1. An Emirates Airlines $A 380$ is at an altitude of $10,000 \mathrm{ft}$, and is climbing at a rate of $2000 \mathrm{ft} / \mathrm{min}$. Your Gulfstream G650 is at an altitude of $4,000 \mathrm{ft}$, climbing at a rate of $3,576 \mathrm{ft} / \mathrm{min}$.
a) Write a system of equations for the altitude (y) of the aircraft.
b) After how many minutes will the aircraft be at the same altitude?
c) At which altitude will their flight paths intersect?
2. On a coordinate plane plot the points $(-5,8)$ and $(3,2)$. On the same coordinate plane plot the points. On the same coordinate plane plot the points $(-3,-1)$ and $(5,-7)$. Is the line between the first pair of coordinates parallel to the line between the second pair of coordinates? Justify your response.
3. The blueprint of your custom built home contains two adjoining rooms, one a regular hexagon and the other a regular octagon.
a. What are the measures of the interior angles of each room?
b. What is the measure of the angle of the grass patio?

4. An F-16 is cruising at an altitude of 2 miles, 30 miles from its base. It detects a possibly hostile target, and climbs to a point 5 miles in altitude and 45 miles from its base, and intercepted the target.
a. What was the distance traveled by the F-16 approaching the target?
b. The F-16 has a climb rate of $50,000 \mathrm{ft} / \mathrm{min}$. How long would it take to reach the target? (hint, there are $5,280 \mathrm{ft} / \mathrm{mile}$ ).
5. A Boeing 787-8's wing has an aspect ratio of 10.58. I generated span and cord measurements for a scale model as follows:

- span (b): 26.44 cm
- tip cord (ct): 0.75 cm
- root cord (cr): 4.2 cm .

If the actual wingspan is 60 m , assuming similarity:
a) calculate the scale factor (round to nearest unit)
b) calculate the actual tip cord
c) calculate the actual root cord
d) calculate the area of the model, in square centimeters.
e) calculate the area of the 787-8's wing, in square meters.
6. You go to Coldstone and get a waffle cone, single scoop of ice cream. The attendant stuffs the cone completely with ice cream, and places a perfectly hemispherical (semi-circle) scoop of ice cream on top.
If the cone has a height of 15 cm and a diameter of 8 cm , how many cubic centimeters of ice cream did you get? (I hope you left a tip!).

7. Your Science class roller coaster has a height of 89 cm , with an incline angle of $45^{\circ}$. When you release your marble, it reaches the first loop at the height of 64 cm .
a) What is the potential energy at the top of the roller coaster?
b) When you reach the first loop what is your speed?
c) If your first loop was at the bottom of the roller coaster, what would be the speed of the marble at the loop?
8. You draw a circle on a coordinate plane with a radius of 2 units.
a) Determine the unknown leg " $b$ " of the right triangle. If it is irrational, keep it irrational.
b) What is the sine of the angle $60^{\circ}$ ?
c) What is the cosine of the angle $60^{\circ}$ ?
d) What is the tangent of the angle $60^{\circ}$ ?

## Extra Credit Questions!

x1. How many solutions can a system of equations have? Show a
 worked-out example of each.
x2. In the figure at right, prove that the sum of the interior angles of the triangle equal $180^{\circ}$. Lines $/$ and $m$ are parallel.
x3. For the simple aircraft image at right, identify the location of the root cord,tip cord, and span. Use the appropriate variables.
x4. Prove that the Aspect Ratio equation is dimensionless, i.e., has no units of measure even though the span has units and the area has units.

$x 5$. Solve the Energy Equation for v. Show each step.
x6. State and describe the Pythagorean formula, and describe each variable.

- solve the formula for 'a'
- solve the formula for 'b'
x 7 . For the slope of a line between the points $\left(x_{1}, y_{1}\right)$ and $(x, y)$, derive the point-slope equation.
x8. Complete the statement, and show examples of the math:


