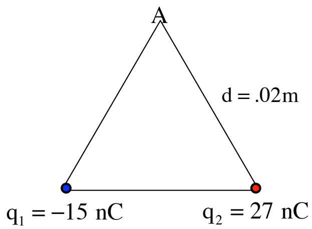
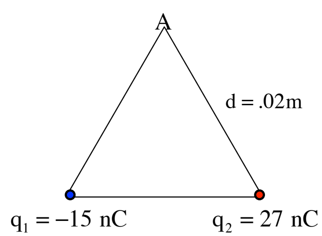
Problem 16.12

a.) Assuming an equilateral triangle of sides d = .02 m, what is V at A?



b.) Determine V halfway between the charges.

a.) The electrical potential at origin?



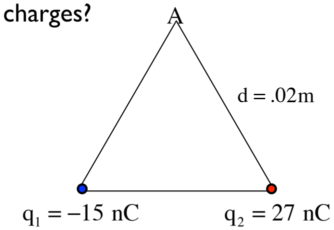
The important point here is that electrical potentials add as SCALARS, not vectors. *Absolute electrical potential* (point voltages) generated by positive charges are *positive* and absolute electrical potentials generated by negative charges are *negative*. In either case, the electrical potential function FOR A POINT CHARGE is

$$V_1 = k\frac{q_1}{r_1}$$

Using this on our situation, remembering to include the sign of the charge in the expression, we get:

$$\begin{aligned} V &= V_{q_1} + V_{q_2} \\ &= k\frac{q_1}{d} + k\frac{(-q_2)}{d} \\ &= \left(9x10^9\right)\frac{\left(-15x10^{-9}C\right)}{(.02\ m)} + \left(9x10^9\right)\frac{\left(27x10^{-9}C\right)}{(.02\ m)} \\ &= 5400\ \text{volts} \end{aligned}$$

a.) The *electrical potential* halfway between the charges?



The only difference is the distances.

$$\begin{aligned} V &= V_{q_1} + V_{q_2} \\ &= k\frac{q_1}{d} + k\frac{(q_2)}{d} \\ &= \left(9x10^9\right)\frac{\left(-15x10^{-9}C\right)}{(.01\ m)} + \left(9x10^9\right)\frac{\left(27x10^{-9}C\right)}{(.01\ m)} \\ &= 1.08x10^4\ \text{volts} \end{aligned}$$