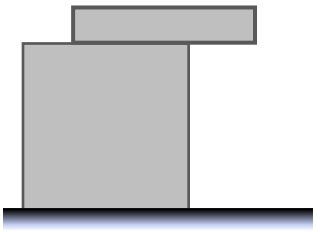
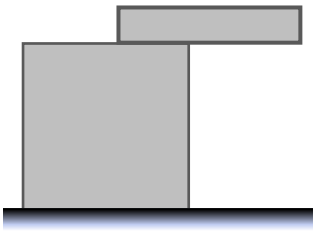
CENTER OF MASS AND SIMPLE BALANCE

● Remember: An object's weight ALWAYS acts on its _____ (_____).

- Also: If an object has _____ mass distribution, its _____ is on its geometric _____.
- An object "sticking out" of a supporting surface will TILT if its _____ is located beyond the support's edge.
- These are Static Equilibrium problems, BUT are solved using _____, which is much simpler:

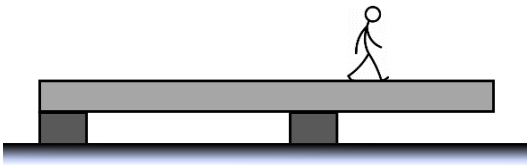




→ X____ = _____ = _____

EXAMPLE: HOW FAR CAN YOU GO ON A PLANK?

EXAMPLE: A 20 kg, 10 m-long plank is supported by two small blocks, one located at its left edge and the other 3 m from its right edge. A 60 kg person walks on the plank. What is the farthest this person can get, to the right of the rightmost support, before the plank tips?



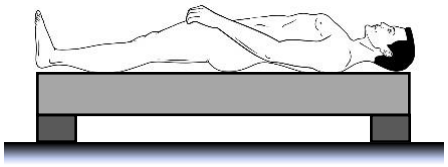
NON-UNIFORM MASS DISTRIBUTIONS

● Unless otherwise stated, assume a Rigid Body has UNIFORM mass distribution, so its weight acts on its _____.

- If it does NOT have uniform mass distribution, you CANNOT assume the location of its _____.

- In these problems, you will be given the center of mass and asked to calculate something else (or vice-versa).

EXAMPLE: An 80 kg, 2 m-tall man lies horizontally on a 2 m-long board of negligible mass. Human bodies generally **do not** have uniform mass distribution. Two scales are placed under the board, at its ends. If the left and right scales read 320 N and 480 N, respectively, how far from the man's head is his center of mass? Use $g = 10\ m/s^2$ to simplify your calculations.



PRACTICE: FORCES ON A PUSH-UP

PRACTICE**:** A 70 kg, 1.90 m man doing push-ups holds himself in place making 20° with the floor**.** His feet and arms are, respectively, 1.15 m below and 0.4 m above his center of mass**.** You may model him as a thin, long board and assume his arms and feet are perpendicular to the floor**.** How much force does the floor apply to each of his hands? *Assume* $g=10m/s^2$**.**