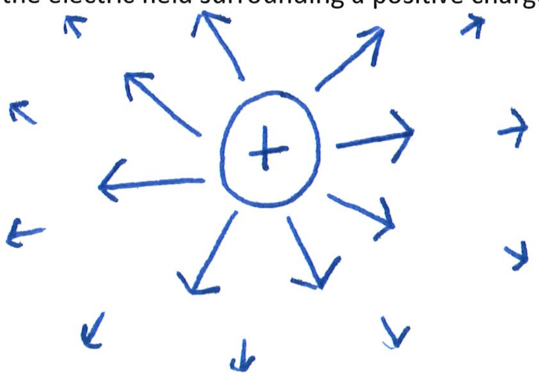
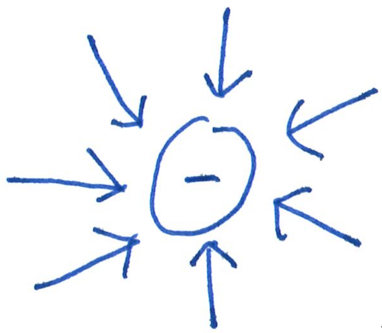
Electric Fields Practice Name:______________________________

1. Sketch the electric field surrounding a positive charge.



2. Sketch the electric field surrounding a negative charge.



3. Consider the electric field 0.50 metres away from a 25 μC point charge.
   a. Will the field's direction be towards or away from the charge?

   Away

   b. What is the field strength?

$$E = \frac{kq}{r^2} = \frac{8.988\times10^9\ \frac{N\cdot m^2}{C^2} \times 25\times10^{-6}\ C}{(0.50\ m)^2}$$

$$= 9.0\times10^5\ N/C$$

4. Consider the electric field 1.5 metres away from a $-50.0\ \mu C$ point charge.
   a. Will the field's direction be towards or away from the charge?

Towards

   b. What is the field strength?

$$E = \frac{8.988\times10^{9} \times 50\times10^{-6}}{1.5^2}$$

$$= 2.0\times10^{5}\ N/C$$

5. When we dealt with gravity, the gravitational field strength was equal to the acceleration due to gravity. Why is this not true about the electric field strength?

gravity is N/kg since $N = \frac{kg\cdot m}{s^2}$

$$\frac{N}{kg} = \frac{\frac{kg\,m}{s^2}}{kg} = \frac{m}{s^2}$$ which is acceleration

the find acceleration in electric field it depends on both mass and charge

6. A $2.5\ \mu C$ charge experiences a 3.52 N electric force in an electric field. What is the strength of the electric field?

$$E = \frac{F_E}{q} = \frac{3.52\ N}{2.5\times10^{-6}\ C}$$

$$= 1.4\times10^{6}\ \frac{N}{C}$$

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7. A $-61.2\ \mu C$ charge experience a 6.23 N electric force in an electric field. What is the strength of the electric field?

$$E = \frac{F_E}{q} = \frac{6.23N}{61.2\times10^{-6}C} = 1.02\times10^{5}\ \frac{N}{C}$$

8. A 0.25 kg object with a charge of 56 μC is in a ~~7.9~~ 7900 N/C electric field. What is the acceleration of the object?

$$F_E = Eq = 7900\frac{N}{C}\times 56\times10^{-6}C = 0.4424N$$

$$a = \frac{F_{net}}{m} = \frac{0.4424N}{0.25kg} = 1.8\frac{m}{s^2}$$

9. At a distance of 1.25 metres from a point charge the electric field strength is 560 N/C. this is the charge

a. At what distance will the field strength be 750 N/C?

$$E = \frac{kq}{r^2} \rightarrow \frac{Er^2}{k} = q \rightarrow \frac{560(1.25)^2}{8.988\times10^9} = 9.7352\times10^{-8}C$$

$$r = \sqrt{\frac{kq}{E}} = 1.1m$$

b. At what distance will the field strength be 2.5 N/C?

19m

c. At what distance will the field strength be 0.44 N/C?

45m

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10. A $+25\ \mu C$ and a $-45\ \mu C$ point charge are 4.0 metres apart. What is the strength and direction of the electric field:

a. 1.0 metres from the +25 μC charge?

(+) ⇉ (−)

1m to 25 means
strength from 25μC is $\frac{8.988\times10^9 \times 25\times10^{-6}}{1^2} = 2.247\times10^5$ away

3m from −45 charge
strength from −45 is $\frac{8.988\times10^9 \times 45\times10^{-6}}{3^2} = 4.494\times10^4$

Total is $2.247\times10^5 + 4.494\times10^4 = 2.7\times10^5\ \frac{N}{C}$ towards −45μC charge

b. 2.0 metres from the +25 μC charge?

from 25μC 5.6175×10^4
From −45μC $+\ 1.011\times10^5$

$1.6\times10^5\ \frac{N}{C}$ towards −45μC charge

c. 3.0 metres from the +25 μC charge?

from 25μC 2.4967×10^4
From −45μC $+\ 4.0446\times10^5$

$4.3\times10^5\ \frac{N}{C}$ towards −45μC charge

Electric Fields Practice Name:______________________________

11. A $+25\ \mu C$ and a $+45\ \mu C$ point charge are 4.0 metres apart. What is the strength and direction of the electric field:

a. 1.0 metres from the +25 μC charge?

winner

from 25μC charge : 2.247×10^5 towards 45μC

from 45μC charge: 4.494×10^4 towards 25μC

Total is $2.247\times10^5 - 4.494\times10^4 = 1.8\times10^5$ N/C towards 45μC charge

b. 2.0 metres from the +25 μC charge?

from 25μC 5.6175×10^4

from 45μC 1.011×10^5 ← winner

Total is $1.011\times10^5 - 5.6175\times10^4$

$= 4.49\times10^4 \frac{N}{C}$ towards 25μC charge

c. 3.0 metres from the +25 μC charge?

from 25μC 2.4967×10^4

from -45 4.0446×10^5 ← winner

Total is $4.0446\times10^5 - 2.4967\times10^4$

$= 3.8\times10^5 \frac{N}{C}$ towards 25μC charge

12. A 3.0 μC and a -4.0 μC charge are 2.6 metres apart. What is the strength and direction of the electric field halfway between the two charges?

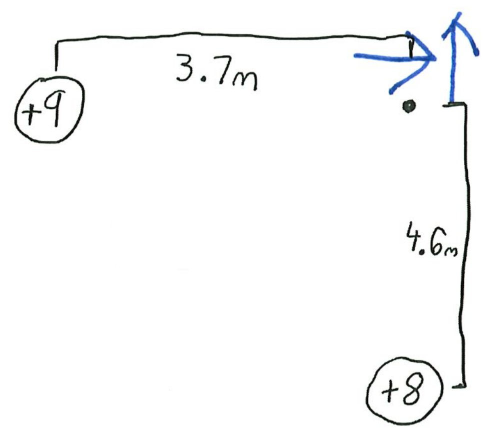
Both point towards $-4\mu C$ charge

from $3\mu C$ charge : $E = \frac{kq}{r^2} = \frac{8.988\times10^{9} \times 3\times10^{-6}}{1.3^2} = 1.5955\times10^{4}\,\frac{N}{C}$

From $-4\mu C$ charge : $2.127\times10^{4}\,N/C$

Total $= 3.7\times10^{4}\,\frac{N}{C}$ towards $-4.0\mu C$ charge

13. What is the strength and direction of the electric field 3.7 metres to the East of a 9.0 μC charge and 4.6 metres to the North of a 8.0 μC charge.



from $9\mu C$ charge : $E = \frac{8.988\times10^{9} \times 9\times10^{-6}}{3.7^2}$

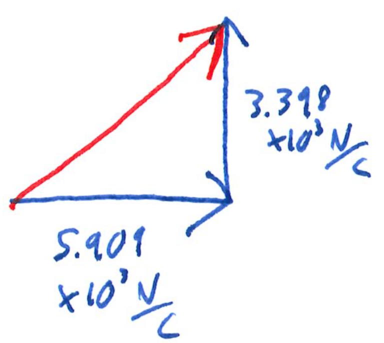
$= 5.909\times10^{3}\,\frac{N}{C}$

~~away~~ to East

from $8\mu C$ charge :

$3.398\times10^{3}\,N/C$

to North



$\sqrt{(3.398\times10^{3})^2 + (5.909\times10^{3})^2}$

$= 6.8\times10^{3}\,\frac{N}{C}$

$\theta = \tan^{-1}\left(\frac{3.398}{5.909}\right) =$ 30° North of East

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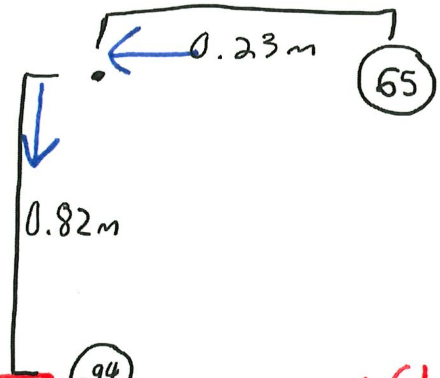
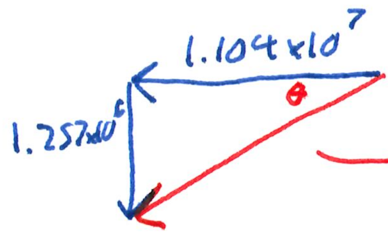
14.

a. What is the strength and direction of the electric field 0.23 metres to the West of a 65 μC charge, and 0.82 metres to the North of a -94 μC charge?



From 65 μC: 1.104×10^7 N/C

From 94 μC: 1.257×10^6 N/C



$\sqrt{(1.104 \times 10^7)^2 + (1.257 \times 10^6)^2}$

1.1×10^7 N/C

θ $\tan^{-1}\left(\frac{1.257 \times 10^6}{1.104 \times 10^7}\right)$

6.5° South of West

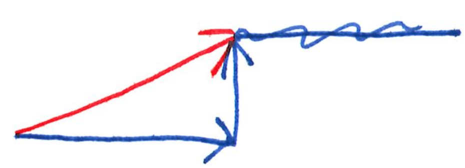
b. If a 2.0 μC charge was placed in that location what would be the electric static force (magnitude and direction) acting on it?

$F_E = Eq = (1.1 \times 10^7) \times 2 \times 10^{-6} = 22$ N

6.5° South of West

c. If a -2.0 μC charge was placed in that location what would be the electric static force (magnitude and direction) acting on it?

Mag will be the same but directions are reversed



22N, 6.5° North of East