**Engineering Sea Travel**

Discovery TV created this video about the innovations that took place in history that allow for the world’s largest cruise liner to exist today.

[https://www.youtube.com/watch?v=N3qh0SBH9EU](https://www.youtube.com/watch?v=N3qh0SBH9EU)

**Clip 1:** Read these questions then watch the start of the video until **7:40**. Stop the video at 7:40 to answer these questions.

1) What problem did the *SS Great Western* attempt to solve? ____________________________

2) Where is the *Independence of the Seas* departing from in this video? ________________

3) What happens to wooden ships at the top of large waves? ____________________________

4) What powered ships traveling across the Atlantic in 1835? ____________________________

5) Who designed the *SS Great Western*? _____________________________________________

6) What is Anthony Burton’s job? ____________________________________________________

7) The video says the *SS Great Western* made the trip across the Atlantic “twice as fast”. How many days did it take to go across the Atlantic before the *SS Great Western* was built?

__________ days

8) What was the initial problem with a steam-powered ship? ____________________________

9) What was the engineering solution to this problem? _________________________________

10) Write a sentence answering whether the *SS Great Western* solved the problem you described in #1.

Critical Thinking: Do you agree that “big is best” in naval engineering? (You can write on the back.)

Video at: [https://www.youtube.com/watch?v=N3qh0SBH9EU](https://www.youtube.com/watch?v=N3qh0SBH9EU).

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Modern-Day Sea Travel

Clip 2: Read these questions then watch the video from 7:40 to 13:10. Stop the video at 13:10 to answer these questions.

https://youtu.be/N3qh0SBH9EU?t=7m41s

1) Why does the narrator say “the Independence of the Seas takes the idea that ‘big is best’ to the extreme”?

_____________________________________________________________________________________

2) Which quote is an important principle of design engineering?
   a. “Material works better if you put it in the right place.” (9:25)
   b. “Last time, two fell straight through to the floor.” (10:13)
   c. “Designers working on Independence of the Seas” (10:34)
   d. “Each box is up to 32 meters wide and 22 meters long.” (10:45)
   e. “Engineers build the boxes in huge hangars.” (10:52)

3) How much does the steel weigh in the Independence of the Seas? __________________________

4) About how many steel boxes are built for the Independence of the Seas? ___________________

5) Where does final assembly of the ship take place? __________________________________________

6) What do the hydraulic jacks do? _________________________________________________________

7) What problem do bulkhead doors solve? _____________________________________________________

8) Why is it important for the bulkhead doors to solve this problem? _____________________________

9) Why is the structure of the Independence of the Seas strong?
   a. It is made of steel.
   b. It was built in a large shipyard.
   c. Its captain is experienced and smart.
   d. Its building material is well arranged.

10) The narrator says the ship is made of “rigid boxes”. What does “rigid” mean in this context?
    a. Safe; will not sink
    b. Stiff; difficult to bend
    c. Strong; lifts lots of weight
    d. Metallic; made with strong metal
Clip 3: Read these questions then watch the video from 13:10 to 23:40. Stop the video at 23:40 to answer these questions.

https://youtu.be/N3qh0SBH9EU?t=13m10s

1) Who engineered the SS Great Britain? _____________________________________________

2) What is the problem with paddlewheels on ocean ships?

_____________________________________________________

3) What is the solution to the problem with paddlewheels?

_____________________________________________________

4) What does Archimedes screw do?

_____________________________________________________

5) How many more pounds does the SS Great Britain weigh than the SS Great Western?

_____________________________________________________

6) What does the tug-of-war demonstration show?
   a. The paddlewheel boat is stronger.
   b. The propeller boat is more efficient.
   c. The propeller stays in the water the entire time.
   d. The paddlewheel boat starts fast but loses strength quickly.

7) What problem is caused by transitioning from a paddle wheel to a propeller?

_____________________________________________________

8) What is the solution to the problem caused by this transition?

_____________________________________________________

9) What problem would traditional propellers cause the Independence of the Seas?

_____________________________________________________

10) How do “Azipods” solve this problem with traditional propellers?

_____________________________________________________

11) Which directions can the Independence of the Seas go? (Select all that apply.)

   □ Forward    □ Backwards    □ Left    □ Right    □ Sideways

12) What problem do the divers try to find?

_____________________________________________________

Critical Thinking: Do you think a car uses a propulsion system that is more like a drive shaft/propeller or a paddle wheel? How does it propel a car forward? (Use the back of this sheet to answer.)
Clip 4: Read these questions then watch the video from 23:40 to 30:10. Stop the video at 30:10 to answer these questions.

https://youtu.be/N3qh0SBH9EU?t=23m40s

1) What makes a ship unstable?
   a. long, narrow hull
   b. old wooden ships
   c. weighing too much
   d. not being tall enough

2) What problem with SS Great Britain does the narrator describe?

3) What type of people do the designers of the Conte Di Savoia want on the ship?

4) What does Tristan Smith mean when he says that “it capsized the board”?

5) What is the Conte Di Savoia’s solution for the problem you wrote in #2?

6) How does the Conte Di Savoia’s solution (#5) work?

7) What is the solution to the problem you wrote in #2 designed for the Independence of the Seas?

8) How does the Independence of the Seas’ solution work?

9) Why is it important that the flaps on the Independence of the Seas are thin and “slice through the water”?

Critical Thinking: Explain whether you think the passengers on the Conte Di Savoia’s and the Independence of the Seas are more alike or more different.
Clip 5: Read these questions then watch the video from 30:10 to 38:30. Stop the video at 38:30 to answer these questions.

https://youtu.be/N3qh0SBH9EU?t=30m9s

1) What event in 1924 causes problems for shipbuilders?

_____________________________________________________________________________________

2) Why is this event a problem for shipbuilders?

_____________________________________________________________________________________

3) What is the solution that shipbuilders come up to solve the problem you wrote in #1?

_____________________________________________________________________________________

4) Why is the smoke from the engine a problem for shipbuilders now?

_____________________________________________________________________________________

5) What is the solution that shipbuilders design to fix the problem with the smoke?

_____________________________________________________________________________________

6) Circle all the records held by the Normandie
   a. largest ship ever built
   b. larger than any ship built before it
   c. cheapest rooms on the trip to America
   d. first ship to have a swimming pool on its deck
   e. fastest ship to travel between Europe and America before 1936

7) What additional problem would be caused by moving the engines to the top deck?

_____________________________________________________________________________________

8) What additional problem would be caused by moving the engines to the back of the boat?

_____________________________________________________________________________________

9) What problem is caused the swimming pools on the Independence of the Seas?

_____________________________________________________________________________________

10) How did Independence of the Seas’ engineers solve the problem caused by the swimming pools?

_____________________________________________________________________________________

11) What problem is caused by empty spaces in the center of a ship?

_____________________________________________________________________________________

12) Select the two solutions engineers use to protect the Royal Promenade.

☐ using marble   ☐ steel plates   ☐ steel girders   ☐ smaller swimming pools   ☐ less smoke

Video at: https://www.youtube.com/watch?v=N3qh0SBH9EU.
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Clip 6: Read these questions then watch the video from 38:29 to 44:35. Stop the video at 44:35 to answer these questions.

https://youtu.be/N3qh0SBH9EU?t=38m29s

1) How do the Queen Mary’s engineers intend to improve on the elegant design of the Normandie?

__________________________________________________________________________

2) Where do waves form on a traditional ship? (Check all that are correct.)
   □ bow    □ stern    □ underneath the hull    □ on top of the deck    □ in the engines

3) What does drag do to a ship?
   □ slow it down    □ speed it up    □ make it safer    □ make it unsafe    □ make it less stable

4) What did engineers discover while testing a prototype of the Queen Mary?

_____________________________________________________________________________________

5) What problem do waves cause?

_____________________________________________________________________________________

6) What solution did the engineers of the Queen Mary develop?

_____________________________________________________________________________________

7) What problem do fast ships encounter?

_____________________________________________________________________________________

8) What is the solution that the Queen Mary use to solve this problem?

_____________________________________________________________________________________

9) What problem does the “bulbous bow” solve?

_____________________________________________________________________________________

10) How does the bulbous bow solve this problem?

_____________________________________________________________________________________

Critical Thinking: The narrator says a solution “massively increases the Queen Mary’s speed” (41:00). Do you agree? Explain why you agree or disagree with the narrator.

_____________________________________________________________________________________

_____________________________________________________________________________________

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Clip 7: Read these questions then watch the video from 44:35 to the end. Stop the video at the end and answer these questions.

https://youtu.be/N3qh0SBH9EU?t=44m35s

1) What is the last problem solved by Independence of the Seas?

____________________________________________________________________________________

2) What does the Independence of the Seas crew do to ensure they are ready to solve this problem?

____________________________________________________________________________________

3) What problem did the Wahine passengers have when they were in the rescue boats?

____________________________________________________________________________________

4) How did the engineers of the Independence of the Seas solve this problem with the rescue boats?

____________________________________________________________________________________

Summary of whole video

5) Select each ship that was the biggest ship ever built when it was launched. (Select all that are correct.)

☐ SS Great Western  ☐ SS Great Britain  ☐ Conte Di Savoia
☐ SS Normandie  ☐ Queen Mary  ☐ Independence of the Seas

6) Select each ship that was the fastest ship ever built when it was launched. (Select all that are correct.)

☐ SS Great Western  ☐ SS Great Britain  ☐ Conte Di Savoia
☐ SS Normandie  ☐ Queen Mary  ☐ Independence of the Seas

7) Why is “Big, Bigger, Biggest” a good title for this video?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

8) What is another good title for this video?

Title: _______________________________________________________

(Explain your thinking below.)

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

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