Color Algebra

This is an "algebraic", in the sense that you are using defined variables, approach to mixing colors of light and pigment. The basic principle to remember here is that **you can only see light** given off by or reflected off of an object. Therefore, you cannot see the object unless light is leaving it and being detected by your eye. **Light**, which is **additive**, is indicated by a **(+)** in front of the letter. **Pigment**, which is **subtractive**, is indicated by a **(-)** in front of the letter. The **(-)** indicates the absorption (or absence)of light.

The following table defines the values for each color of light and pigment to use the color algebra. Note that the light values are represented by simple addition of the colors while the pigment values are identified by subtraction of light, or what is absorbed by the pigment. For example if you see red light you see red light, if you see a red pigment the only reason you see it is because it absorbs all colors except the red which is reflected.
Try this: *a red pigment is –B -G, there is no light here, you can't see a pigment unless there is light to be reflected back to your eye. To keep it simple use normal white light shining on the red pigment,* ***(+R+G+B) + (-B-G) = +R*** , which is red light reflected off the pigment to your eye, so you see red.

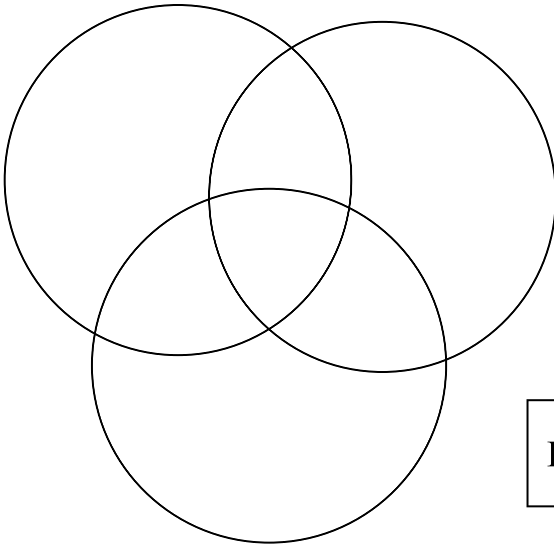
The following table lists the primary/secondary colors and their color algebra values:

Primary and Secondary Colors	Light (+)
RED	+R
GREEN	+G
BLUE	+B
MAGENTA	+R+B
CYAN	+B+G
YELLOW	+R+G
WHITE	+R+G+B

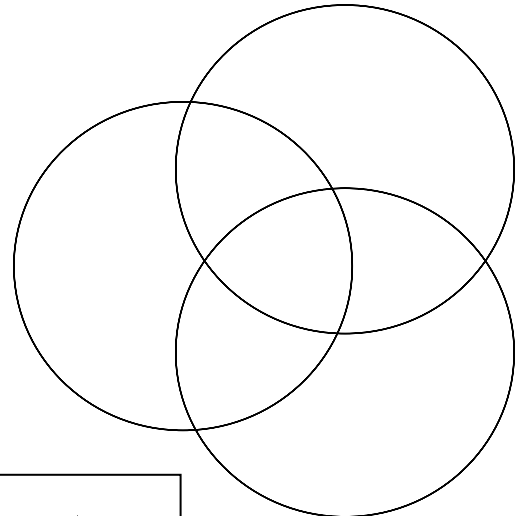
Primary and Secondary Colors	Pigment (-)
CYAN	-R
MAGENTA	-G
YELLOW	-B
GREEN	-R-B
RED	-B-G
BLUE	-R-G
BLACK	-R-G-B

In order to determine what you would see as a result of any combination of light/light, pigment/pigment, or light/pigment simply add the values of the desired colors. The resulting combination of **+,-** and **letters** tells you what you would see, which will only be the +letters. One last example: A blue pigment under only red light: ***(-R-G) + (+R)*** **= *-G*** . This result has no light, which would be represented by a **+** in front of the letter, so you "see" **BLACK**, which is the absence of any light. Also if the answer is zero you would "see" black.

Another way to mix colors is to actually mix the colors. Complete the two Venn diagrams showing the relationships of the primary and secondary colors both in light and pigment as they are actually mixed together:



Light



Pigment

In the following chart the columns indicate the light which is made available. The rows indicate the color of paper when viewed in the available color. The reason the paper has a color is that it reflects that color of light and absorbs all others. Notice that the first column is when white (all colors) light is available. **Complete the remaining columns** using your knowledge of the colors of light and pigment. You are not required to use color algebra, however, it works so try it.

	White light	Red light	Green light	Blue light	Magenta light	Cyan light	Yellow light
1.	Red paper						
2.	Green paper						
3.	Blue paper						
4.	Magenta paper						
5.	Cyan paper						
6.	Yellow paper						
7.	White paper						