

In the region shown above there is an electric field due to charged objects not shown in the diagram. A tiny glass ball with a charge of  $7\text{e-}09$  coulomb placed at location  $A$  experiences a force of  $\langle -2.8\text{e-}05, -2.8\text{e-}05, 0 \rangle$  N, as shown in the diagram.

Which arrow (a-j) best indicates the direction of the electric field at location  $A$ ?



What is the electric field at location  $A$ ?

$\vec{E} =$   N/C

What is the *magnitude* of this electric field?

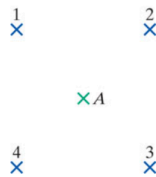
$|\vec{E}| =$   N/C

Now the glass ball is moved very far away. A tiny plastic ball, with charge  $-8\text{e-}09$  coulombs is placed at location  $A$ . Which arrow best indicates the direction of the electric *force* on the negatively charged plastic ball?

What is the force on the negative plastic ball?

$\vec{F} =$   N

You discover that the source of the electric field at location  $A$  is a negatively charged particle. Which of the blue **X**'s below best indicates the location of the negatively charged particle that is the source of the field?



Part One

Charge is positive so f

Part Two

$$\vec{E} = \langle -4000, -4000, 0 \rangle \text{ N/C}$$

Part Three

$$|\vec{E}| = \sqrt{4000^2 + 4000^2}$$

$$= 5656.854 \text{ N/C}$$

## Part Four

Charge is negative so b

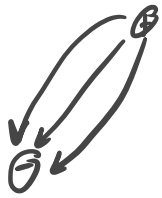
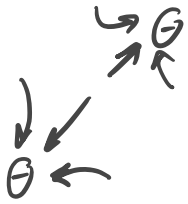
## Part Five

$$\vec{E} = \frac{\vec{F}}{q}$$

$$\vec{F} = \vec{E} q$$

$$= \langle 3.2e-5, 3.2e-5, 0 \rangle \text{ N}$$

## Part Six



1

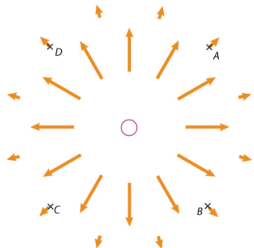
2

x<sub>A</sub>

3

4

3



In the region shown in the diagram above there is an electric field due to a point charge located at the center of the magenta circle. The orange arrows indicate the magnitude and direction of the electric field at the locations shown.

What is the sign of the source charge?

Now a particle whose charge is  $-6\text{e-}09$  C is placed at location C. Which arrow (a-j) best indicates the direction of the electric force on the  $-6\text{e-}09$  C charge?



The electric field at location C has the value  $\langle -9000, -9000, 0 \rangle$  N/C. What is the unit vector in the direction of  $\vec{E}$  at this location?

$$\hat{E} = \boxed{\phantom{000}}$$

What is the electric force on the  $-6\text{e-}09$  C charge?

$$\vec{F} = \boxed{\phantom{000}} \text{ N}$$

What is the unit vector in the direction of this electric force?

$$\hat{F} = \boxed{\phantom{000}}$$

Part One

Positive

Part Two

B or ↗

Part Three

$$\hat{E} = \frac{\vec{E}}{|\vec{E}|}$$

$$= \langle -0.71, -0.71, 0 \rangle \text{ N/C}$$

Part Four

$$\vec{E} = \frac{\vec{F}}{q}$$

$$\vec{F} = \vec{E}q$$

$$= \langle 5.4e-5, 5.4e-5, 0 \rangle \text{ N}$$

Part Five

Same as part three just in the other direction

$$\hat{F} = \langle 0.71, 0.71, 0 \rangle \text{ N}$$