

MAE 101B MIDTERM: SPRING 2014

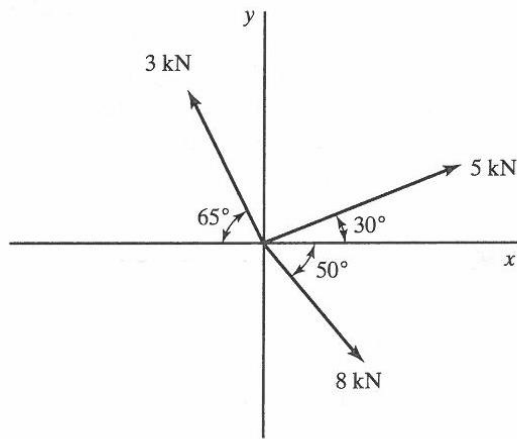


Fig. 1 Figure for numbers 1 & 2

- 1) For the three forces shown in the above figure, find the magnitude of the resultant force
 - a. 6.40kN
 - b. -6.25kN
 - c. 10.00kN
 - d. 8.25kN
- 2) In problem 1, find the direction of the resultant force with respect to the x-axis
 - a. 80.00° south
 - b. 6.22° south
 - c. 10.00° North
 - d. 7.55° North

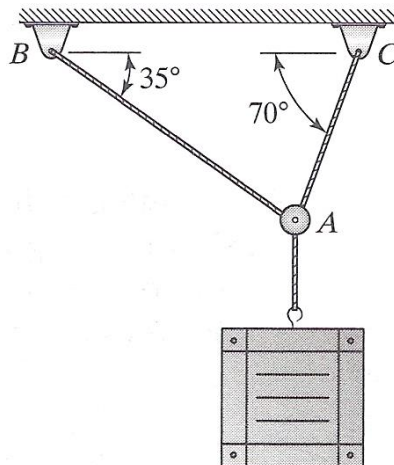


Fig. 2 Figure for numbers 3 & 4

- 3) A 160 lb crate hangs from ropes as shown in the figure above, Find the tension in ropes AB.
 - a. 80.00 lb
 - b. 25.78 lb
 - c. -40.00 lb
 - d. 56.65 lb

- 4) In problem 3 find the tension in rope AC
 a. 80.00 lb b. 135.69 lb c. 122.68 lb d. 56.65 lb

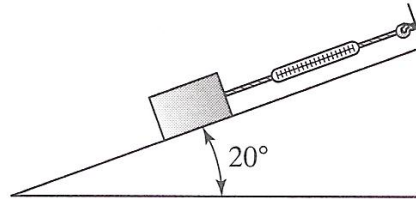


Fig. 3. Figure for number 5

- 5) A 250 lb box is held in place by a cord with a spring scale on an inclined plane as shown in the Figure directly above. If all surfaces are smooth, what is the force Reading on the scale?
 a. 85.5 lb b. 94.65 lb c. 78.66 lb d. 113.5 lb

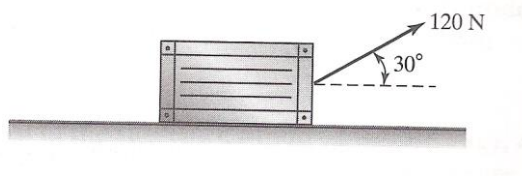


Fig. 4. Figure for numbers 6 & 7

- 6) Fig. 4. shows a crate that is being dragged across a rough floor by a force $F=120\text{N}$. A friction force of 40 N acts to retard the motion of the crate. If the crate is dragged 25 m across the floor, what is the work done by the 120 N force?
 a. 3000 lb b. 2598.08 lb c. -3000.00 lb d. -2598.08 lb
- 7) From problem number 6 and Fig. 4, what is the work done by the friction force?
 a. -1000.00 lb b. 1000.00 lb c. 4000.00 lb d. -4000.00 lb
- 8) A 650.0 kg mass hangs by a cable from the ceiling. Using the standard value of gravitational acceleration $g=9.81\text{ m/s}^2$, what is the tension in the cable? Express the answer with the correct number of significant figures.
 a. 6376.5 N b. 64 N c. 6000.0 N d. 6.38 kN
- 9) A 72.9 A current flows through a $360\ \Omega$ resistor. Using Ohm's Law $V=IR$, what is the voltage across the resistor? Express your answer with the correct number of significant figures
 a. $2.6 \times 10^4\text{ V}$ b. 26244 c. 26240 V d. 20000 V
- 10) Perform the following calculations, reporting the answer with the correct number of significant digits: $5.65/1.9$
 a. 2.968 b. 3 c. 3.0 d. 2.97

- 11) Perform the following calculations, reporting the answer with the correct number of significant digits: $500./0.0025$
 a. 200,000 b. 200,000.00 c. 2.0×10^5 d. 2×10^5
- 12) For the following dimensional equation, find the base dimensions of the parameter k: $ML^2 = kLtM^2$
 a. $LM^{-1}t^{-1}$ b. $LM \ t^{-1}$ c. $LM^{-1}t$ d. LMt
- 13) A rock ($\rho = 2300 \frac{kg}{m^3}$) is suspended by a single rope. Assuming the rock to be spherical, with a radius of 20 cm, what is the tension in the rope:
 a. 2835.35 N b. 2481 N c. 756 N d. 7.56×10^8
- 14) When I was playing Football a linebacker with a mass of 9.63 slugs. What is the linebacker's weight?
 a. 94.5 lb b. 400 lb c. 310 lb d. 410 N
- 15) An engineering student is late for an early morning class, so she runs from LA5 to ECS at a speed of 9 mi/h. Determine her speed in units of m/s
 a. 10 m/s b. 9 m/s c. 5.6 m/s d. 4.02 m/s
- 16) At launch, the Saturn V rocket that carried astronauts to the moon developed five million pounds of thrust. What is the thrust in units of MN
 a. 19 MN b. 2.0 MN c. 22.2 MN d. 200 MN
- 17) Certain properties of animal (including human) tissue can be approximated by using those of water. Using the density of water at room temperature $\rho = 62.4 \text{ lb/ft}^3$, calculate the weight of a human male by approximating him as a cylinder with a length and diameter of 6 ft and 10 in respectively?
 a. 204 lb b. 1.17×10^5 c. 816 lb d. 81.6 lb
- 18) Perform the following calculations, reporting the answer with the correct number of significant digits: $(45.8 - 8.1)/1.922$
 a. 19 b. 20 c. 19.6 d. 19.615
- 19) The cylinder of an internal combustion engine is reported to have a diameter of 4.000 in. If the stroke (length) of the cylinder is 6.25 in, what is the volume of the cylinder in units of in^3 ? Write the answer using the correct number of significant figures
 a. 78.5 in^3 b. 78.54 in^3 c. 314.16 in^3 d. 314.0 in^3

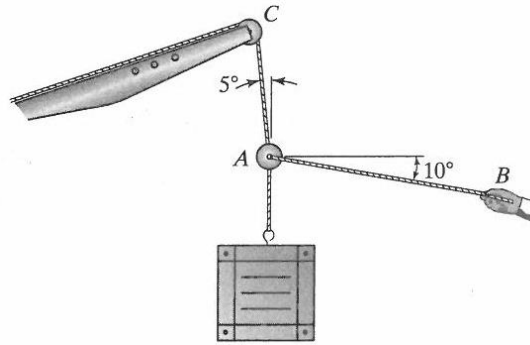


Fig. 5. Figure for number 20

- 20) A construction worker holds a 500 kg crate in the position shown in Figure above. What force must the worker exert on the cable?
- a. 120.5 lb b. 99.5 lb c. 90.5 lb d. 80.5 lb
- 21) Starting Fall 2014 MAE 472 is a GE capstone course.
- a. True b. False