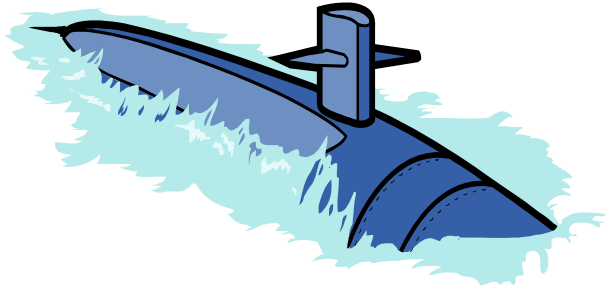


NAME _____



A submarine compensates its overall weight by adding and subtracting water ballast. Assuming that you are the diving officer of the U.S. Barracuda, *how much sea water (at **one gallon of sea water per 8 lbs.**) would you add or remove from your ballast (or trimming) tanks to neutralize the following changes:*

1. 3617 lbs. of fresh provisions received on board

$$\begin{array}{r} \underline{3617 \text{ lbs}} \\ \times \end{array} = \frac{8 \text{ lbs}}{1 \text{ gal. sea water}} = \underline{\hspace{2cm}} \text{ gallons of sea water } \underline{\text{added}} \text{ or } \underline{\text{removed}} \text{ (circle one)}$$

2. 3 passengers at 150 lbs. reported on board
3. 2 torpedoes at 1865 lbs. sent off for overhaul
4. 64 3-inch shells at 55 lbs. each were received on board
5. 3078 gals. of fresh water received from dock (fresh water at 8 lbs. per gal)
6. 2 tons (at 2000 lbs. per ton) of engine parts removed to storage on land
7. You fill No. 1 trimming tank, capacity 185 cu. ft., with lubricating oil (weighing 51 lbs. per cubic foot)

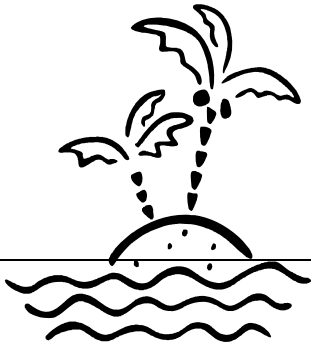

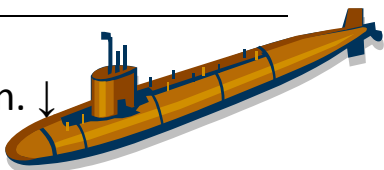
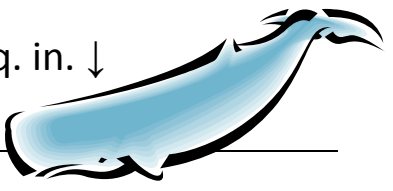
Atmospheres, page 2

3. A submarine is planning to make a test dive to a depth of 2,425 feet.

a. How many atmospheres is that? _____.

b. What do you think will happen to the sub if its construction can't take the pressure?
_____.

4. During a U.S. Navy exercise at sea, two submarines are playing hide-and-seek to test their invisibility. At first, the subs dive as deep as they can go, but then each hides in the ocean. Sub #1 stops at a depth where it is affected by 88.3 lbs/sq. in. of pressure. Sub #2 is floating at a depth of 165 feet. Which is deeper? _____.

	<p align="center">1 Atmosphere = 14.7 lbs. / sq. in. ↓</p>
<p align="center">↓</p> <p>2 Atmospheres = 33 ft. below sea level</p>	<p align="center">= 29.4 lbs. / sq. in. ↓</p> 
<p align="center">↓</p> <p>3 Atmospheres = 66 ft. below sea level</p>	<p align="center">= 44.1 lbs. / sq. in. ↓</p>
<p align="center">↓</p> <p>4 Atmospheres = 99 ft. below sea level</p>	<p align="center">= 58.8 lbs. / sq. in. ↓</p> 
<p align="center">↓</p> <p>5 Atmospheres = 132 ft. below sea level</p>	<p align="center">= 76.3 lbs. / sq. in. ↓</p>
<p align="center">↓</p> <p>6 Atmospheres = 165 ft. below sea level</p>	<p align="center">= 88.0 lbs. / sq. in. ↓</p> 

At Latitude	Length of 1 Degree of Longitude	X 360 (degrees in a circle)	Length around the world at the given latitudes:
0	111.321 km	X 360	
15	107.553 km	X 360	
30	96.448 km	X 360	
45	78.849 km	X 360	
60	55.802 km	X 360	
75	28.903 km	X 360	
90	0 km	X 360	

Use a map (maybe one found on the internet) to identify the following:

1. Three cities located along the equator
2. Three cities located along the 30° North Latitude
3. Three cities located along the 30° South Latitude
4. Three cities located along the 60° North Latitude
5. Three cities located along the 60° South Latitude



NAME _____

WORKING WITH DATA SETS

Diving Records from the Ocean Planet Exhibition

Complete the chart:

- free dive (Francisco Ferreras).....417
- military submarine.....2,950
- bathysphere.....3,000
- Johnson Sea Link (four-person submersible).....3,000
- RMS Titanic's final resting place.....12,500
- Alvin (three-person submersible).....14,763
- Jason (robotic submarine).....19,685
- Shinkai (three-person submersible).....21,414
- deepest spot on earth.....35,802

Feet	Meters	Atmospheres	PSI
417			
2,950			
3,000			
3,000			
12,500			
14,763			
19,685			
21,414			
35,802			

The Titanic was at a depth of what percentage of that of the Jason robotic Submarine’s maximum depth?

What happens to the number of people in the submarine as the depth increases? Why do you think that is?

The Military Submarine can reach a depth that is what percentage of the total (deepest spot on Earth) depth?

The Jason was able to achieve what percentage increase in depth over the Alvin?