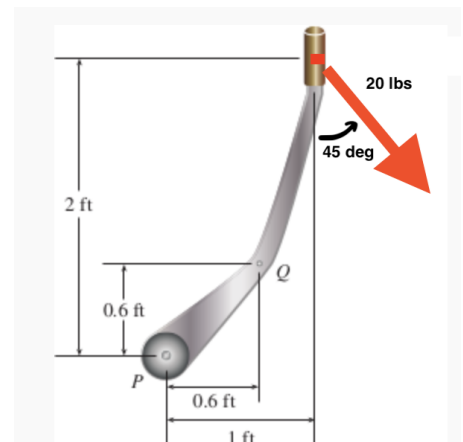


The class before the exam there will be a chance to earn extra credit. Groups of two to three can present a solution to one of the problems below. Up to 4% can be earned:

- [1] Mastery of the problem: Do you understand the problem and all of the steps used to solve it? Would you be able to solve the problem if given a slightly different question?
- [1] Presentation of the problem: You are presenting material to your classmates that will be on their exam next week! Take care to explain your steps and why you take them but your group also needs to complete your presentation in under 10 minutes!
- [1] Presentation: Do you interact with the class? Do you make eye contact?
- [1] Fielding questions: Can you understand the questions and give a cohesive answer?

Word Problem Practice

1. Describe and sketch an object that satisfies all of the following:
 - When illuminated by rays parallel to the z -axis, its shadow is a circular disk.
 - If the rays are parallel to the y -axis, its shadow is a square.
 - If the rays are parallel to the x -axis, its shadow is an isosceles triangle.
2. A rower wants to row her rowboat across a river that is 1400 ft wide and land at a point 600 ft upstream from her starting point. She can row (when in water) at 7 ft/s and the current of the river is flowing at 3ft/s. In what direction should she steer the rowboat and how long will the trip take?
3. A dock crane is holding a 500 lb rectangular bundle of materials horizontal by four support cables (assuming the cables have negligible weight). The cables consist of two pairs of cables where a cable is connected on each side to adjacent corners of the bundle. The hook of the crane then lifts both cables at once making an angle of 60° between the cables and the top of the rectangular bundle. Find the vector that records the tension in each support cable as well as the magnitudes.
4. Consider the bicycle pedal shown on the right. A diagonal force of 20 lbs is applied to the handle as shown in the same plane as the gearing.
 - (a) Write the components of the force vector with respect to your 3D axis.
 - (b) Find the *vector* of the torque created about the pivot point P .



5. A molecule of methane, CH_4 , is structures with the four hydrogen atoms at the vertices of a regular tetrahedron and the carbon atop at the centroid. The bond angle is the angle formed by the H-C-H combination. Find the angle bond angle for CH_4 .
6. The path of a projectile is modeled by $x = (90 \cos(\theta))t$ and $y = (90 \sin(\theta))t - 16t^2$, in degrees where x and y are measured in feet. Find the angle that mazimized the range of the projectile.
7. The position of a red particle at time t is given by
 $x = t + 5$ $y = t^2 + 4t + 6$
 and the position of a green particle is given by
 $x = 2t + 1$ $y = 2t + 6$
- Eliminate t to find the Cartesian equations of the paths of the two particles.
 - Find the two points where the paths intersect.
 - Are either of these intersection points? Explain.
8. The position of a magenta particle at time t is given by
 $x = t - 1$ $y = t^2 + 2t + 3$
 and the position of a gray particle is given by
 $x = 2t - 5$ $y = 12t - 21$
- Eliminate t to find the Cartesian equations of the paths of the two particles.
 - Find the x -coordinate(s) where the paths intersect.
 - Are either of these *COLLISION* points? Explain.