

Special Relativity Animation

Galileo's Ship

By Mark Egdall 6/15/ 09
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1. Animation on Galileo's dictum:

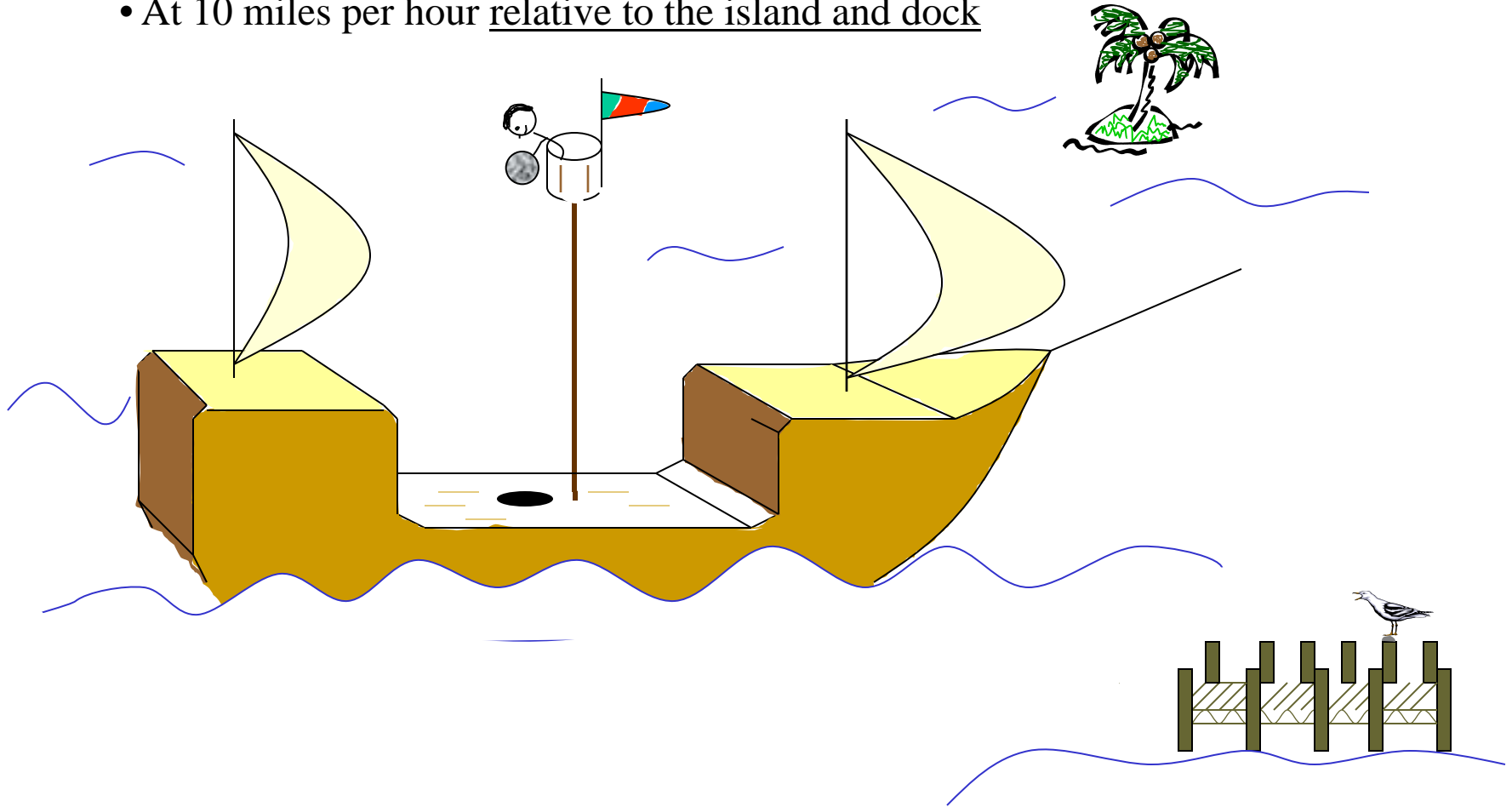
An object in uniform motion is traveling at a constant speed and in a constant direction

- Galileo's dictum: You cannot tell whether you are *in uniform motion or at rest*
 - Einstein called this his first postulate – all speeds are relative
- In other words, everything is moving with respect to something else. There is no “at rest” frame of reference

View from Shore

Assume ship traveling in uniform motion

- At 10 miles per hour relative to the island and dock

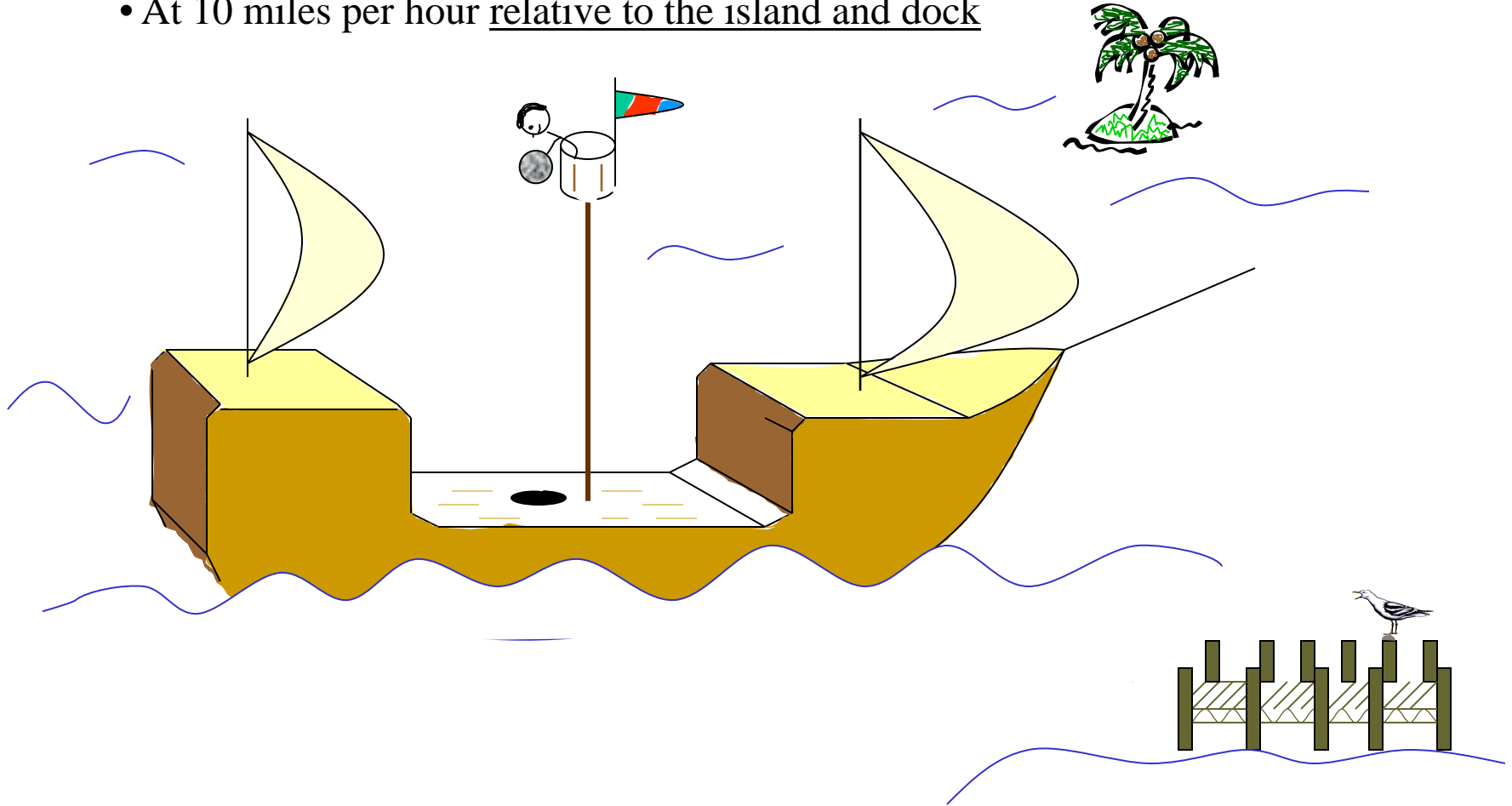


* Based on 1632 treatise by Galileo Galilei, as cited by Richard Panek, The Year of Albert Einstein, *Smithsonian*, June 2005, p. 110

View from Shore

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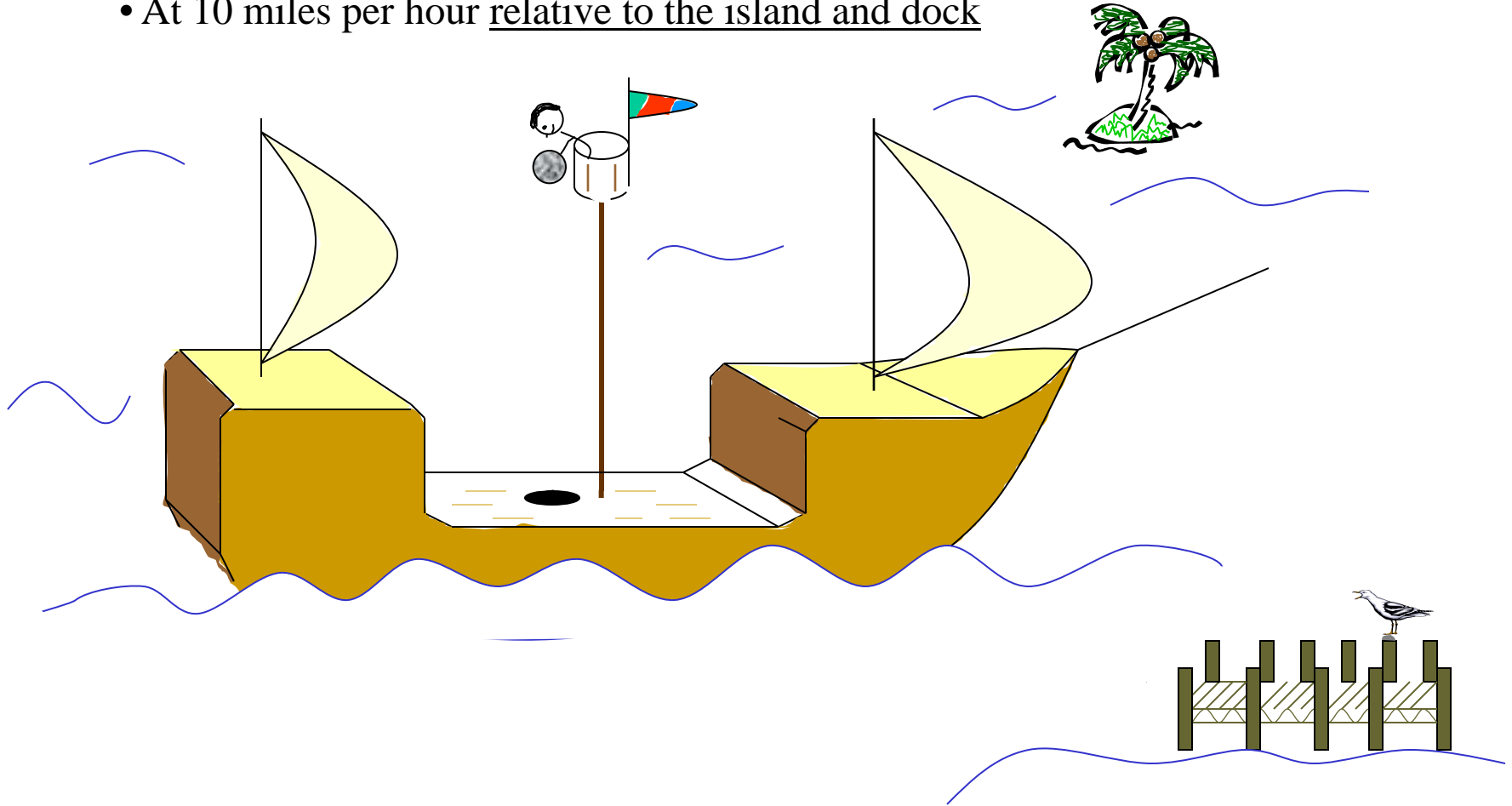
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View from Shore

Assume ship traveling in uniform motion

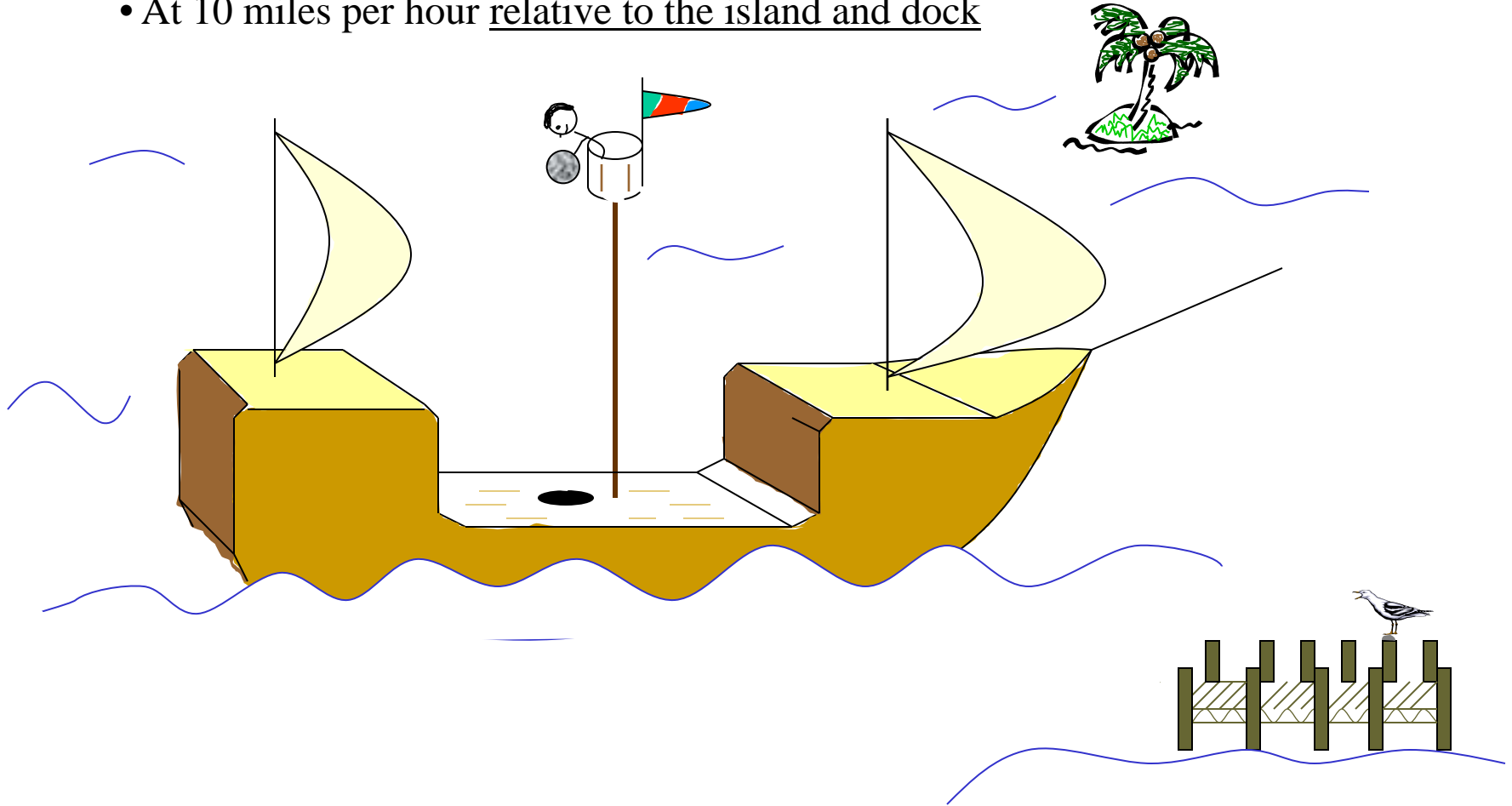
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View from Shore

Assume ship traveling in uniform motion

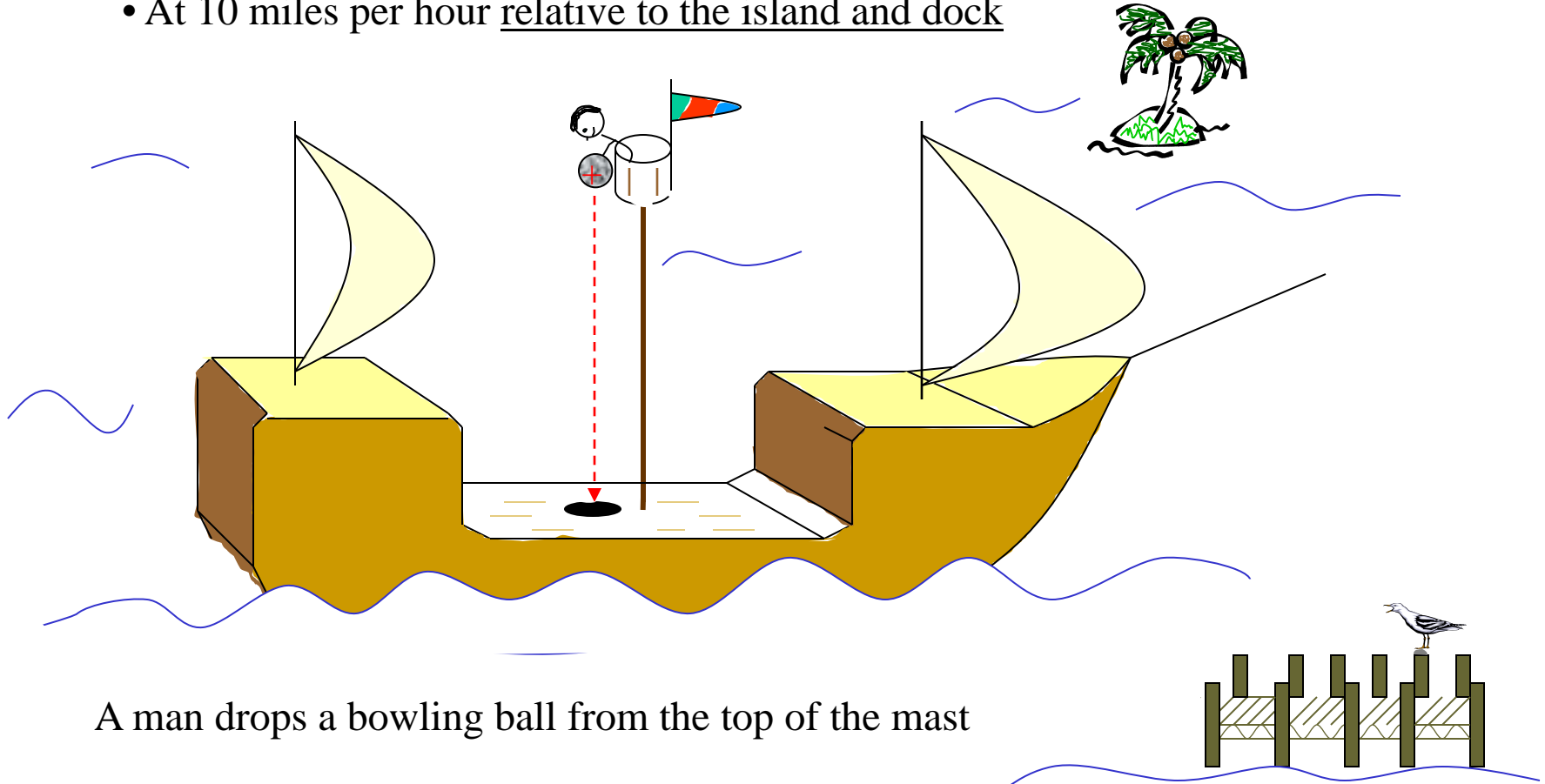
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View from Shore

Assume ship traveling in uniform motion

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A man drops a bowling ball from the top of the mast

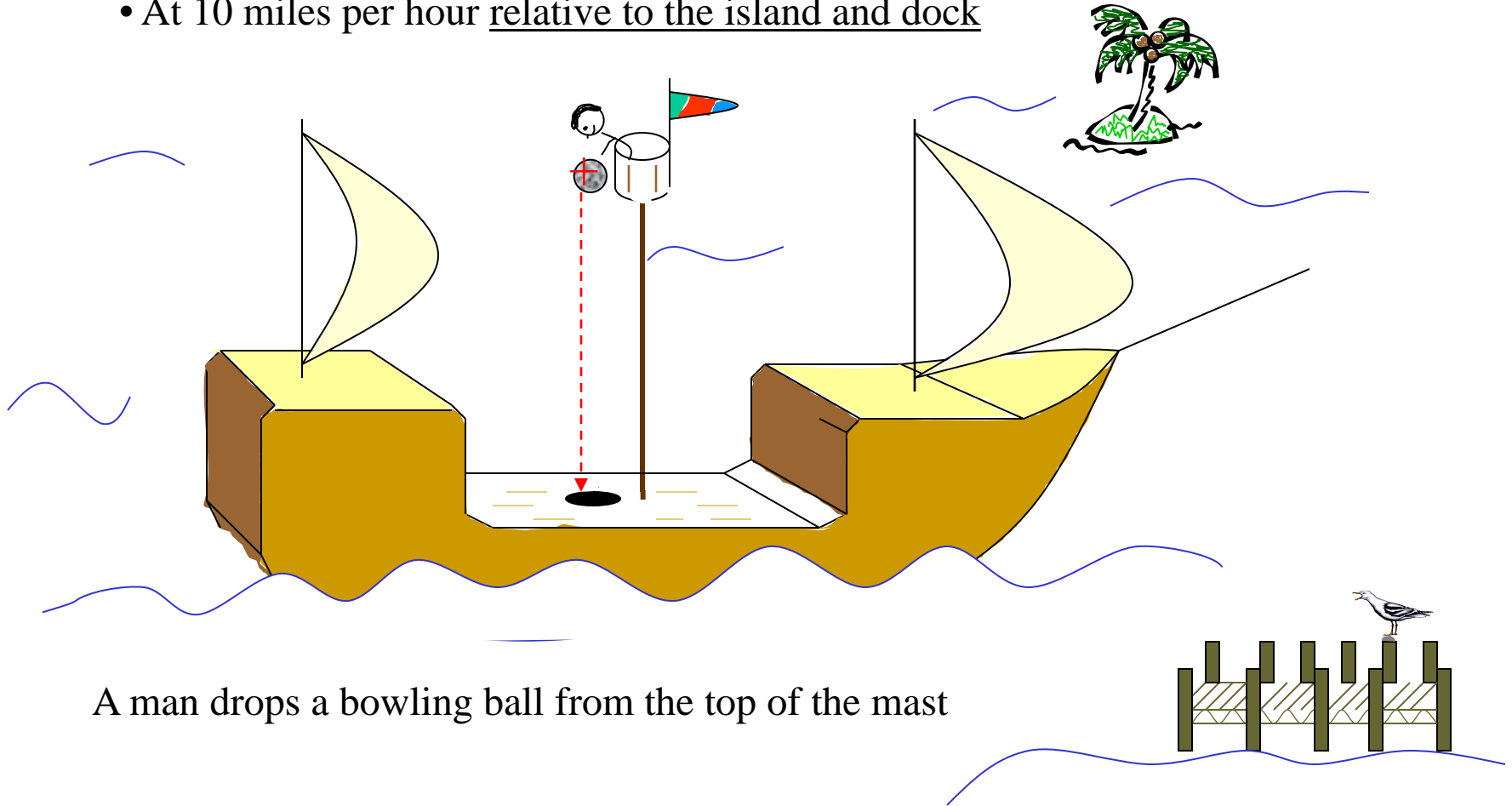
Galileo asks - With ship still in motion, will the ball

- A) drop straight down and miss the moving hole, or**
- B) drop at an angle and fall into the moving hole?**

View from Shore

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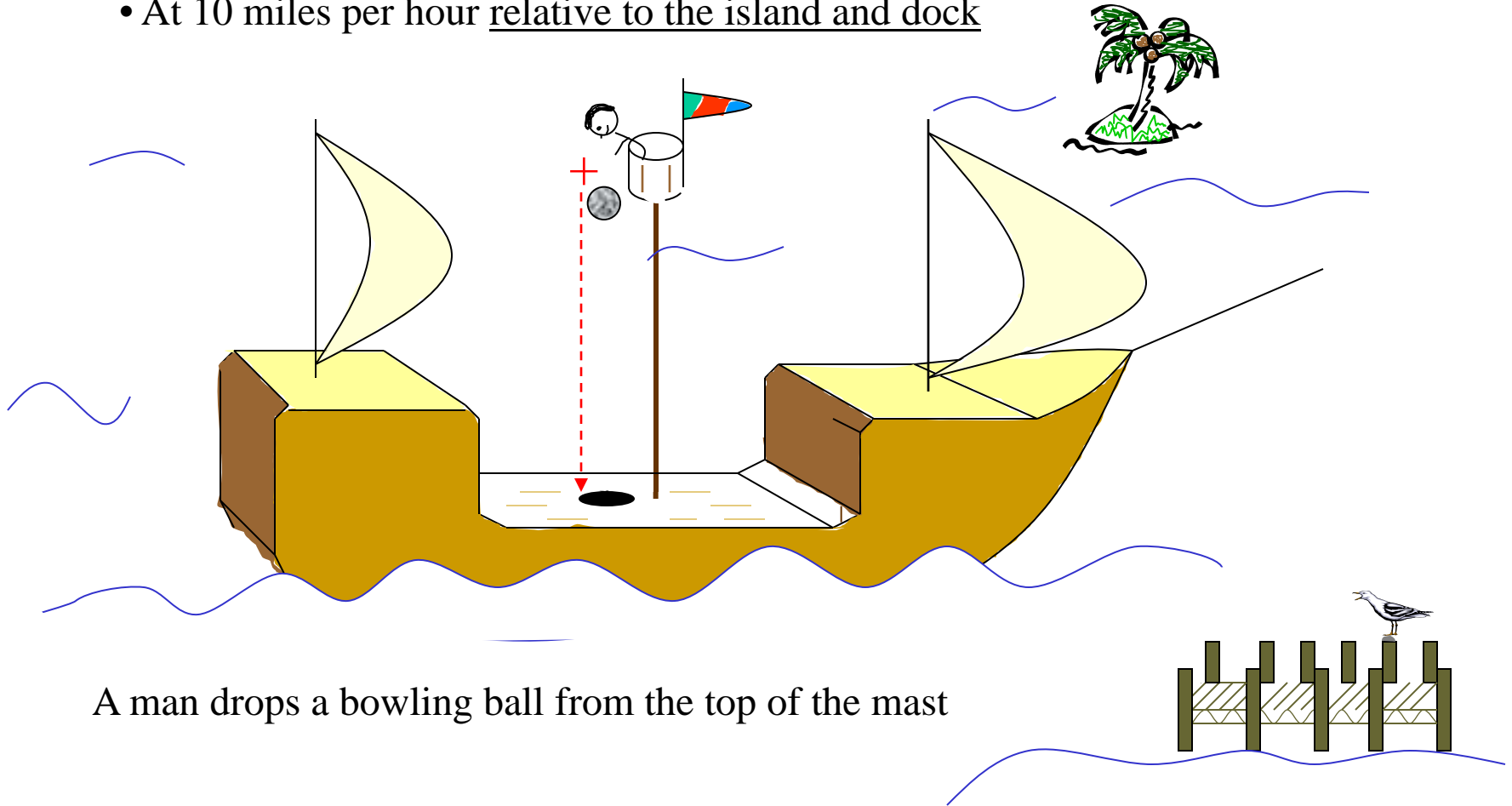


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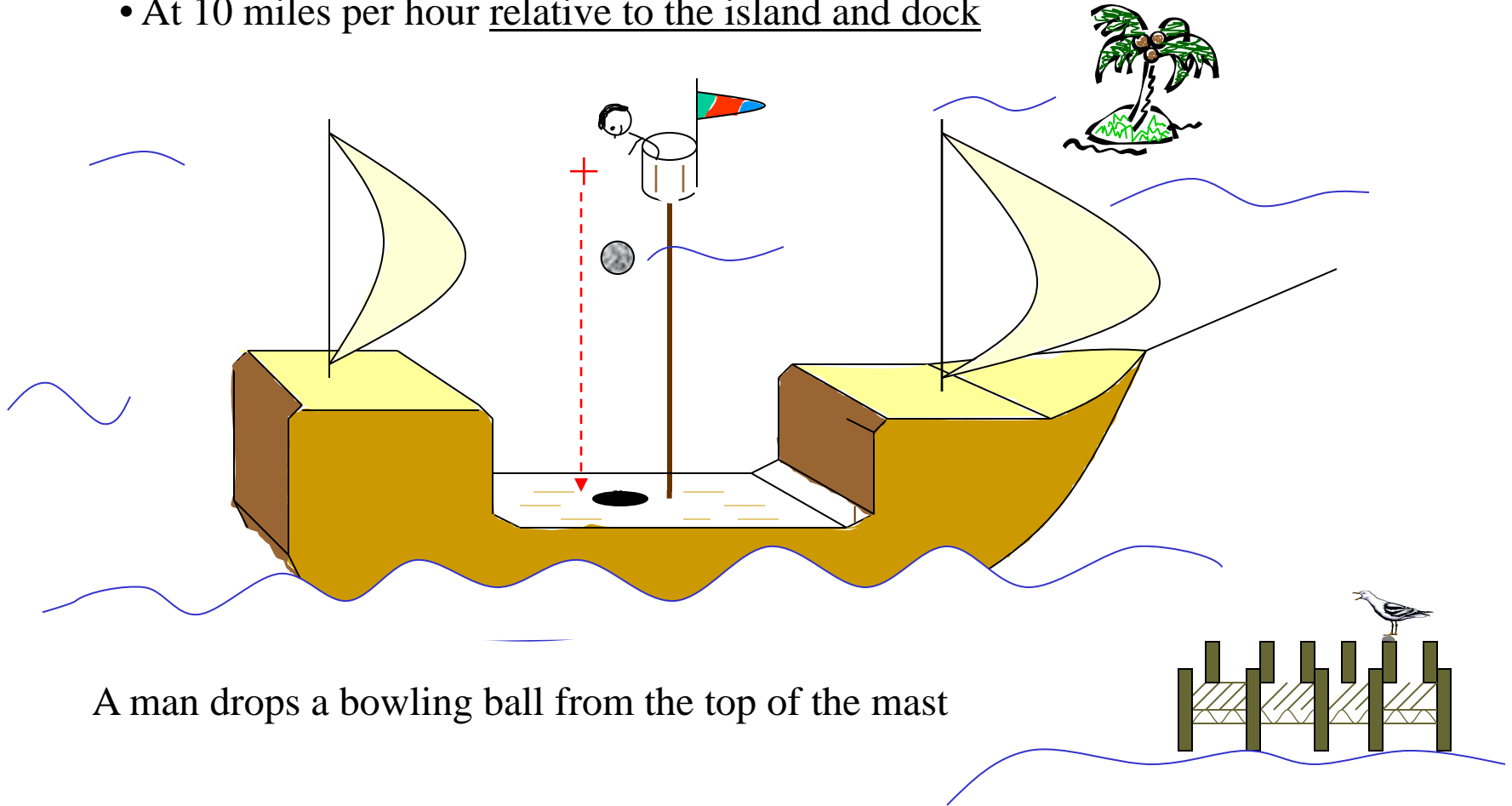


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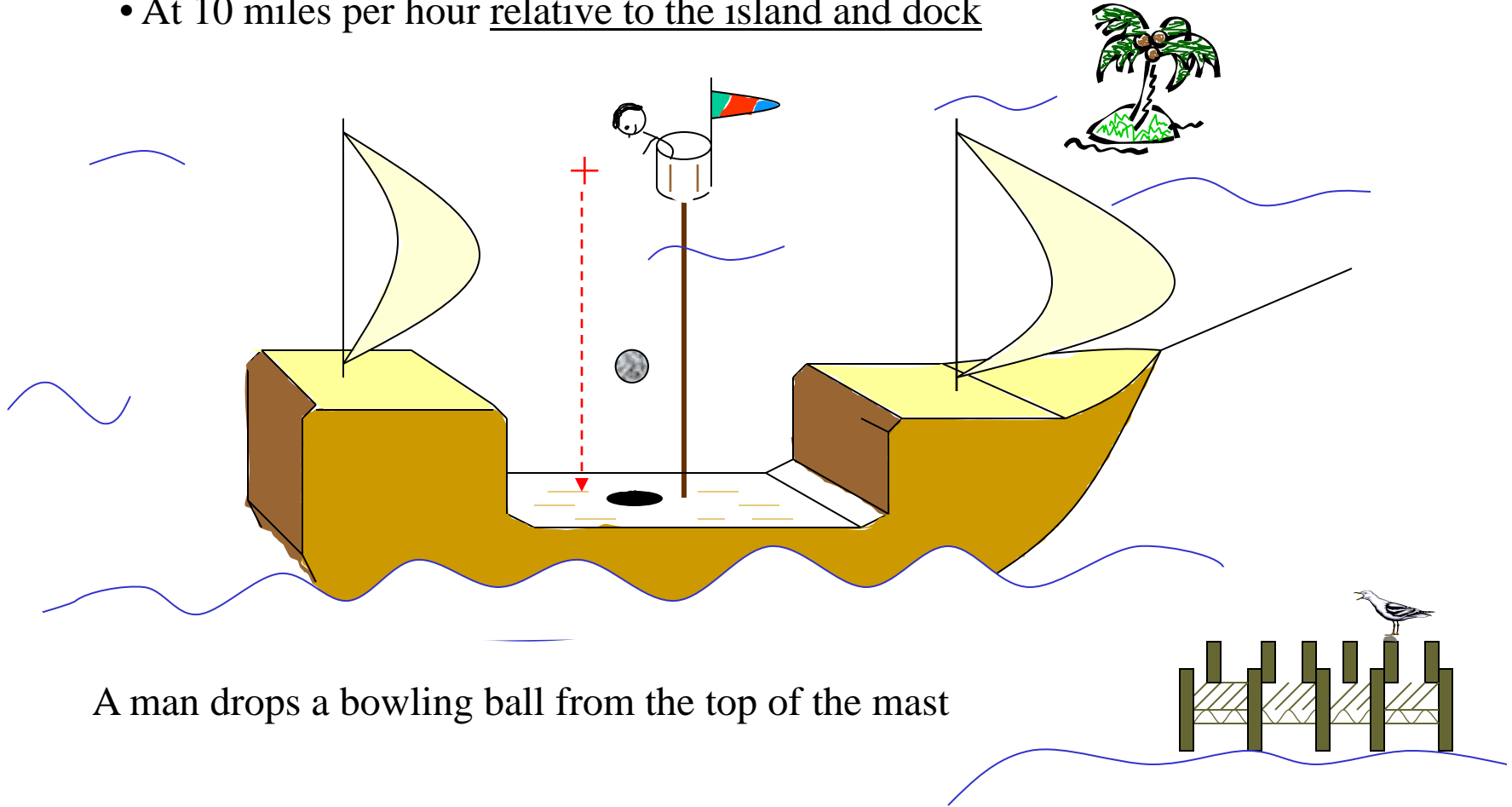


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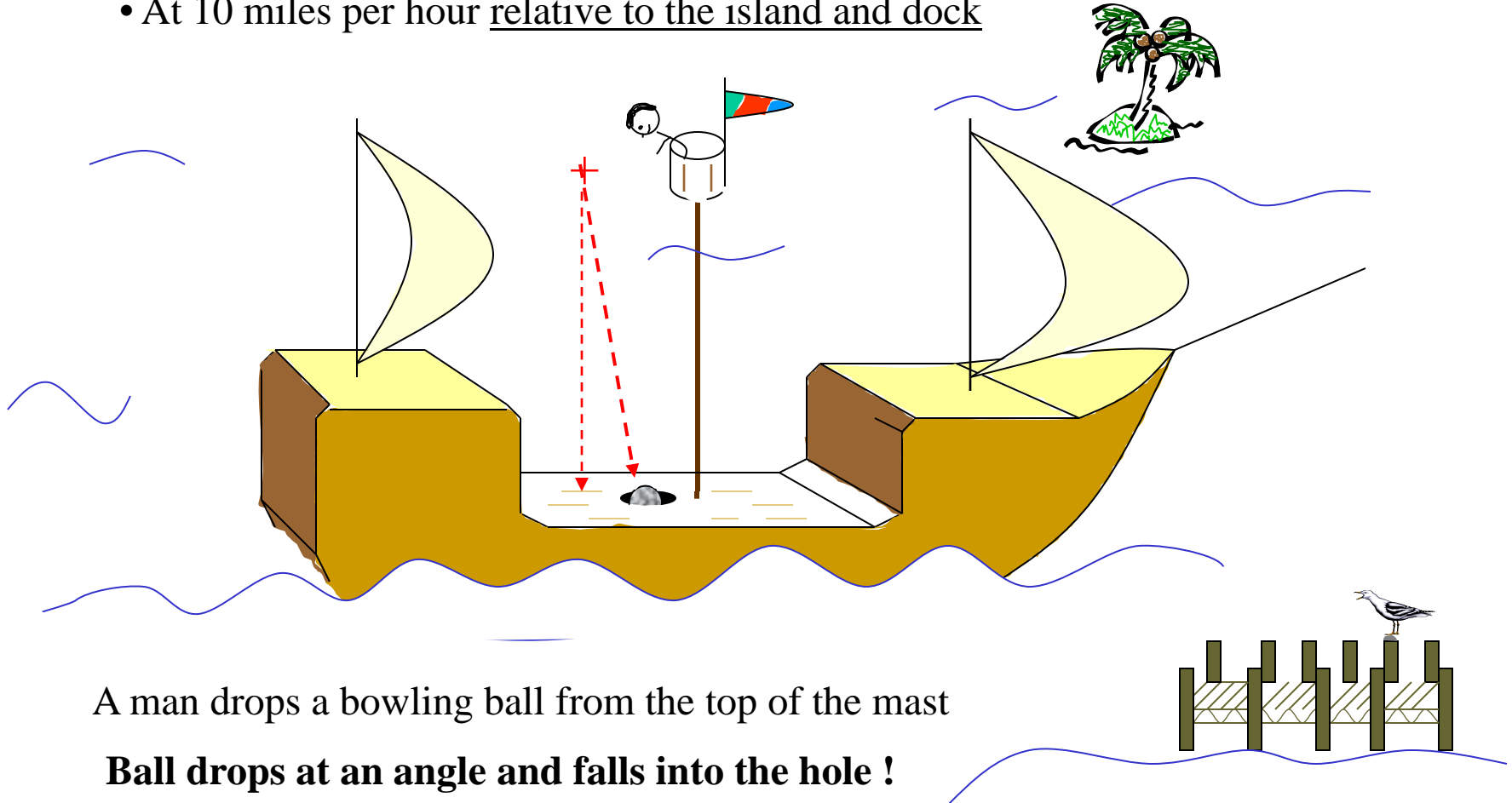


A man drops a bowling ball from the top of the mast

View from Shore

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A man drops a bowling ball from the top of the mast

Ball drops at an angle and falls into the hole !

- Ball is on ship, so starts out traveling left to right at same speed as ship
- Ball continues to travel with ship *after* it is let go

What Does It Look Like From the Point of View of the Man on the Ship ?

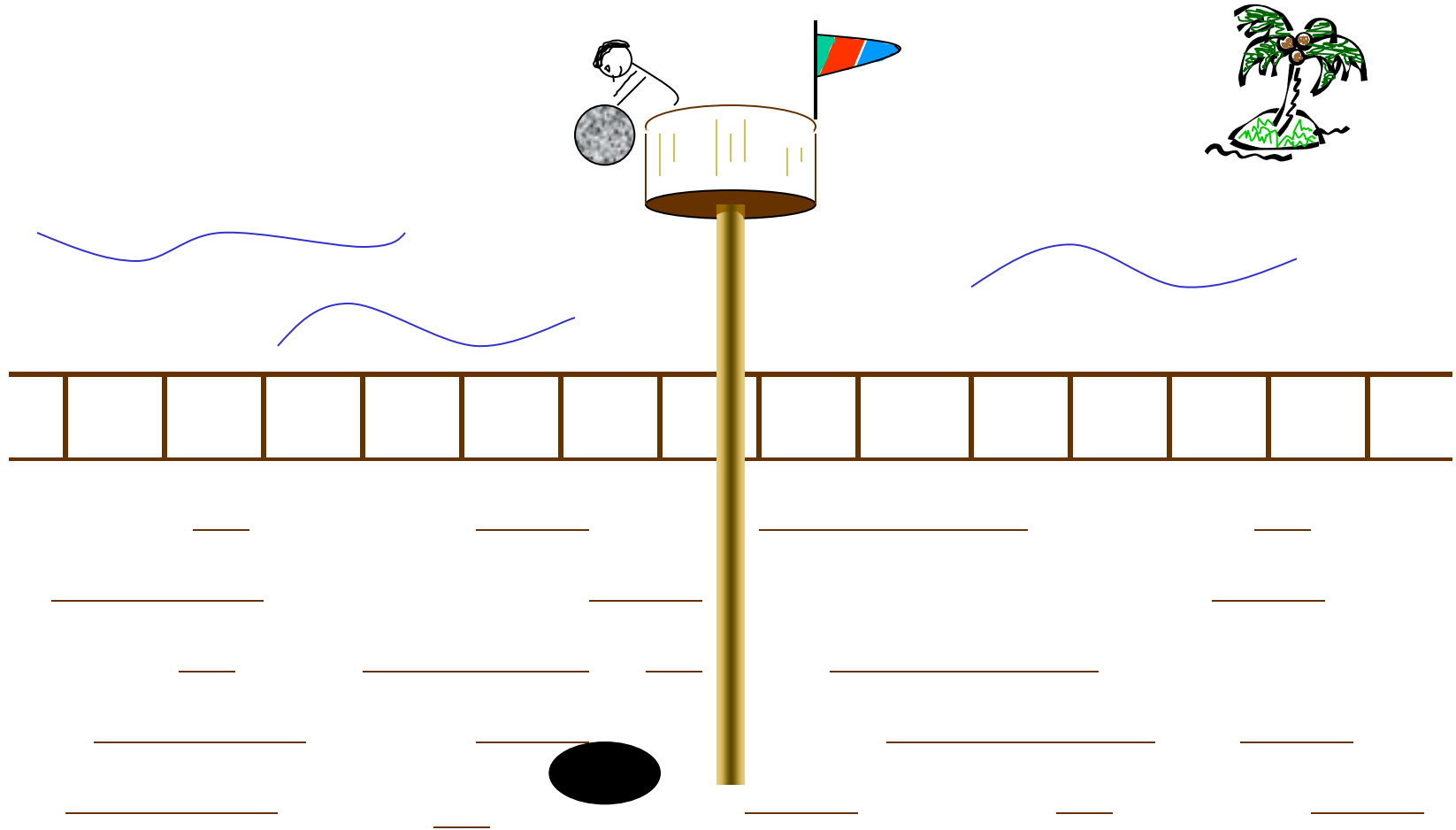
When A and B are moving in uniform motion with respect to each other:

- There are always two ways to look at the situation
 - A sees himself as standing still with B moving
 - B sees himself standing still with A moving
 - Both are equally valid

From Ship's Point of View

Assume ship traveling in uniform motion

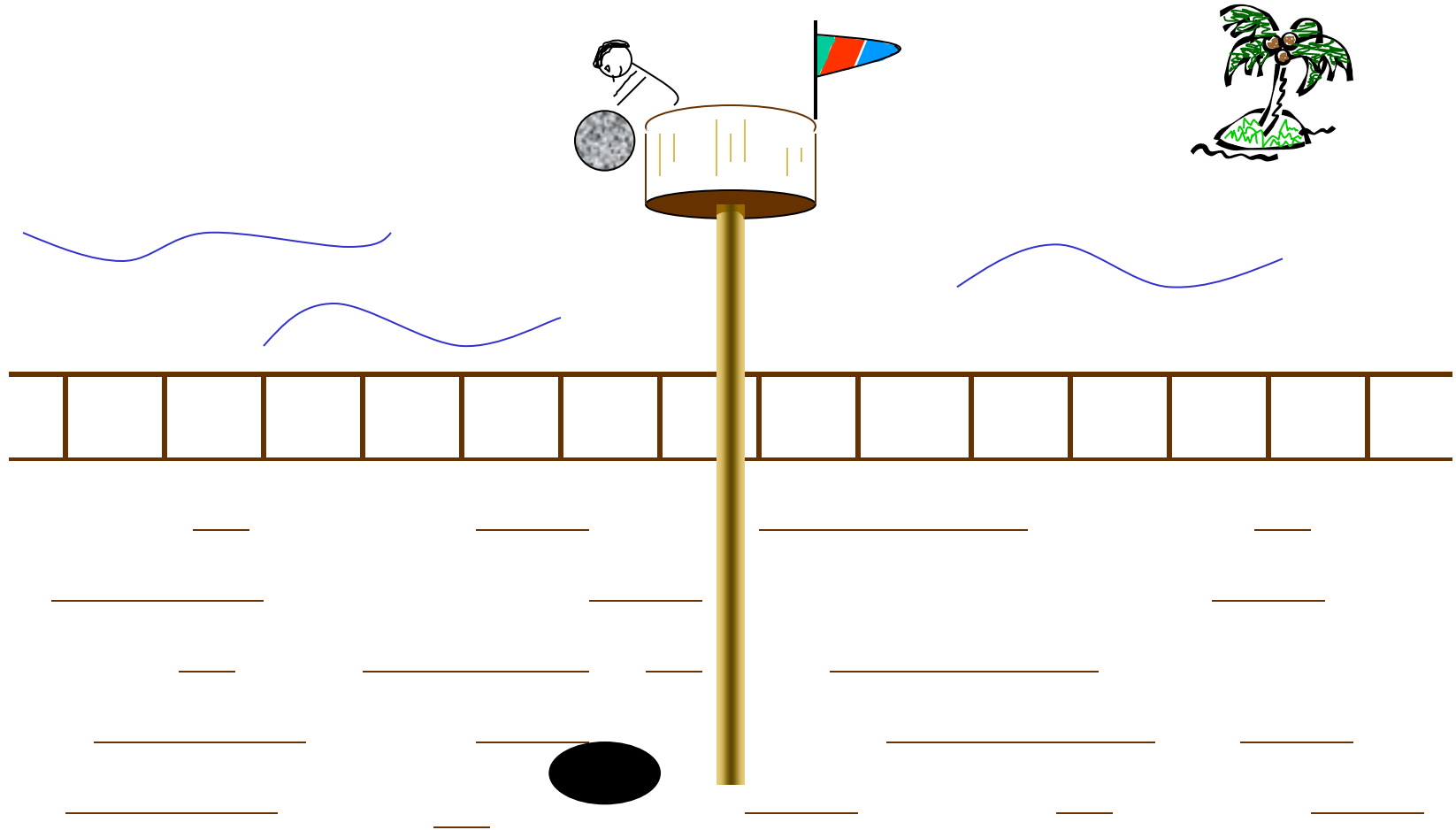
- At 10 miles per hour relative to the island and dock



From Ship's Point of View

Assume ship traveling in uniform motion

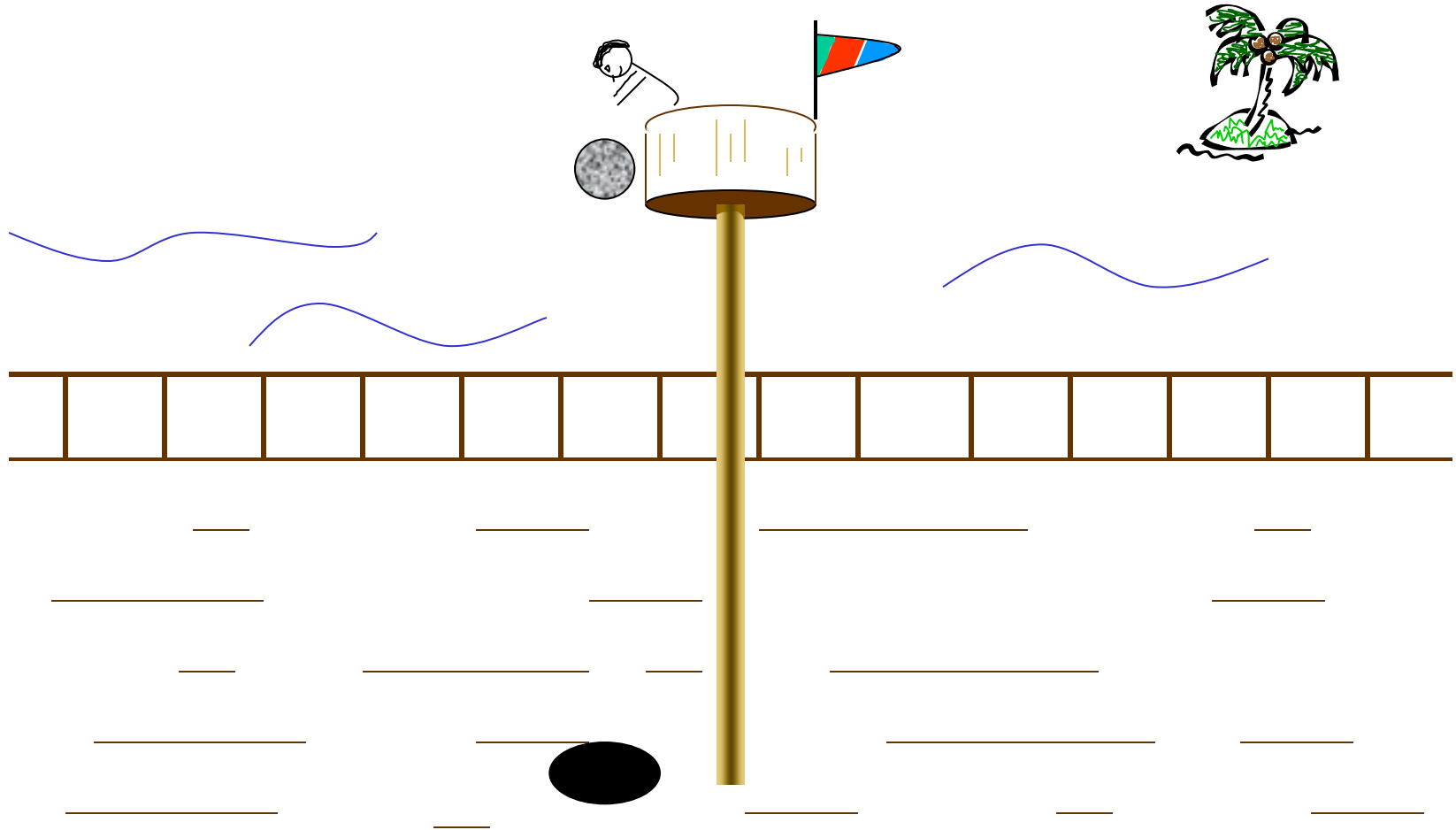
- At 10 miles per hour relative to the island and dock



From Ship's Point of View

Assume ship traveling in uniform motion

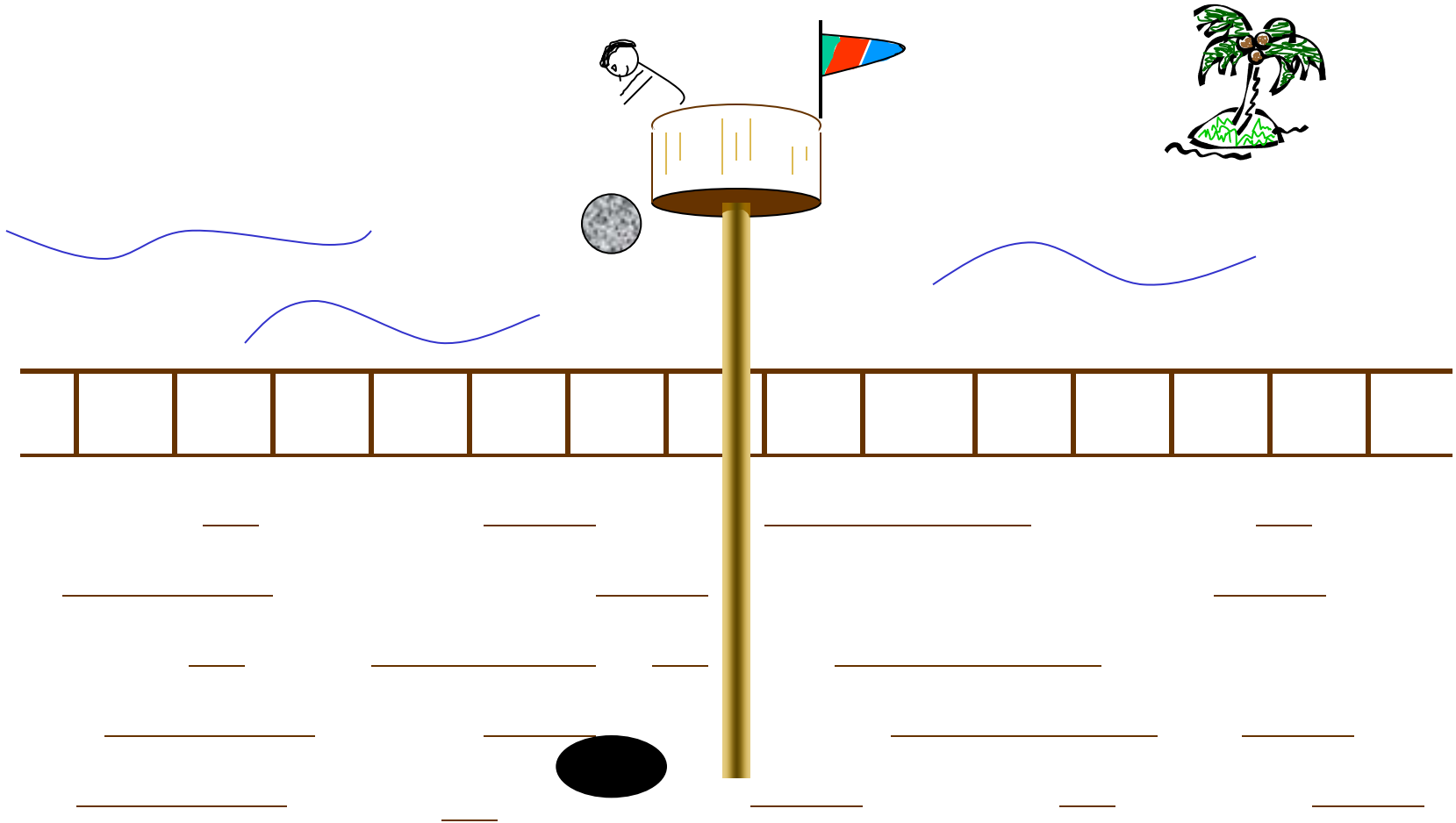
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From Ship's Point of View

Assume ship traveling in uniform motion

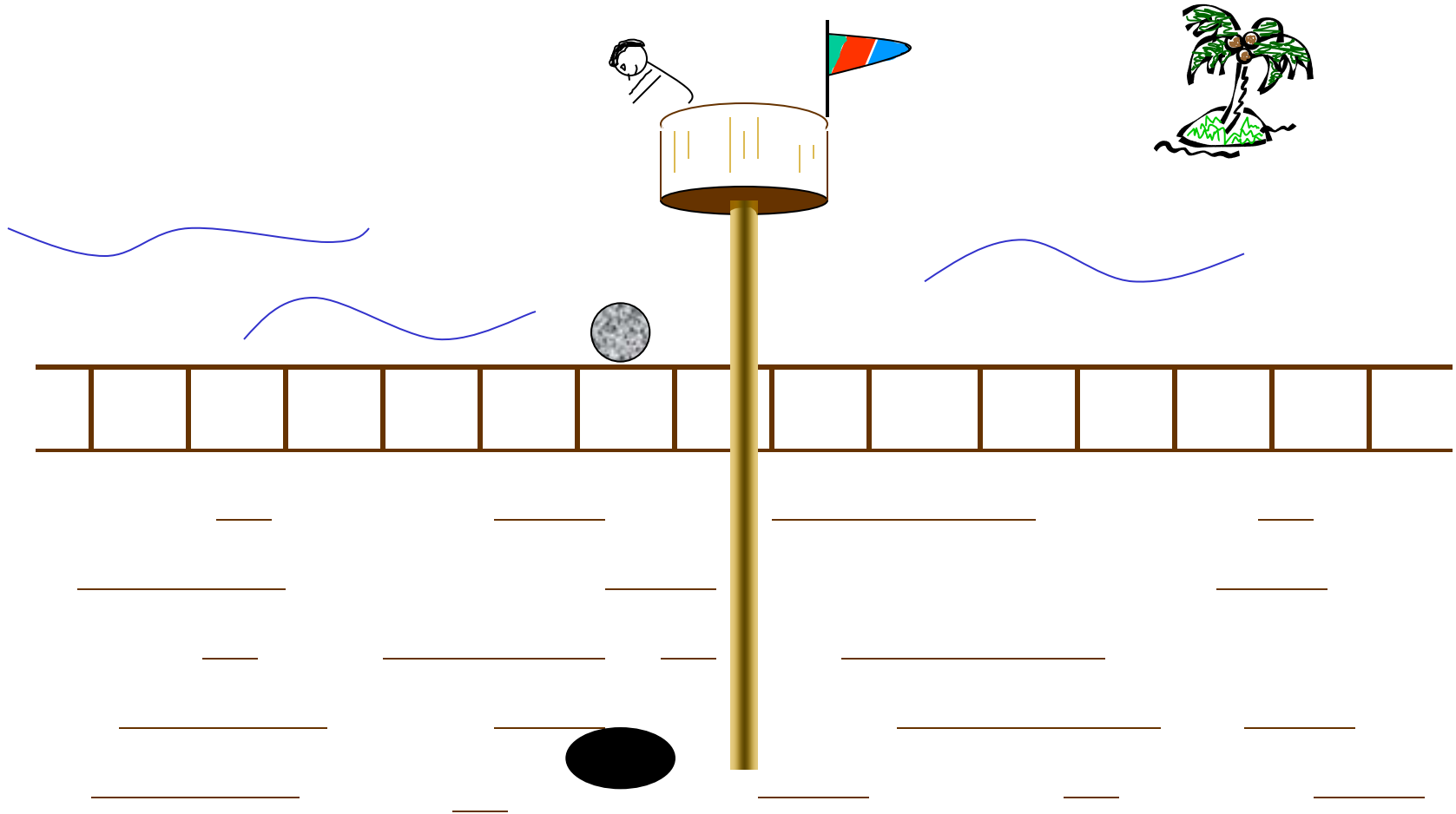
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From Ship's Point of View

Assume ship traveling in uniform motion

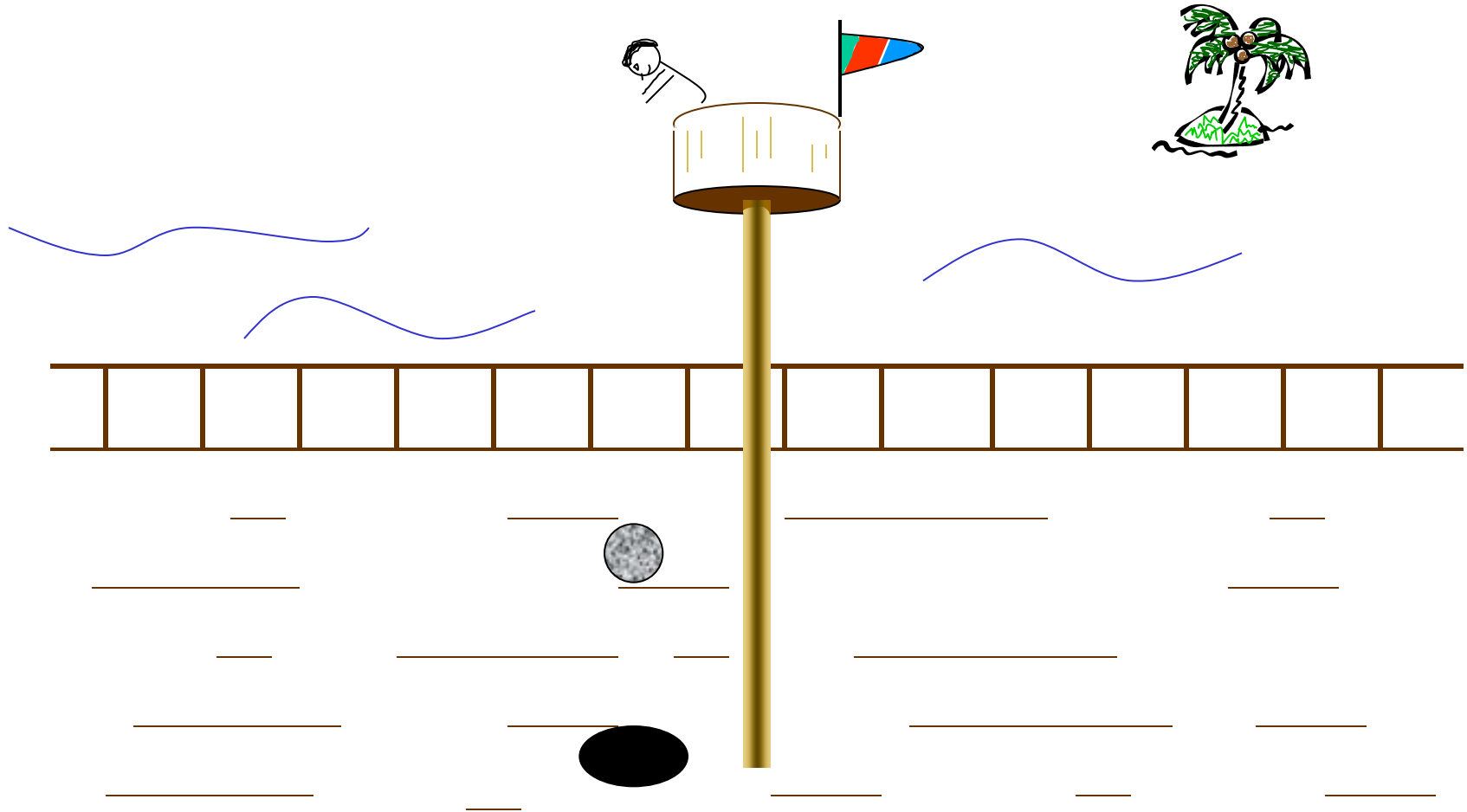
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From Ship's Point of View

Assume ship traveling in uniform motion

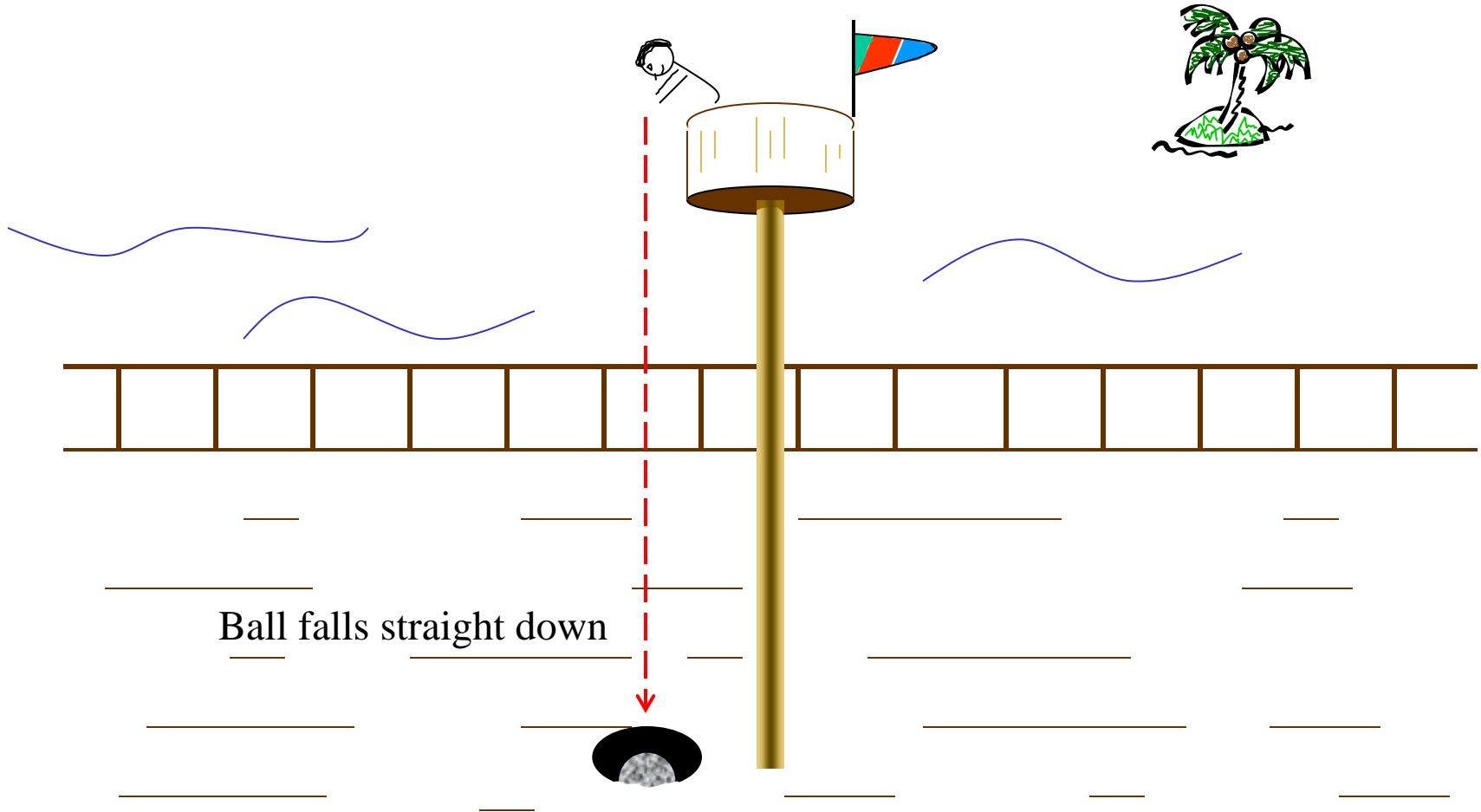
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From Ship's Point of View

Assume ship traveling in uniform motion

- At 10 miles per hour relative to the island and dock



From the Point of View of the Man on the Ship:

He and the ship are standing still, and

Everything else is moving by him in the opposite direction

Motion is relative

Path of falling ball is relative too!

- **View onboard ship – straight down**
- **View from shore – at an angle
(actually a parabola)**