1. Bob has 15 km of fencing that he plans to use to fence off a rectangular region next to a river. In addition, he plans to use some of the fencing to subdivide the region into three smaller regions as shown below:

(a) Determine the total amount of fence used in terms of $a$ and $b$ (no fencing is required next to the river).

(b) Determine the area of the total region enclosed by the fence in terms of $a$ and $b$. 

---

River

$\begin{array}{c}
  a \\
  a \\
  a \\
  b
\end{array}$
(c) If $a = 1$ km, determine the area of the region enclosed by the fence (recall that he has 15 km of fence).

(d) If $a = 3$ km, determine the area of the region enclosed by the fence.

(e) Express the area of the region as a function of $a$.

(f) Sketch a graph of the function for the area of the region (from part (e)).
2. A freight company wants to manufacture large metal shipping containers. The containers will have the shape of a box with no top, and must be twice as long as they are wide:

Each container is required to hold 10 cubic meters of goods. Material for the bottoms of the containers costs $20 per square meter, and material for the sides costs $9 per square meter.

(a) Find a formula for the total cost of one container in terms of the width $x$ and the height $h$. 
(b) Determine the volume of the box in terms of $x$ and $h$.

(c) Express the total cost of the container as a function of $x$.

(d) Sketch a graph of the function of the cost of the container (from part (c)).
3. Carol plans to create a large open box (a box without a top) from a piece of cardboard. She has a cardboard rectangle with side lengths 6 feet and 12 feet. She will cut off a square with side length $a$ from each corner, and then fold the resulting flaps up to create a box.

(a) Express the volume of the resulting box as a function of $a$.

(b) Sketch a graph of the formula for the volume of the box (from part (a)).
4. Boat $A$ starts at a dock and travels due North at a speed of 20 km/hour. At the same time, Boat $B$ starts 90 km East of the dock, and is sailing West at a speed of 15 km/hour.

(a) How far will Boat $A$ be from the dock after 1 hour?

(b) How far will Boat $B$ be from the dock after 1 hour?

(c) Determine the distance between Boats $A$ and $B$ after 1 hour.

(d) Determine the distances between the boats after 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, and 6 hours, and then fill in the following table with the values:

<table>
<thead>
<tr>
<th></th>
<th>1 hour</th>
<th>2 hours</th>
<th>3 hours</th>
<th>4 hours</th>
<th>5 hours</th>
<th>6 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(e) How far is Boat $A$ from the dock after $t$ hours?

(f) How far is Boat $B$ from the dock after $t$ hours?

(g) How far apart are the two boats after $t$ hours?

(h) Sketch a graph of the formula for the distance between the two boats (from part (g)).