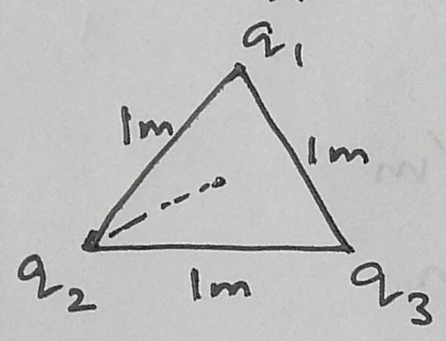
Electric Potential

1. $\Delta V = V_B - V_A = \frac{KQ}{r_B} - \frac{KQ}{r_A}$

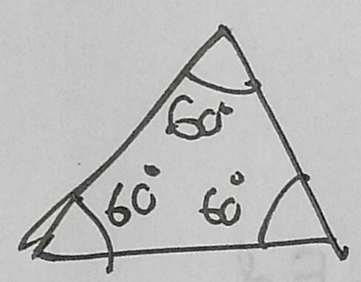
2. see lecture slides.

3. $U = K\frac{qQ}{r}$

4. 5. $U_A = K\frac{qQ}{r_A}$ $\quad U_B = K\frac{qQ}{r_B}$

6. 

Find the distance corner to center of equilateral triangle.



7. $V = -Ed$

8. $V(x) = ax - bx^2$ $\quad E = -\frac{dV}{dx}$

condition, $E = 0$; $\quad a - 2bx = 0$

9. $V(x,y) = \frac{a}{x^2+y^2}$ $\quad E_x = -\frac{\partial V}{\partial x} = \frac{2ax}{(x^2+y^2)^2}$

$E_y = -\frac{\partial V}{\partial y} = \frac{2ay}{(x^2+y^2)^2}$

$E = \sqrt{E_x^2 + E_y^2}$

$= \frac{2a}{(x^2+y^2)^{3/2}}$

10. $\vec{E}(x) = ax^2\,\hat{x}$

$$V_B - V_A = -\int_A^B \vec{E}\cdot d\vec{l} = -\int_A^C \vec{E}\cdot d\vec{l} - \int_C^B \vec{E}\cdot d\vec{l}$$

Equipotential line, $-\int_C^B \vec{E}\cdot d\vec{l} = 0$

Thus, $V_B - V_A = -\int_A^C \vec{E}\cdot d\vec{l} = -\int_0^3 ax^2\,dx$

11. $V = -Ed$ $\qquad E = 5.5\times10^{6}\ V/m$

$d = 8.0\times10^{-9}\ m$

12. use, $W = Fd = \Delta K$

here, $F = qE$ thus, $K = qEd$