

Electronic supplementary material: Corresponding sample items from the pre-, post-, and follow-up tests

Kite¹

Daniel got a 1 m long and 50 cm wide kite for his 8th birthday. He flies it with his girlfriend Sandra. They stand 80 m away from each other. The kite line is 100 m long. Sandra is standing directly under the kite.

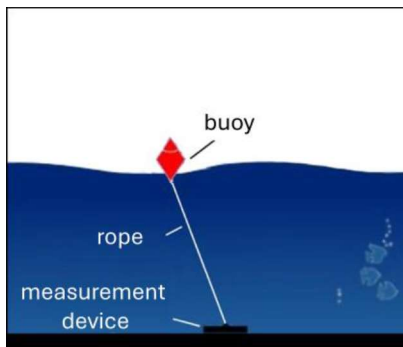
How high is the kite flying at this moment?



¹ cf. Schmitz & Schukajlow (2021)

Buoy²

Buoys are to be installed in the Indian Ocean to warn of seaquakes. They float on the sea surface and are connected by a rope (length: 6,025 m) to the measuring device on the sea floor, which is 6,000 m below the sea surface.



What is the maximum distance that the buoy can drift from the point on the sea surface directly above the instrument?

Describe your solution.

² cf. Bürgermeister (2014), Rellensmann et al. (2022)

IronMan Austria³

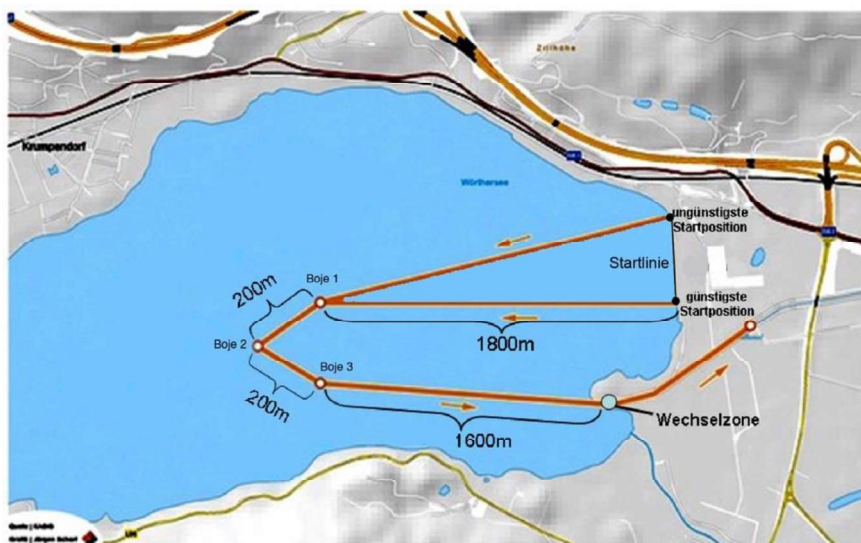
Every year in mid-July the IronMan Austria (triathlon) takes place in Carinthia at the Wörthersee. The following distances must be completed:

- 3.8 km swimming in the Wörthersee,
- 180.0 km cycling and
- 42.2 km running (marathon)



The 1200 participants will start with the swim and, due to the large number of participants, will start from a 410 m wide starting line on the beach (see sketch!). After the start, three turning buoys must be passed. A competitor who starts on the far right will have to swim a longer distance to the first buoy than a competitor who starts on the far left.

How many more meters does a competitor with the worst starting position swim than a competitor with the best starting position?



³ cf. Schukajlow & Krug (2014)

References

- Bürgermeister, A. (2014). *Leistungsbeurteilung im Mathematikunterricht: Bedingungen und Effekte von Beurteilungspraxis und Beurteilungsgenauigkeit* [Classroom assessment practices: Conditions and consequences of assessment practices and judgment accuracy]. Waxmann.
- Rellensmann, J., Schukajlow, S., Blomberg, J., & Leopold, C. (2022). Effects of drawing instructions and strategic knowledge on mathematical modeling performance: Mediated by the use of the drawing strategy. *Applied Cognitive Psychology*, 36(2), 402–417. <https://doi.org/10.1002/acp.3930>
- Schmitz, M., & Schukajlow, S. (2021). Pictures in modelling problems. Does numerical information make a difference? In F. K. S. Leung, G. Kaiser, G. Stillman & K. L. Wong (Eds.), *Mathematical Modelling Education in East and West* (pp. 189-199). Springer.
- Schukajlow, S., & Krug, A. (2014). Do multiple solutions matter? Prompting multiple solutions, interest, competence, and autonomy. *Journal for Research in Mathematics Education*, 45(4), 497–533. <https://doi.org/10.5951/jresmetheduc.45.4.0497>