

3 truths and a Lie with force diagrams: directions (works well for review, subs can handle it)

0. Do not put your name on your work paper!

1. Make a sketch of a situation in which 3 or 4 forces act on an object (you can add details with words if you need to). Your situation can be one that involves balanced forces OR unbalanced forces. At least one of the forces in your situation should be an 'off-axis' force, one that is neither entirely in the x or y direction.

2. Make a force diagram to (almost) match your sketch and description. Your force diagram must have the most appropriate axes (shown and labeled) and it should have ONE force that is a lie -- either mislabeled, drawn in the wrong direction, missing or 'extra.' The approximate lengths of your force arrows should be correct -- if you know a force is larger than another, its arrow should be longer. Every force's arrow should be easily seen and distinct from the axis -- no fair just adding an arrowhead to the axis and pretending you're done.

3. When everyone is finished, divide into groups of 3. (The teacher will give each group a letter.) With your group, **quietly** review the three problems your group has created. The object of the game we're about to play is to identify the 'lie' forces in each case. If the people in your group can't figure out what's wrong with your example, you can explain -- be sure that they agree with you that your example is correct, and that there is only ONE 'lie' force shown.

4. Number the people in your group 1 to 3. Write your name and the answers to your problem (see below) on the appropriate line of your group's answer sheet, but **ONLY** wrote the letter and number on the top of the page you designed.

When everyone is ready, pass your papers (face down) to the group on your right. At the teacher's mark, turn over the new papers and begin working. Be careful that you are marking your answers for the right group! (If you forget and answer E1 in the A1 space, don't erase, just write E to the left of A1-A3, but be sure I can tell what you did.)

Every answer has two parts: First, write N1 or N2 for each case as appropriate:

N1: stopped or constant velocity motion),

N2: motion is changing velocity in both x and y directions

N1x and N2y: constant speed in x direction, changing velocity in y

N2x and N1y: no motion in y but changing velocity in x

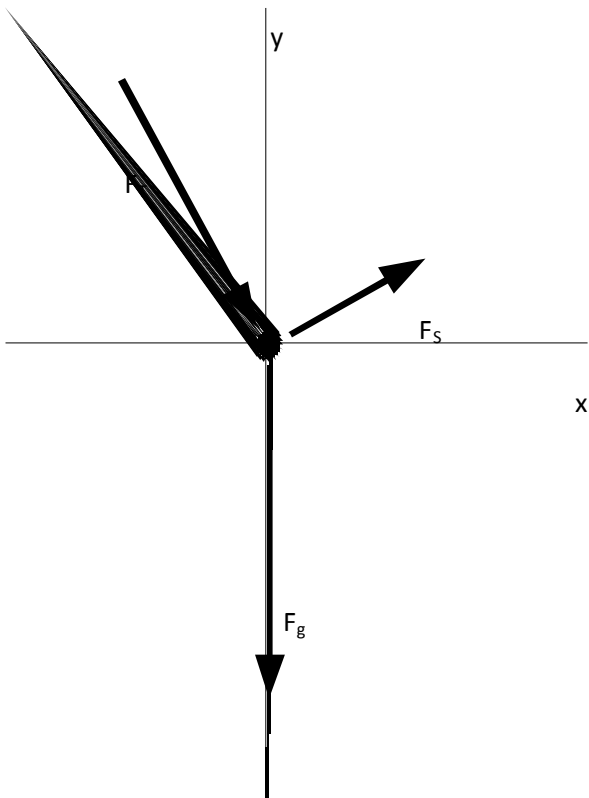
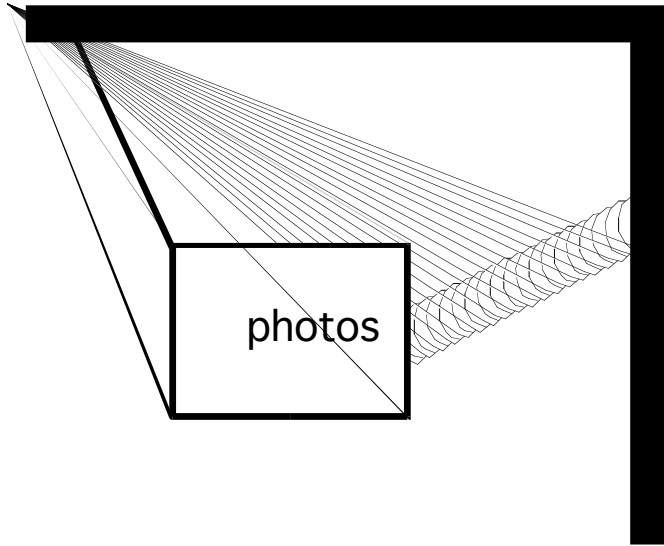
Second, Explain what the lie is in each case ("Normal force should be perpendicular to hill, not vertical," "should be static friction, not kinetic," "kinetic friction points in same direction as motion," etc.) You may talk quietly with your group, but don't let your neighbors overhear! When the teacher tells you (about 10 minutes), pass your papers to the next group. Each group should have time to analyze all the other groups' work. I will check your work when I get back, and determine which group is the winner! (The group with the greatest accuracy in their answers wins glory .)

Group Answer Sheet (Put your names AND your group's answers in for your group)

A1
A2
A3
B1
B2
B3
C1
C2
C3
D1
D2
D3
E1
E2
E3
F1
F2
F3

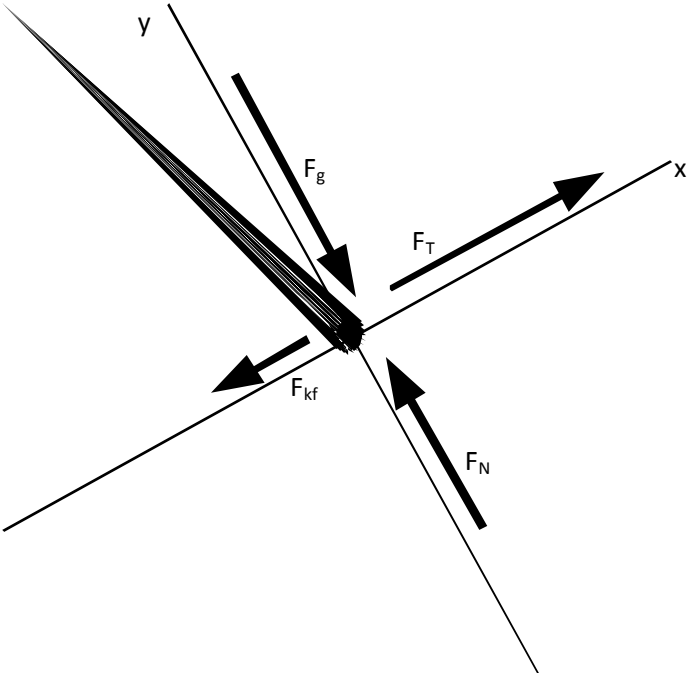
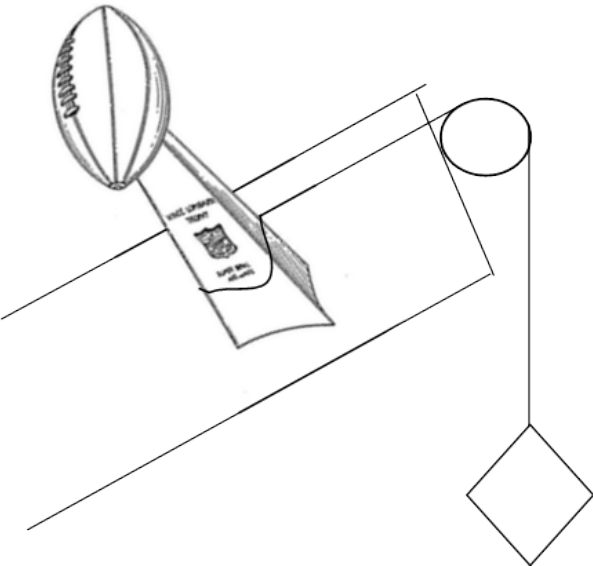
3 Truths and a Lie example #1

My aunt's box full of priceless photographs hangs from the ceiling, held up by a cord on one side and a spring that is connected to the wall on the other.



Ans: N1, The tension force should point up and to left, away from the box.

A Superbowl trophy (3.2 kg) is pulled up a ramp by a 7 kg mass that hangs from a pulley at the top of the ramp.



Ans: N_{2x} and N_{1y} , Gravity should be straight down, not parallel to the y axis.