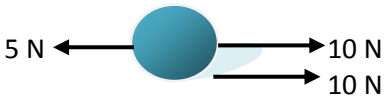
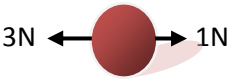
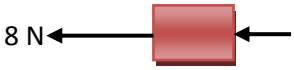
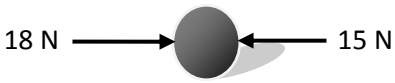
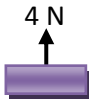
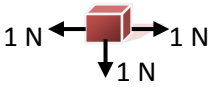
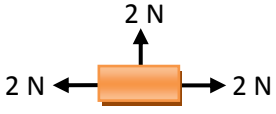
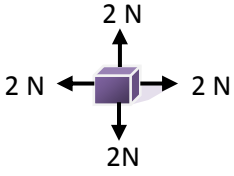
FUN WITH FORCES

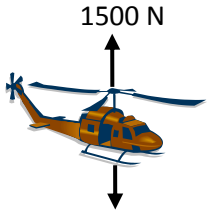
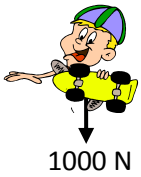
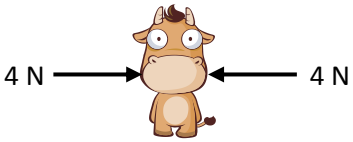
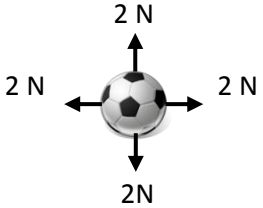
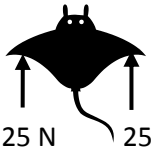
Force is a vector quantity (it has both **magnitude** (size) and **direction**). To determine the **net force** (resulting force on an object) you need to **add** all the forces that are acting on the object together. In general, forces to the **right** or **up** are considered **positive** and forces to the **left** or **down** are considered **negative**. The net force is always a **positive** amount. The **negative sign** just tells you the **direction** the object is moving (*see above*).The direction the arrow points is the direction the force is applied. It does not matter which side the number is on, just the way the arrow points.

DIRECTIONS: Determine the following for each force diagram (free body diagram):

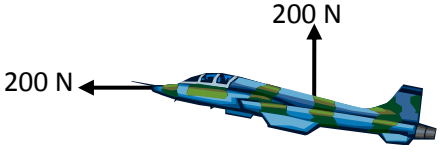
1. Draw each force diagram (including the arrows).
2. What is the net force acting on each object? (show you work and the correct unit (Newton))
3. Are the forces balanced or unbalanced? (YES or NO)
4. Which way will the object move? (Left, Right, Up, Down, or Stay Still)

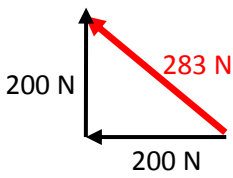
***THE NET FORCE IS ALWAYS POSITIVE. THE NEGATIVE SIGN DESCRIBS THE DIRECTION THE FORCE IS ACTING (left or down) (numbers 2, 3, 4, 8, 14, 16, have negative signs, but the force is a positive quanity).**

1.	 **(-2N + 5N = 3N), UNBALANCED, RIGHT**	7.	 **(-5N + 10N + 10N = 15N), UNBALANCED, RIGHT**
2.	 **(-20N + 14N = -6N), UNBALANCED, LEFT**	8.	 **(-3N + 1N = -2N), UNBALANCED, LEFT**
3.	 **(-8N + -3N = -11N), UNBALANCED, LEFT**	9.	 **(-1N + 3N = 2N), UNBALANCED, RIGHT**
4.	 **(-7N - 8N = -15N), UNBALANCED, LEFT**	10.	 **(18N - 15N = 3N), UNBALANCED, RIGHT**
5.	 **(4N), UNBALANCED, UP**	11.	 **(-1N + 1N = 0 N) PLUS (-1N) = NET FORCE -1N DOWNWARDS, UNBALANCED, DOWN**
6.	 **(-2N + 2N = 0 N) PLUS (2N) = NET FORCE 2N UPWARDS, UNBALANCED, UP**	12.	 **(-2N + 2N = 0 N) PLUS (2N - 2N = O N) = NET FORCE 0 N, BALANCED, STAY STILL**

13	 **(1500N - 1000N = 500 N) , UNBALANCED, UP**	19	 **(-10N + 25N = 15N), UNBALANCED, RIGHT**
14	 **(5000N – 500N = 4500 N), UNBALANCED, LEFT**	20	 **(-1000N), UNBALANCED, DOWN**
15	 **(900N - 100N = 800N), UNBALANCED, RIGHT**	21	 **(150N – 30 N = 120N), UNBALANCED, RIGHT**
16	 **(-20n - 20N + 440n = 400N), UNBALANCED, LEFT**	22	 **(123N), UNBALANCED, RIGHT**
17	 **(-3N + 6N - 6N + 3N = 0 N), BALANCED, STAY STILL**	23	 **(4N - 4N = 0 N), BALANCED, STAY STILL**
18	 **(-2N + 2N = 0 N) PLUS (2N – 2N = O N) = NET FORCE ZERO NEWTONS, BALANCED, STAY STILL**	24	 **(25N + 25N = 50N), UNBALANCED, UP**

<u>BONUS</u>: You need to put the arrows together (one arrow to the end of the other) and use: $a^2 + b^2 = c^2$. The hypotenuse is the resulting vector of the upwards and forwards forces being added together. You might be tempted to just add them together and get 400N, but that would result in the gross or total forces involved and not the NET FORCE (and where and by how much) is acting on the airplane.





$(200N)^2 + (200N)^2 = C^2$

$40000N + 40000N = C^2$ $80000N = C^2$ $C = 283N$

283N is the <u>NET FORCE</u> on the plane. Unbalanced moving northwest (diagonally left and up at 315°)