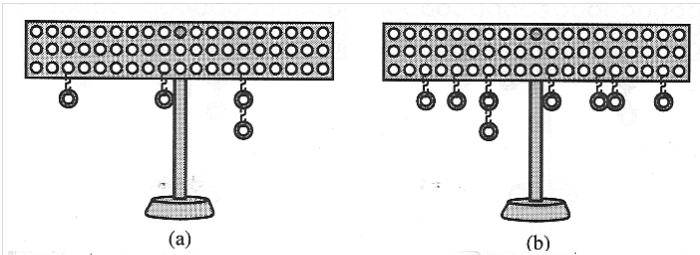**Problem 2** (10 points)

For each of the balance situations below, indicate what you could do so that the two sides will balance. Explain your reasoning. If nothing needs to be done, say that and explain why.

(a)   (b)

You can use the turning effect to find how to balance each scale. Take the turning effect (mass times length from fulcrum) for each side to determine this. If multiple bolts on each side, find turning effect for each one, then add together to find the effect for that side.

A.

Left side

Bolt 1	Bolt 2		Right side Bolt (3+4)
$7 \times 1 = 7$	$1 \times 1 = 1$		$4 \times 2 = \boxed{8}$

$7 + 1 = \boxed{8}$

In this case, the 2 sides are equal & nothing needs to be done to balance the scale, it is already balanced.

B. Left Side

Bolt 1	Bolt 2	Bolt (3+4)
$7 \times 1 = 7$	$5 \times 1 = 5$	$3 \times 2 = 6$

$7 + 5 + 6 = \boxed{18}$

Right Side

Bolt 5	Bolt 6	Bolt 7	Bolt 8
$1 \times 1 = 1$	$4 \times 1 = 4$	$5 \times 1 = 5$	$8 \times 1 = 8$

$1 + 4 + 5 + 8 = \boxed{18}$

Once again, this scale is already balanced & nothing needs to be

---

Dr. Saul's comments: This is a pretty good solution with a definition of the turning effect that includes add the effect of all the washers on a given side. So in both cases above, the balance is balanced since the turning effect on the right hand side equals the turning effect on the left hand side. Another solution is shown on the next page naming the turning affect and giving the formula. This solution is also pretty good but could be improved if the equation summed the M x L's on each side of the balance.

For balance (a) nothing needs to be done to
make the two sides balance because the turning
affect is equal on each side

$$M_1 L_1 = M_2 L_1$$
$$1(8) + 1(1) = 2(4)$$
$$8 = 8$$

For balance (B) nothing needs to be done to make
the two sides balance because the turning affect is
equal on each side.

$$M_1 L_1 = M_2 L_1$$
$$1(7) + 1(5) + 2(3) = 1(1) + 1(4) + 1(5) + 1(8)$$
$$18 = 18$$