ACADEMIC DISHONESTY POLICY

Academic honesty is one of the foundations of the educational mission and Catholic commitment of this University. Academic dishonesty, including such practices as cheating, plagiarism and fabrication, undermines the learning experience, and, as it involves fraud and deceit, is corrosive of the intellectual principles and is inconsistent with the ethical standards of this University. Academic dishonesty damages the sense of trust and community among students, faculty and administrators.

Types of Academic Dishonesty

Plagiarism is the act of presenting the work or methodology of another as if it were one's own. It includes quoting, paraphrasing, summarizing or utilizing the published work of others without proper acknowledgment, and, where appropriate, quotation marks. Improper use of one's own work is the unauthorized act of submitting work for a course that includes work done for previous courses and/or projects as though the work in question were newly done for the present course/project. Fabrication is the act of artificially contriving or making up material, data or other information and submitting this as fact. Cheating is the act of deceiving, which includes such acts as receiving or communicating or receiving information from another during an examination, looking at another's examination (during the exam), using notes when prohibited during examinations, using electronic equipment to receive or communicate information during examinations, using any unauthorized electronic equipment during examinations, obtaining information about the questions or answers for an examination prior to the administering of the examination or whatever else is deemed contrary to the rules of fairness, including special rules designated by the professor in the course.

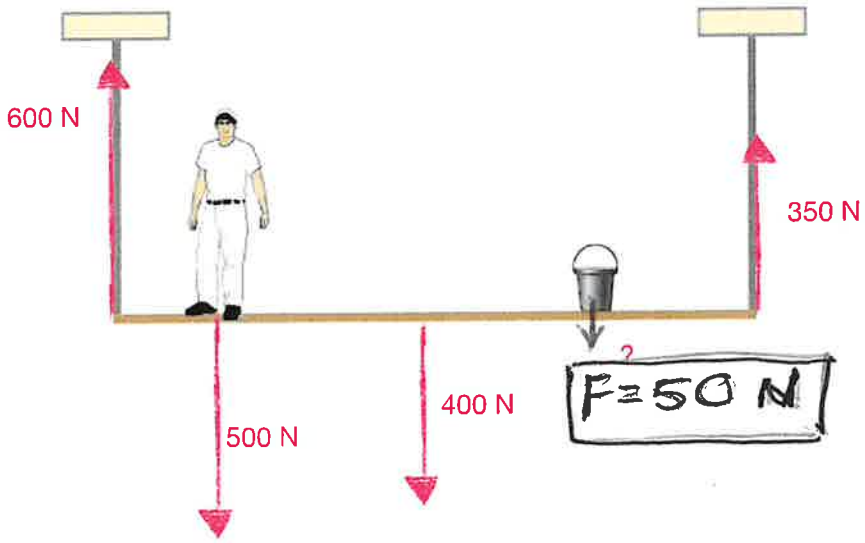
By Signing below, I verify that I have taken this test honestly and have neither cheated nor helped anyone else cheat; this is a mark of academic integrity.

Student Name (Please Print): CARLOS VERO (SOLUTIONS)

Student Signature: _____ Date: _____

Student ID #: _____ Course Title/Number: PHYS 101

1) **(5 pts)** A staging that weighs 400 N supports a 500-N painter and a bucket filled with water. To maintain mechanical *equilibrium*, the tension on the ropes are 600 N (left) and 350 N (right). What is the weight of the bucket ? (Draw the vector and specify its magnitude)

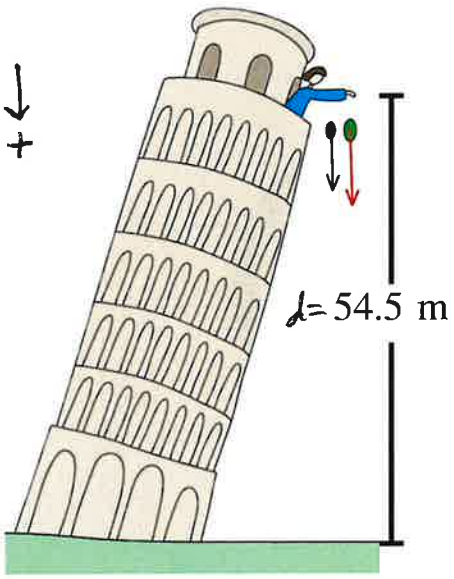


$F_{net} = 0$

$600N + 350N = 500N + 400N + F$

$F = 950N - 900N \Rightarrow F = 50\ N$

2) **(25 pts)** In his famous experiment, Galileo Galilei *dropped* a light and heavy object (*initially at rest*) from the Leaning Tower of Pisa at approximately an *initial height* of 54.5 m and showed that given *negligible air resistance* the objects in *free fall* hit the ground at the same time.



a) **(5pts)** What is the *acceleration* of the objects at any point of their trajectory after they are released but before they hit the ground ?

$a = +10\ m/s^2$

b) **(5pts)** *How fast* (at what speed) are the objects falling 3 seconds after they are dropped ?

$v = v_0 + at \Rightarrow v = 0\ m/s + (10\ m/s^2)(3s)$

$v = 30\ m/s$

c) **(5pts)** *How long* (what time) does it take for the objects to hit the ground ?

$d = v_0 t + \frac{1}{2} a t^2 \qquad v_0 = 0\ m/s$

$d = \frac{1}{2}(10\ m/s^2)\, t^2 \rightarrow t^2 = \sqrt{\frac{2d}{10\ m/s^2}} = \sqrt{\frac{2(54.5\ m)}{10\ m/s^2}}$

$t = 3.3\ s$

d) **(5pts)** *How fast* (at what speed) do the objects hit the ground ?

$v = v_0 + at$

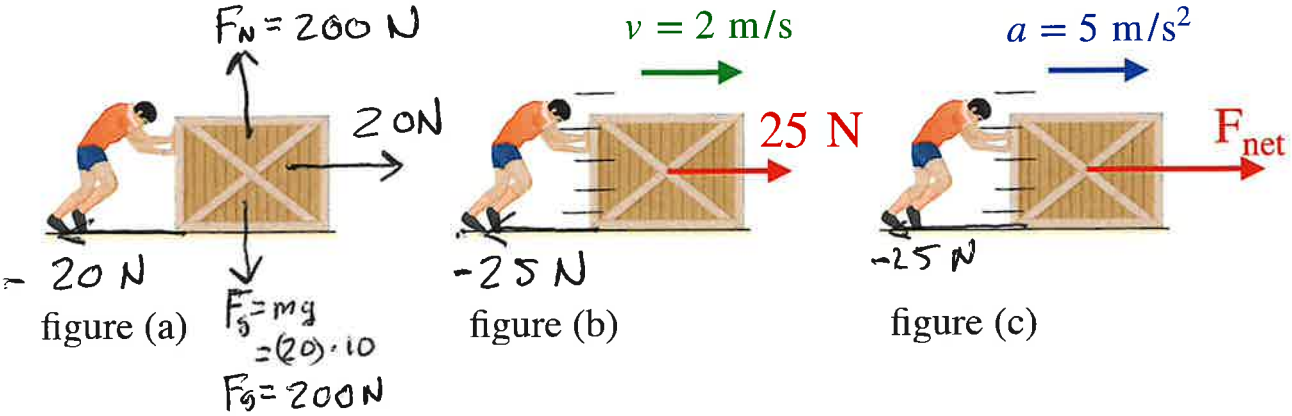
$v = 0\ m/s + (10\ m/s^2)(3.3s)$

$v = 33\ m/s$

e) **(5pts)** What is the *speed* and *acceleration* of the objects after hitting the ground ?

$v = 0\ m/s$ $\qquad$ $a = 0\ m/s^2$

3) **(20 pts)** A 20-kg crate is pushed by a person in three scenarios



a) **(5 pts)** In **figure (a)**, the person applies a force of 20 N force, but the crate remains at *rest*. Draw all *forces* acting on the crate (specify magnitude and direction of each force)

b) **(5 pts)** In **figure (b)**, the person applies 25 N of force to get the crate moving at a *constant velocity* of 2 m/s. Draw the magnitude and direction of the frictional force in this case.

c) **(5 pts)** In **figure (c)**, calculate the *net force* F_{net} required to *accelerate* the crate by 5 m/s^2. $F_{net} = ma \Rightarrow F_{net} = (20\,kg)(5\,m/s^2)$

$$\boxed{F_{net} = 100\,N}$$

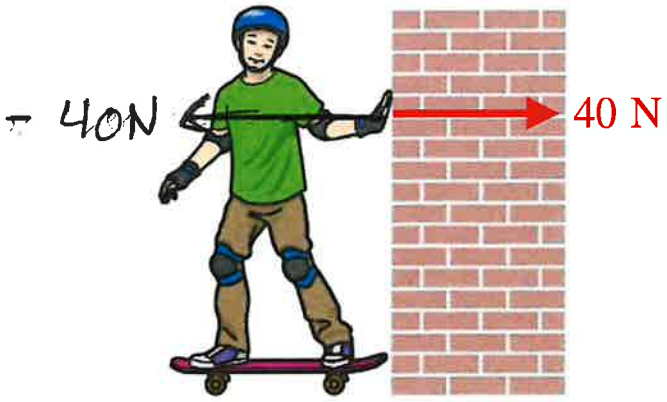
d) **(5 pts)** In **figure (c)**, if the frictional force is $F_{friction} = -25$ N, what is the force F_{push} applied by the person to push the crate? (*hint:* use the fact $F_{net} = F_{push} + F_{friction}$ and the result from (c) to solve for the value of F_{push})

$F_{net} = 100\,N = F_{push} - 25\,N$

$\Rightarrow F_{push} = 100\,N + 25\,N$

$$\boxed{F_{push} = 125\,N}$$

4) **(15 pts)** A skateboarder stands next to a wall on a frictionless skateboard and pushes the wall with a force of 40 N.



a) **(5 pts)** How hard does the wall push on the skateboarder? (Draw magnitude and direction)

b) **(5 pts)** If the skateboarder's mass is 80 kg, how much would he accelerate and in which direction ?

$$F_{net} = m\,a \Rightarrow a = \frac{F_{net}}{m} = \frac{-40\ N}{80\ kg}$$

$$\boxed{a = -0.5\ m/s^2} \leftarrow \text{a "left"}$$

c) **(5 pts)** How much would the skateboarder accelerate if he were push the wall with twice as much force ?

$$a = \frac{-40N\,(2)}{80kg} \Rightarrow \boxed{a = -1\ m/s^2}$$ "left"