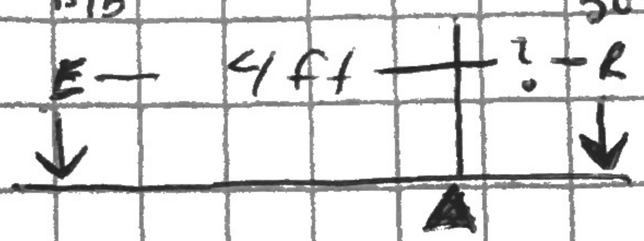
Activity

1. First class lever in static equilibrium has 50-lb res. Force and 15 lb eff. Force. The lever's effort force is located 4 ft from the fulcrum.

R = 50lb E = 15lb



2. AMA of system

$AMA = \frac{50}{15} = 3.33:1$

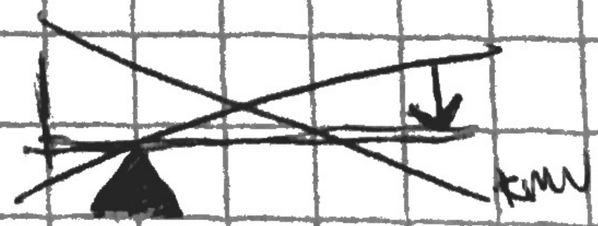
3. $15lb \times (4ft) = 50lb \times DR$

$60lb\text{-}ft = 50lb \times DR$

$60/50 = DR$

$DR = 1.2ft$

4. A wheel barrow is used to lift a 200-lb load. The length from the center of the wheel to the center of the load is 2ft. The length from the wheel to the effort is 5 ft.



7

Pulleys continued

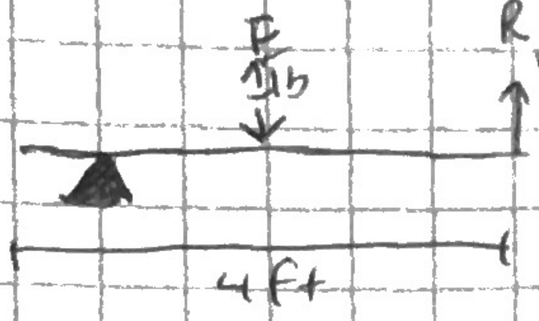
1/10/16

5. 5ft. / 2ft = 2.5 IMA = 2.5 6. 200lb × (2ft) + (9ft)(FE) = 0

5 ft(FE) = 400 lbs ft

FE = 80 lbs

7. A medical technician uses a pair of four-inch-long tweezers to remove a wood silver from a patient. The technician is applying 7 lb of squeezing force to the tweezers. If more than ½ lb of force is applied to the silver, it will break and become difficult to remove.



8. 1lb/(½)lb AMA = 0.2

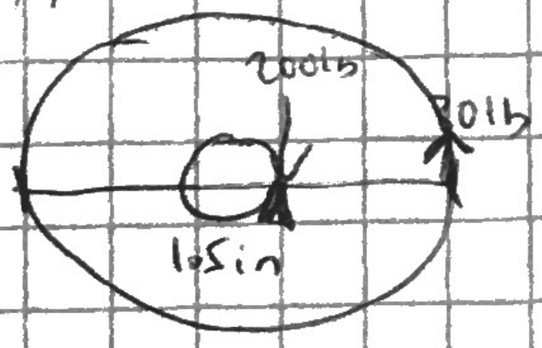
9. (4in)(½ lb) + (1lb)(DE) = 0

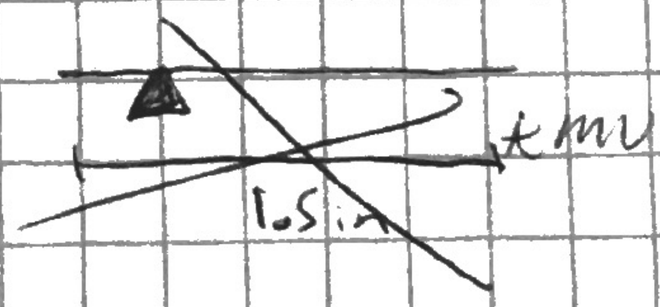
1lb(DE) = (4/5) lb/in

DE = 0.8 in

10. The linear distance traveled in one Revolution of a 36 inch diameter wheel would be equivalent to its circumference. That would be 36×π = 113.1

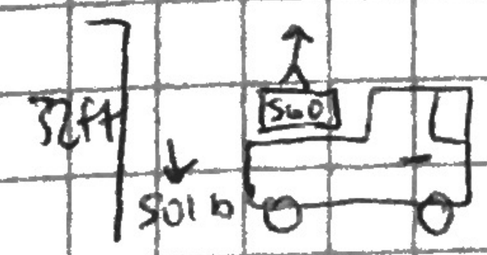
11. An industrial water shutoff valve is designed to operate with 30lb of effort force. The valve will encounter 200 lb of resistance force applied to a 1.5 in-diameter axle





12. 200/30 = 6.67 13. 30 = 200lb • 1.5 d input wheel = 10 in in dia.

14. A construction crew lifts approximately 560lb of material several times during a day from a flatbed truck to a 32 ft. rooftop. A block and tackle system with 50lb of effort force is designed to lift the materials.



14. 560/50 AMA = 11.2

15. 2x(# of moveable pulleys) + 2(1 changing direction) = # of strands

(2×4) + 2 = 9 strands

~~16. Max weight 900 lbs kmv~~

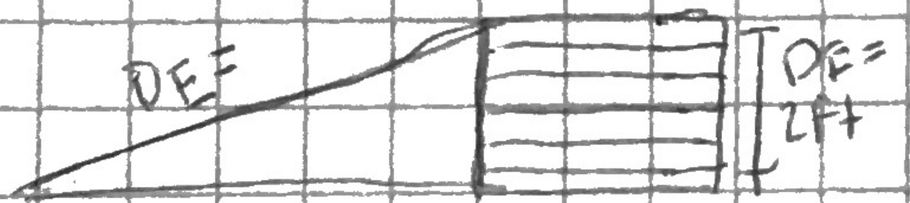
16. MA = 9

17. Max weight 900 lbs

Zayla Murphy

Activity:

18. A civil engineer must design a wheelchair-accessible ramp next to a set of steps leading up to a building. The height from the ground to the top of the stairs is 2 ft. Based on ADA Codes, the slope must be 1:12 or less. Slope is equal to the rise of the ramp divided by the run of the ramp.



19. slope = $\frac{\text{rise}}{\text{run}}$ $\frac{1}{12} = \frac{2}{\text{run}}$ run = 24 ft

20. $a^2 + b^2 = c^2$ $(24ft^2) + (2ft^2) = DE^2$

$576 + 4 = 580$

$\sqrt{580} = DE = 24.08$

Activity continued

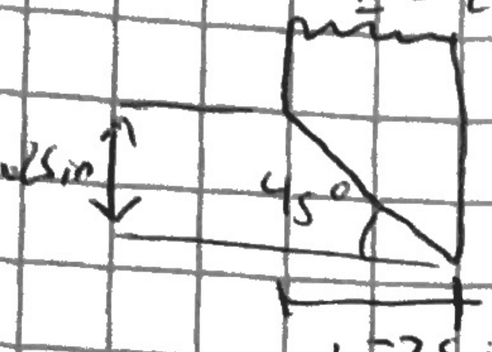
21. $IMA = \frac{24.0\,in}{2\,in} = 12.04$

22. If a person and wheelchair have a combined weight of 185 lb, how much ideal effort force is required to travel up the ramp?

$12.04 = \frac{185}{F_E}$ → $F_E = \frac{185\,lb}{12.042}$ → $F_E = 15.363\,lb$

$F_E = 15.4\,lb$

23. A hydraulic shear applies a 200 lb force to a wedge. It is used to shear plate steel to rough size. The shear has a 1/4 inch-thick cutting blade with a 45° slope



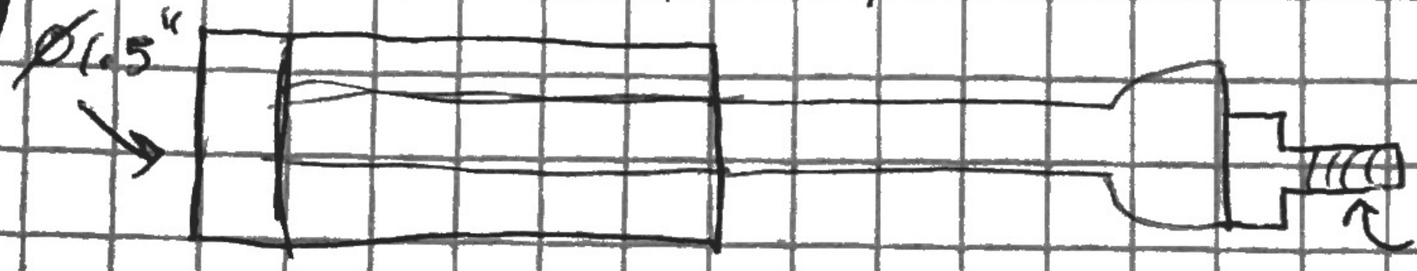
24. $a^2 + b^2 = c^2$ $(0.25\,in)^2 + (0.250\,in)^2 = L^2$

$L = \sqrt{0.25\,in^2 + 0.25\,in^2}$

$L = 0.35355\,in$

25. $\frac{0.250\,in}{0.250\,in} = 1.00 = IMA$

26. A 7/16 nut driver with a 1 1/2 inch diameter handle is used to install a 1/4-20 UNC bolt into a robotic arm.



27. $C = \pi(1.5\,in) = 4.7124\,in$

28. $p = \frac{1}{20\ TPI} = \frac{1}{20.0\ threads/in} = 0.05\,in$

29. $IMA = \frac{4.7124\,in}{0.0500\,in} = 94.248$

30. Ideally, how much force can be overcome if 5 lb of force is exerted?

$R = 94.248\,(5.00\,lb) = 471.24\,lb$ $R = 471\,lb$