Name: _____ **Date:** _____
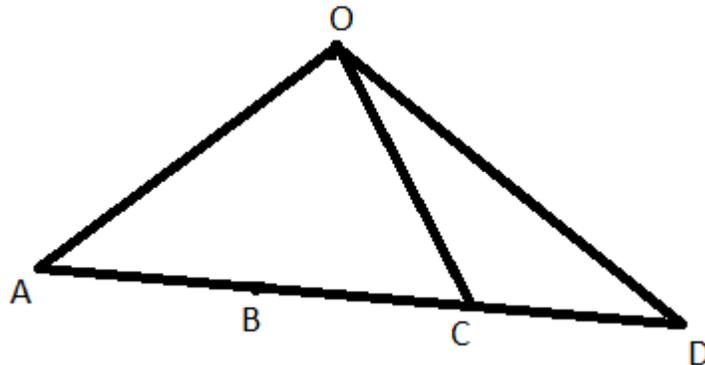
MCV4U: Choice Assignment #2
Due: Tuesday, March 7th, 2017

Please answer **nine** of the following **ten** questions. Good luck and have fun!

1) In parallelogram ABCD, M, N are midpoints of BC and CD respectively. Prove
$$3(\bar{A}B + \bar{A}C + \bar{A}D) = 4(\bar{A}M + \bar{A}N)$$

2) In the diagram, $\overrightarrow{AB} = \overrightarrow{BC} = \overrightarrow{CD}$,show that $\overrightarrow{OC} = \frac{1}{3}\overrightarrow{OA} + \frac{2}{3}\overrightarrow{OD}$

3) If $\vec{u}$ = 28km[N23°W], $\vec{v}$ = 15km[W38°S] and $\vec{w}$ = 21km[S8°E], find
$2\,\vec{u}\, + 4\,\vec{v}\, - 3\,\vec{w}$

4) Mr. Sadler's daughter has learned to walk (and only walks in straight lines). She leaves her room and travels 10m[S13°W] to get to her ball, then 8m[N23°W] to get to her elephant, then 5m[E11°N] to get to her toy turtle, before going 6m[S22°E] to get to the kitchen table for breakfast. What is her total displacement and her heading (please round your final answer to one decimal place and keep exact answers for the intermediate steps!)

5) An object weighing 400N is hanging from two ropes. One rope is attached to the ceiling and makes an angle of 40° with the ceiling. The other rope is attached to the wall, and makes an angle of 50° with the wall.
a) Draw a vector diagram to illustrate the situation
b) Calculate the tension in the two ropes.

6) A swimmer wishes to swim directly across a river that has a current of 2.5m/s. He can swim 3.5m/s in a pool.
a) Calculate the heading that the swimmer must use in order to swim directly across the river, relative to the current direction.
b) Calculate his actual bearing relative to the riverbanks.

7) A crate weighing 300N is stationary on a ramp that is inclined at an angle of 15° to the horizontal. There are three forces acting on the crate: the force of gravity of 300N downwards; the force of friction acting up the ramp; and the contact force (normal force) between the ramp and the crate, acting at right angles to the ramp.
a) What is the total of the three forces?
b) Calculate the magnitude of the frictional force and the contact force.

8) A crate is being pulled up a ramp inclined at an angle of 20° by an applied force of 350N. The crate weighs 500N. There is a frictional force resisting the applied force. The frictional force has a magnitude of $0.20F_N$, where F_N is the normal force.
a) Resolve the weight into components parallel and perpendicular to the ramp.
b) Calculate the magnitudes of the normal force and the force of friction.
c) Calculate the total force on the crate.

9) An object is hanging from two ropes anchored to the ceiling. One of the ropes makes an angle of 55° with the ceiling and has a tension of 270N. The other rope makes an angle of 42° with the ceiling. Calculate the weight of the object.

10) A ship is sailing at 20km/h [N30°E] when it encounters a current of 6km/h from the south. A passenger is walking across the deck with a speed of 5km/h at angle of 40° to the right of the front of the ship. What is the velocity of the passenger relative to the ocean floor?