Software Development Engineering

U3H2 “Simple Machines”

7°N | English VI

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33.1 Complete the article about the *Titanic*, taken from a popular science magazine. Look at A and B opposite to help you.

It's been suggested that the passenger liner *Titanic* wouldn't have sunk after colliding with an iceberg in 1912, if it had hit the obstacle head on and damaged only the front of the ship. As history tells, the crew tried to turn to avoid the iceberg, and 1,517 lives were lost. But how severe would a frontal impact have been for the passengers? The answer depends on several questions:

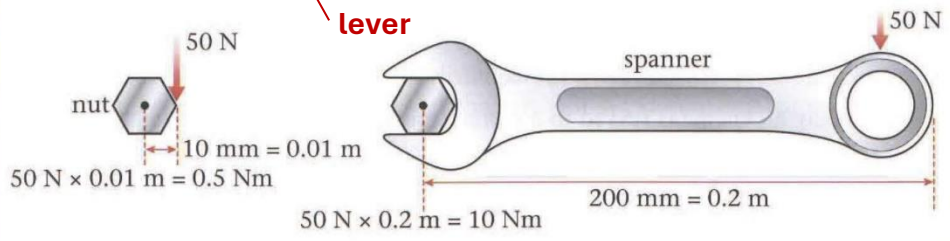
- The ship tried to slow while turning. Would (1) linear deceleration have been more effective, allowing the ship to (2) decelerate more rapidly?
- Based on this (3) rate of deceleration (and assuming the ship would not have stopped in time), what would the (4) velocity of the ship have been at the moment of impact?
- What was the (5) mass of the iceberg? Calculating the approximate number of kilograms of ice would allow the (6) inertia of the iceberg to be compared with the momentum of the *Titanic*. This would show whether the impact would have caused the iceberg to (7) accelerate to any significant degree, and so absorb some of the shock as it was pushed forward.

Clearly, the above questions depend on numerous unknown variables. So let's make a rough estimate. Let's assume the impact would have occurred at a pretty fast 25 kilometres per hour – that's seven (8) meters per second. And allowing for some shock absorption from bending steel and crushing ice, let's say the ship would have stopped within three seconds (although it would probably have taken longer). This would have resulted in a deceleration of 2.3 (9) meters per second squared. Expressed as a (10) G-force, that gives 0.23 – less than one-third of the deceleration generated by a car braking heavily. So the impact probably wouldn't have caused too much of a shock to the passengers. Whether or not the ship would have sunk, however, is another question.

33.2 Replace the underlined words and expressions with alternative words and expressions from A and B opposite.

The first diagram below illustrates how a worker is able to apply a total (1) force of 50 newtons to the corner of a nut using just his fingers. The distance from the centre of the nut – the point around which the nut (2) turns – and the corner of the nut is 10 mm. This results in a (3) force of leverage of 0.5 newton metres. This is insufficient to tighten the nut properly.

The second diagram shows how a spanner can be used as a (4) tool to provide a (5) boost in force. Applying the same 50-newton force to the end of the 200 mm spanner, which acts as a (6) turning tool, generates 10 newton metres – a force 20 times greater, and enough to tighten the nut.



effort
pivots
moment
simple machine
mechanical advantage
lever

Over to you

Think about a simple machine you use or are familiar with. How does it provide a mechanical advantage, and how great is the advantage?