quality Assurance and Physics Teacher's Guide

Connections:

Previous Lesson	Current Lesson	Next Lesson
Measurements and Accuracy	Quality Assurance	Kinematic Variables

Objectives:	<ul style="list-style-type: none"> To understand the concept of quality assurance To connect physics concepts to the quality assurance process
Resources required:	<ul style="list-style-type: none"> A table-tennis ball and table or a writing desk A ruler The stencil provided with the activity A pair of scissors A pencil or marker Student's Worksheet Lesson 2
Useful data:	<p>Table dimensions</p> <ul style="list-style-type: none"> Length = 274 cm Width = 152.5 cm Height = 76 cm Net height = 15.25 cm <p>The Olympics size ping-pong balls have:</p> <ul style="list-style-type: none"> Diameter = 4 cm = 0.04 m Wall thickness varies but is approximately 0.04 cm.
Video(s):	<p>Start by showing a short video clip where a sports disaster is clearly a manifestation of poor quality:</p> <p>https://youtu.be/gkKlr7YOlq</p>
Discussion Questions	<p>The activity starts with some questions:</p> <ol style="list-style-type: none"> 1. What do you understand by the word: "Quality Assurance" (sometimes called QA) 2. Why do you think QA matters? 3. Which parts of the table-tennis game do you think need a quality control (table surface, dimensions, wood, net size, ball size, ball material, etc.) 4. Suggest tools to measure some of these quantities (meter stick, Vernier, weigh balance, etc.) <p>A number of follow-up questions can now be asked to prepare for the next class:</p> <ol style="list-style-type: none"> 1. What did you learn from the video and later calculations?

	<p>2. Why do you think these measurements matter? Or are relevant for the physics of sports?</p> <p>3. What will happen if you use a table which is not up to the standards? How will you find out?</p> <p>4. What other factors about the table should be checked? (You can remind them that the table material may be important and so is its polish as a very smooth table will have less friction whereas a rough table will have more).</p>
Preparation / Warm-up:	<p>Start with the given stencil and students, working in groups of two, will create the device needed to make the measurements. The stencil is available to the teachers as a separate file to be printed on 8.5x14 paper</p> <p>Tell students that:</p> <ol style="list-style-type: none"> 1. The standard table yields a uniform bounce of about 23 cm when a standard ball is dropped onto it from a height of 30 cm. 2. Your stencil allows you to measure if the ball bounced 23 cm or more than 27m 3. Repeat the experiment 3 times and record your observations here. 4. If there are balls of other type available (other ping-pong balls, Styrofoam balls, etc.), use them and compare.
Fun fact	<p>You can try to play the game under water:</p> <p>https://www.youtube.com/watch?v=UW2g_Pi1nPM</p> <p>Explore the challenges that are presented in this environment. Suggest ways in which you can improve the quality of game underwater. Note that the crush depth of a ping-pong ball (the depth of water at which a ping-ball collapses due to water pressure outside), is approximately 30 meters.</p>