

Self guided Active Physics Worksheet for the Maritime Museum San Diego

Name _____ per _____

The museum is located at 1492 North Harbor Drive, Phone (619)234-9153, Admission is \$9 for adults and \$7 for students and military. Call or check the web for hours and if the ships are available for tours. www.sdmaritime.org

Start your visit on the **Surprise**. If you have a hard time finding anything on the ships ask for help.

On board the **Surprise** what connects the (fake) steering wheel (helm) to the ropes that go to the rudder? Seven of these provide the friction necessary. _____

How is the friction between the Boom and the Mizzenmast reduced ? _____

Go down below deck and look for a small model of a cannon in the center of the ship. Next to it is a cut away model of how a cannon was fired. Fill in the blanks to learn how a cannon fires.

“ The gunlock mechanism uses a _____ to produce a _____ that ignites the priming powder in the _____ pan and vent. This in turn _____ the main charge- three pounds of powder for a nine pound (canon ball inside the) gun. The _____ forces the shot out of the barrel and towards the target. Wadding secures the shot in place and increases the _____ of the discharge. (the barrel) contains the expanding gas of the black powder charge and directs most of the _____ generated into propelling the shot forward.

Why do the cannons have ropes attached to pulleys? _____

Now go to the **Star of India**

Find the midships capstan. Use the short piece of wood in the nearby barrel and insert it into a hole in the capstan. Turn the capstan in a clockwise direction. Notice the entire capstan turns as you walk. Now turn it in a counter **clockwise** direction. What direction does the bottom part turn? The part that looks like this) (? . Find a mark on the) (like a scuff in the paint. Turn the capstan three full turns **counter clockwise** and tell me how many turns the) (part makes?

Make a fraction $\frac{\text{\# turns of the bottom part of the capstan }) (}{\text{\# turns counter clock wise}}$ = mechanical advantage

Now go below deck (Tween Decks) and find displays titled Knots and Block and Tackle. Fill in the blanks

Knots and Friction: Knots work through the principle of _____ a resistance to movement created when pressure is applied to two objects that are _____ each other.

“Mechanical advantage: The picture below shows how you can _____ heavier and heavier loads without having to work harder. The mechanical advantage achieved by using the block and tackle can be calculated by dividing the _____ by the _____ (load ÷ effort = mechanical advantage)

In example A the load is 25 pounds and the effort required to _____ it is _____ pounds. The effort required to lift it is 25 pounds. The _____ as a ratio is 1 to 1. (one wheel)

In example B the mechanical advantage is 2 to 1 (Two wheels)

What is the mechanical advantage in example C? _____ (four wheels)

Now find the display labeled Binnacle,, aft of the Mechanical Advantage display.
How did the Engineers reduce the effect of the magnetized iron in the ship on the magnetic compass?

The display does not say this but the red and _____spheres could also be slid in and out on the tracks holding them to adjust the magnetic compass. This type of compass is still used today.

Now move further aft and find Star Navigation. To safely navigate out of sight of land, mariners would need instruments capable of observing _____, _____traveled, _____ spent traveling and ultimately their own precise _____. To find speed early navigators

A **Dutchman's log** consisted of tossing a piece of wood off the _____ of the ship and timing how long it took to pass between two fixed points on the _____. By the distance between these points and then assuming that the ship was moving and the wood was stationary, sailors could approximate the ships _____. The **Nantucket Harpoon Log** was an improvement, the innovative component of the harpoon log was an internal gauge incorporated in its outer case that recorded distance as it _____ through the water while being trailed behind a ship.

Now go down below deck . Find the Mock yard training aid. “please touch” fill in the blanks.

“In order to have both hands free to tie and untie the _____. A sailor has to get his _____ of gravity “ over the yard. “ support yourself by your chest or stomach _____ the yard.

Now go aboard the **Berkley** The worksheet will go down the right side of the ferry, and come back on the left side.

Find *Charting The Sea*. Fill in the blanks on how a fathometer works. “The fathometer bounces a _____ wave off the ocean floor, and the _____ taken for the _____ to return is used to measure how far the _____ has traveled.

Exploring the Pacific On the HMS Challenger model. What two ways could power the ship?

Mapping the Coastline. Mariners Quadrant. Why might this device be called a quadrant? It has to holes for sighting at each end along the top edge. What would this tool be used for? _____

Building a City How did tug boats bring large logs down to San Diego from the Pacific Northwest?

At war, Oil steamer is sunk. During the 1920's Japan developed an advanced heavy torpedo, which would travel underwater and carry a large explosive to a target vessel. How did the engine work under water? What supplied the air into the engine? _____

Look for a large model of the battleship Missouri. Because the surface of the earth is curved, Every 5 miles you go out toward the horizon the surface of the earth drops about 16 feet. That means ships on the surface of the ocean can only see so far. Putting lookouts and radar up high helps some but only so much. What does the battleship carry on the stern to help its captain know what's going on beyond the horizon? _____
