

# task\_1.1.5

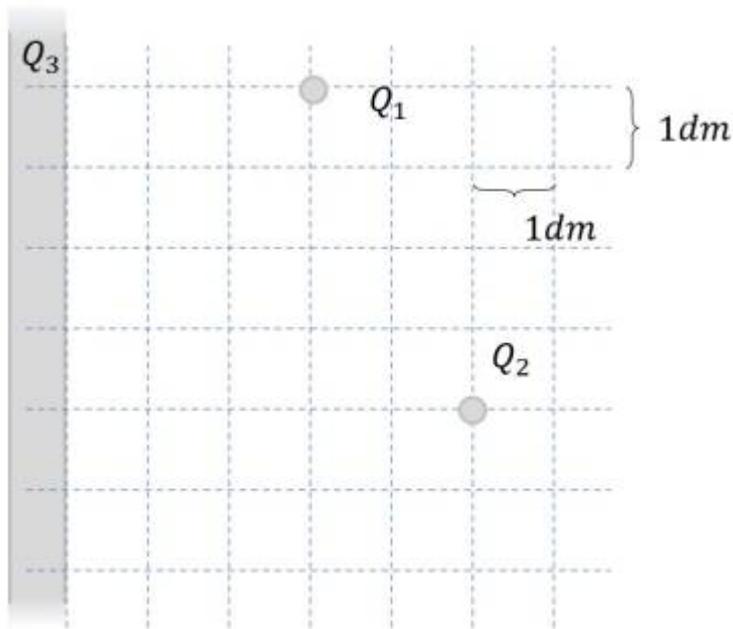
## Student Group

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### Aufgabe 5.1.5 Variation: Forces on Charges (exam task, ca 8% of a 60 minute exam, WS2020)



Given is an arrangement of electric charges located in a vacuum (see picture on the right).

The charges have the following values:

$Q_1 = 2 \mu\text{C}$  (point charge)

$Q_2 = -4 \mu\text{C}$  (point charge)

$Q_3 = 0 \text{ C}$  (infinitely extended surface charge)

$\epsilon_0 = 8,854 \cdot 10^{-12} \text{ F/m}$ ,  $\epsilon_r = 1$

1. calculate the magnitude of the force of  $Q_2$  on  $Q_1$ , without the force effect of  $Q_3$ .

Result

$$|F_C| = 0,3595 \text{ N} \rightarrow 0,36 \text{ N}$$

2. is this force attractive or repulsive?

Solution

The force is attractive because the charges have different signs.

Now let  $Q_2 = 0$  and the surface charge  $Q_3$  be designed in such a way that a homogeneous electric field with  $E_3 = 100 \text{ kV/m}$  results.

What force (magnitude) now results on  $Q_1$ ?

Result

$$|F_C| = 0,4 \text{ N}$$

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