

An endpoint is not a journey

High school worksheet | OBML-005 | Name: _____ Date: _____

Goal: evaluate an endpoint inference, distinguish source models and design evidence for a timing question. No formulas or measured dataset are supplied.

HS01. Two ideal runs are said to have equal finish speeds. Before reading the model note, state whether this fixes their arrival order. Identify the logical gap, or the extra information that would close it.

Model note

Finish speed describes how fast an object moves at the finish. Elapsed journey time describes the interval from release to arrival. For the ideal marble comparison, equal drops give equal finish speeds. That does not specify the motion throughout the routes or establish equal journey times. Real tracks require observation; a route drawing supplies no measured winner.

Ideal marble comparison: the same marble starts from rest with no push, rolls without skidding, loses no movement energy to its surroundings, and receives no powered boost. Compare the vertical drop of its center from release to finish.

Vocabulary: translation is travel of the object's center; rotation is its spin; a model boundary is a stated condition that limits where its prediction applies. Elapsed time covers the whole interval; finish speed describes motion at the endpoint.

HS02. Explain the qualified equal-finish-speed prediction for the two routes. Name two conditions that an actual run could fail to satisfy, then explain why an actual timing result is a separate question.

Compare evidence without merging models



Two routes have matching release and finish heights. A straight route and a differently shaped downhill route connect them. A separate release-to-finish interval represents journey time; a marker only at the finish identifies endpoint speed. The drawing contains no measured time, speed or winning route. It is not to scale.

Evidence A: Harvard describes a particular ball race in which a cycloidal curved incline beats a straight one to the bottom. Its short description supplies no numerical timing dataset or full apparatus-loss controls.

Evidence B: Illinois derives travel time for an initially resting particle sliding without friction. Time depends on speed along the whole path. That particle model has no marble spin energy; it is not a plug-in finish-speed formula for a rolling marble.

HS03. What useful timing lesson do A and B support? Give one inference each source does not justify about arbitrary homemade marble routes, and distinguish the two kinds of evidence.

HS04. Diagnose these claims: 'Every curve wins'; 'equal endpoint speeds prove equal times'; 'a frictionless sliding-particle calculation is the rolling-marble calculation.' Explain the missing condition or reasoning for each.

Plan evidence for a new constraint

HS05. A tabletop marble cue must arrive in time for a planned camera shot. Write a paper-only plan for comparing two existing low tracks: define the start/finish events, the changed factor, comparable conditions, what would be recorded and what uncertainty could remain. Do not run or build the apparatus for this worksheet. The finish-speed check alone cannot decide the cue timing.

HS06. A draft report claims, 'The picture predicts a winner, and one successful cue proves the rule for every curve.' Rewrite its conclusion as a bounded proposed investigation. Name what remains unknown and what evidence would be needed; do not invent observations.

Paper activity: compare the three claims in HS04 with the supplied evidence. Trace the whole route and its endpoint separately, then explain the difference aloud or on paper. Materials: sheet and pencil; no-material alternative: use the printed text description and verbal reasoning. No physical build, small parts, tools, high tracks, stairs or roads. This reasoning exercise does not measure travel times or establish real-track performance.

Optional routes and source access

This worksheet stands alone offline. Following a link is optional and requires no account.

Finish Speed versus Arrival Time - optional original micro-lesson |
<https://thisworldexplained.com/okay-but/finish-speed-versus-arrival-time/>

One More Take - Quinn ends with a timing question, rather than a timed route demonstration |
<https://thisworldexplained.com/okay-but/one-more-take/>

Harvard ball-race description - a particular cycloidal route beats a straight incline |
<https://sciencedemonstrations.fas.harvard.edu/presentations/brachistochrone>

Illinois teaching notes - whole-path time for a frictionless sliding particle, not a spinning marble |
<https://liberzon.csl.illinois.edu/teaching/cvoc/node24.html>

OpenStax Rolling Motion - ideal rolling energy and its conditions |
<https://openstax.org/books/university-physics-volume-1/pages/11-1-rolling-motion>

Free to print for classroom and home use. Answers are supplied separately.