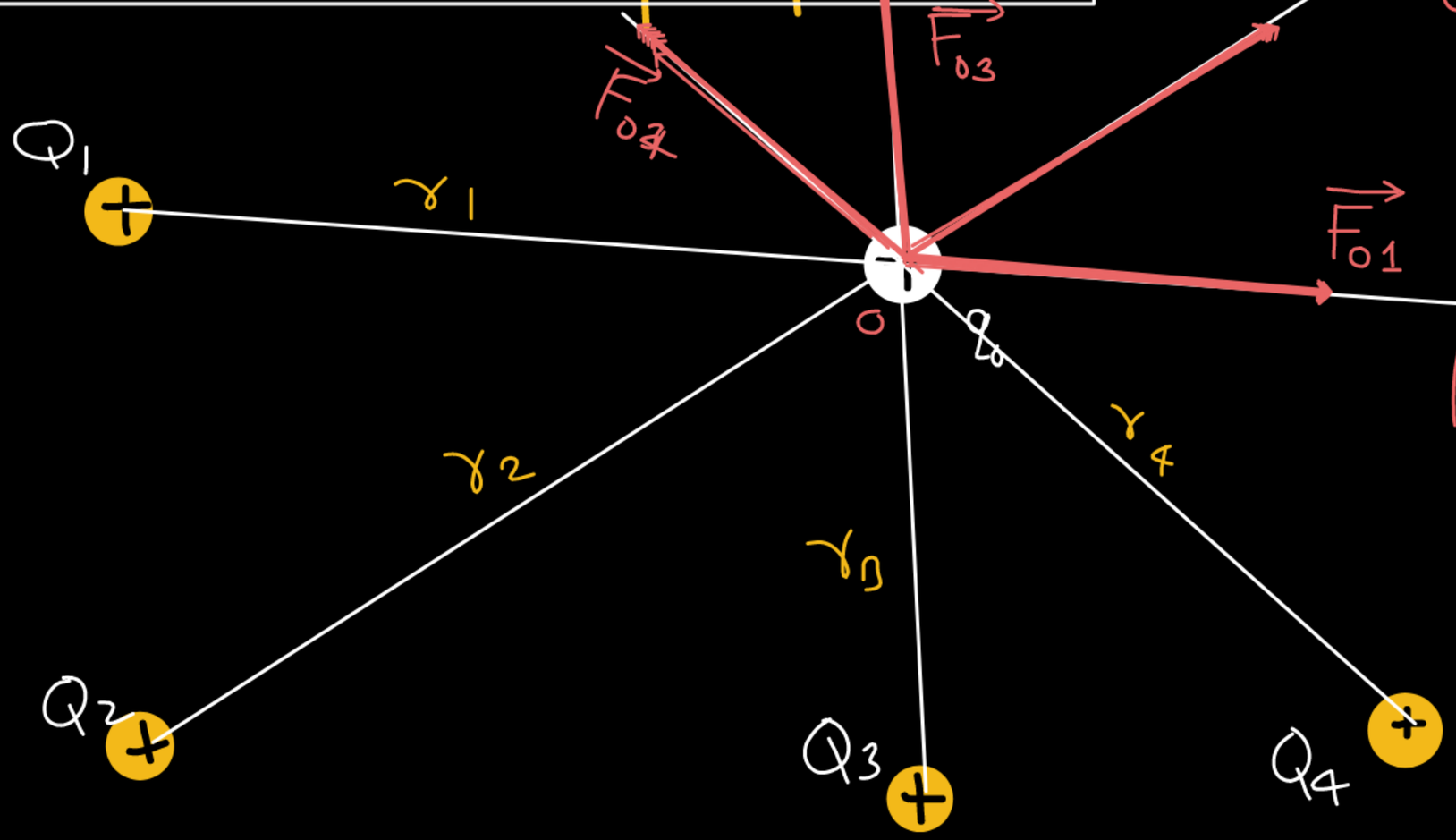
अध्यारोपण का सिद्धान्त
Principle of Superposition

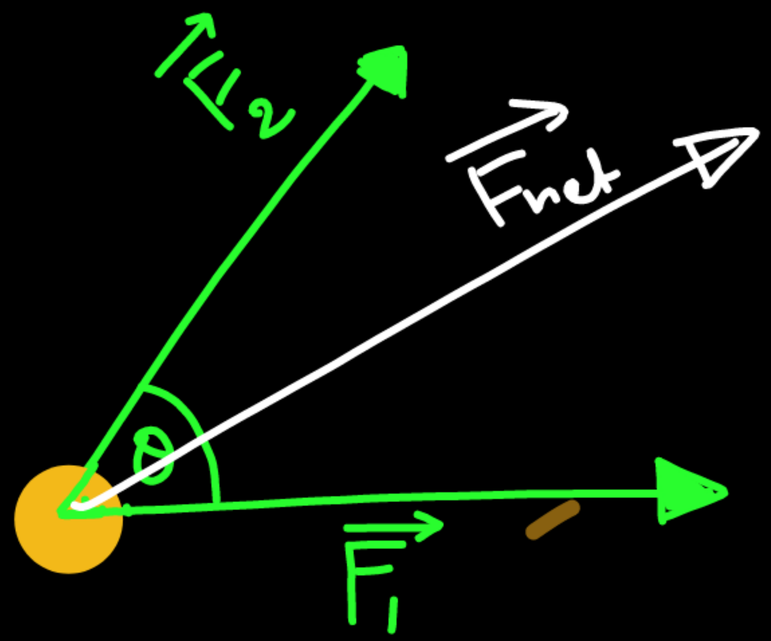


Total force applied on charge q_0:

q_0 पर आरोपित कुल बल:

$$\vec{F}_{net} = \vec{F}_{01} + \vec{F}_{02} + \vec{F}_{03} + \cdots + \vec{F}_{0n}$$

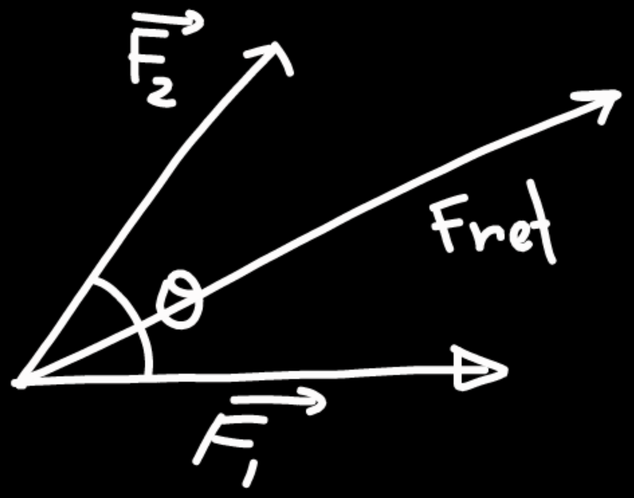
सदिशों का जोड़



F_{net} का परिमाण

$$\left|\vec{F}_{net}\right| = F_{net}$$

$$= \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$$



Case ① $\theta = 0^\circ$

$$F_{total} = F_1 + F_2$$

Case ②:

$\theta = 180^\circ$

$$F_{net} = F_1 - F_2$$

$$F_{net} = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$$

* यदि $F_1 = F_2 = F$

$$F_{net} = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$$

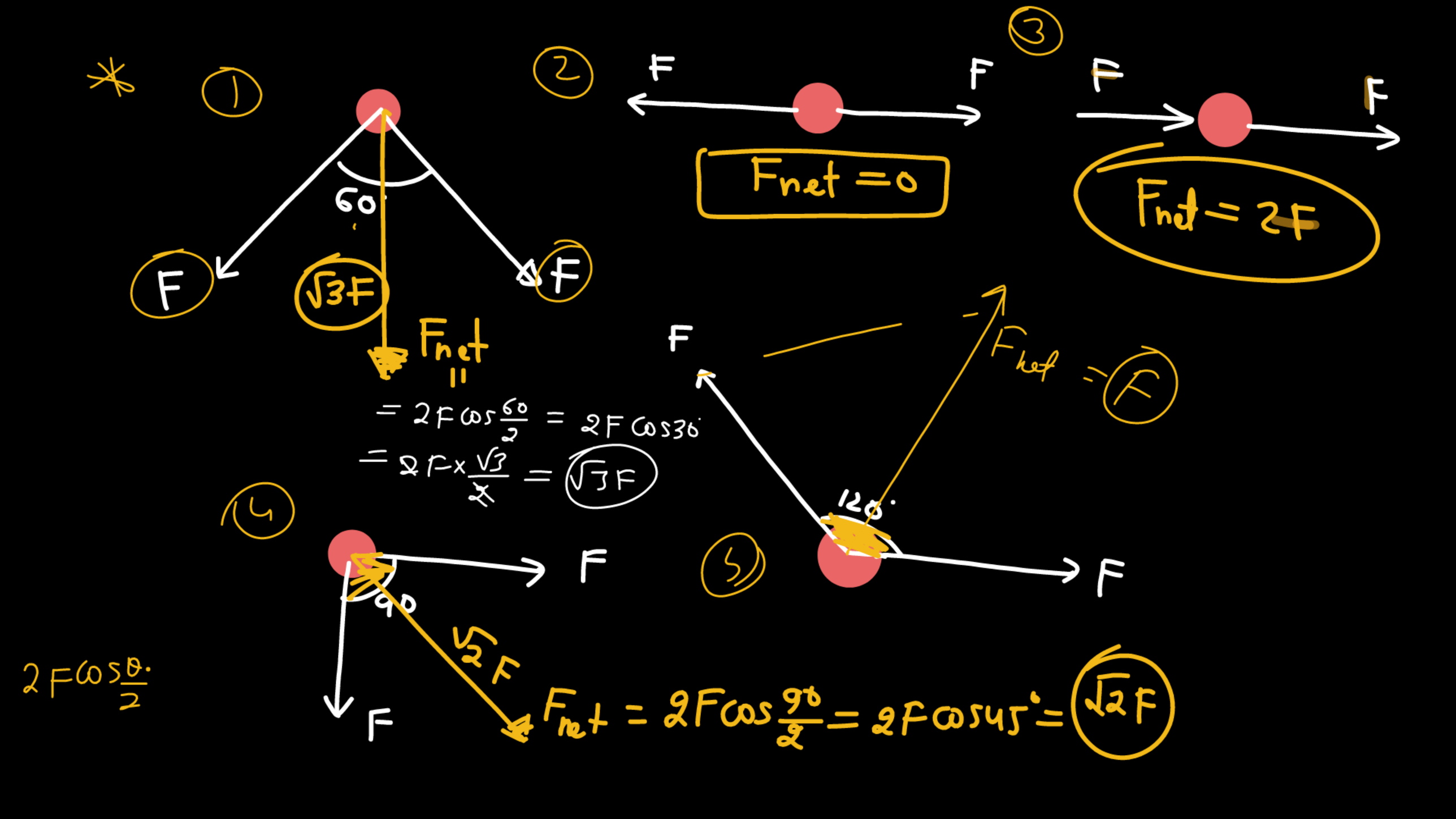
$$= \sqrt{F^2 + F^2 + 2FF\cos\theta}$$

$$= \sqrt{2F^2 + 2F^2\cos\theta}$$

$$= \sqrt{2F^2(1+\cos\theta)}$$

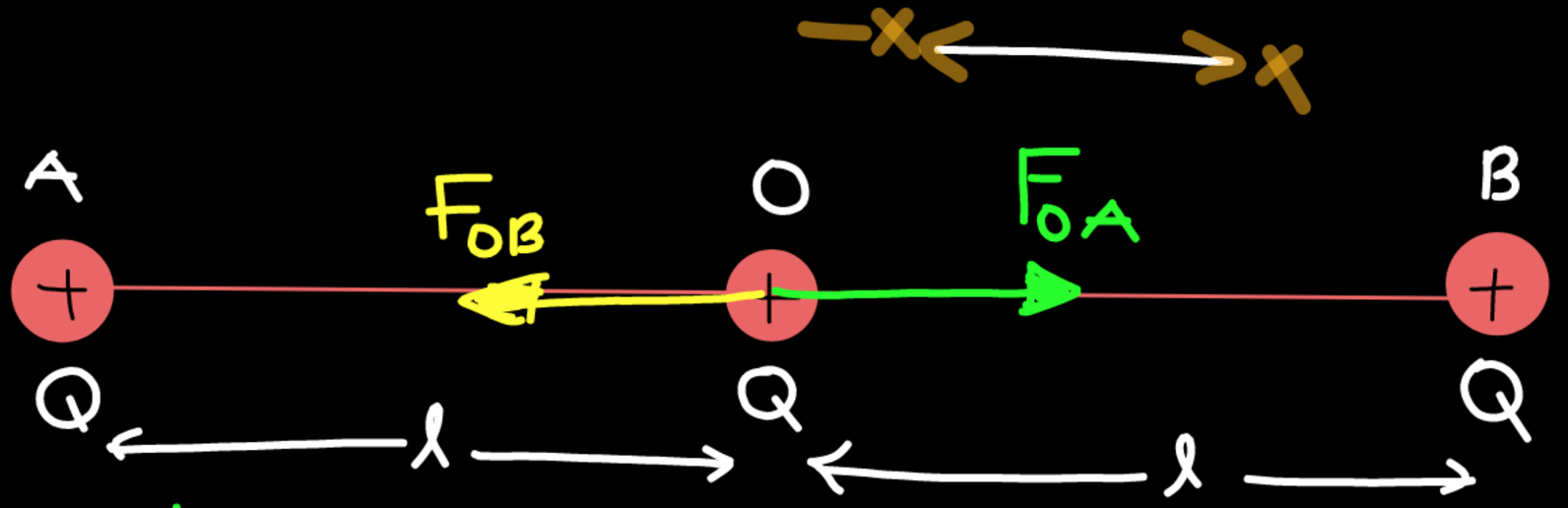
$$= \sqrt{2F^2 \times 2\cos^2\frac{\theta}{2}}$$

$$F_{net} = 2F\cos\frac{\theta}{2}$$


*
1
60°
F
F
√3F
Fnet
= 2F cos 60/2 = 2F cos 30°
= 2F × √3/2 = √3F
2
F
F
Fnet = 0
3
F
F
Fnet = 2F
4
F
F
90°
F
√2F
Fnet = 2F cos 90/2 = 2F cos 45° = √2F
5
F
F
120°
Fnet = F
2F cos θ/2

प्रश्न: दिए गए आकृति में विन्दु 'o' पर बल ज्ञात करो

1.



$\vec{F}_{net} = F_{OA}\hat{i} + F_{OB}(-\hat{i})$

$= \frac{kQ^2}{l^2} - \frac{kQ^2}{l^2}$

$= 0$

$F_{OA} = \frac{kQQ}{l^2}$

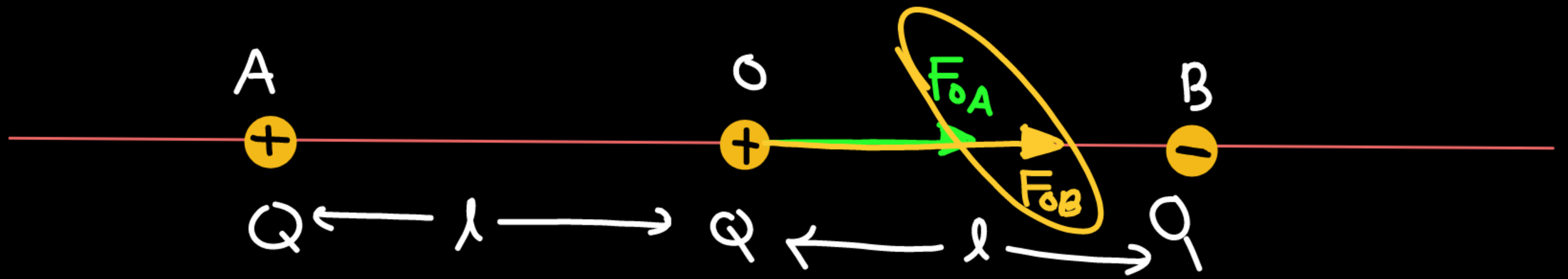
$F_{OA} = \frac{kQ^2}{l^2}$

$F_{OB} = \frac{kQQ}{l^2}$

$F_{OB} = \frac{kQ^2}{l^2}$

② F_{net} at O = ?

$$F_{OB} = \frac{kq^2}{l^2}$$

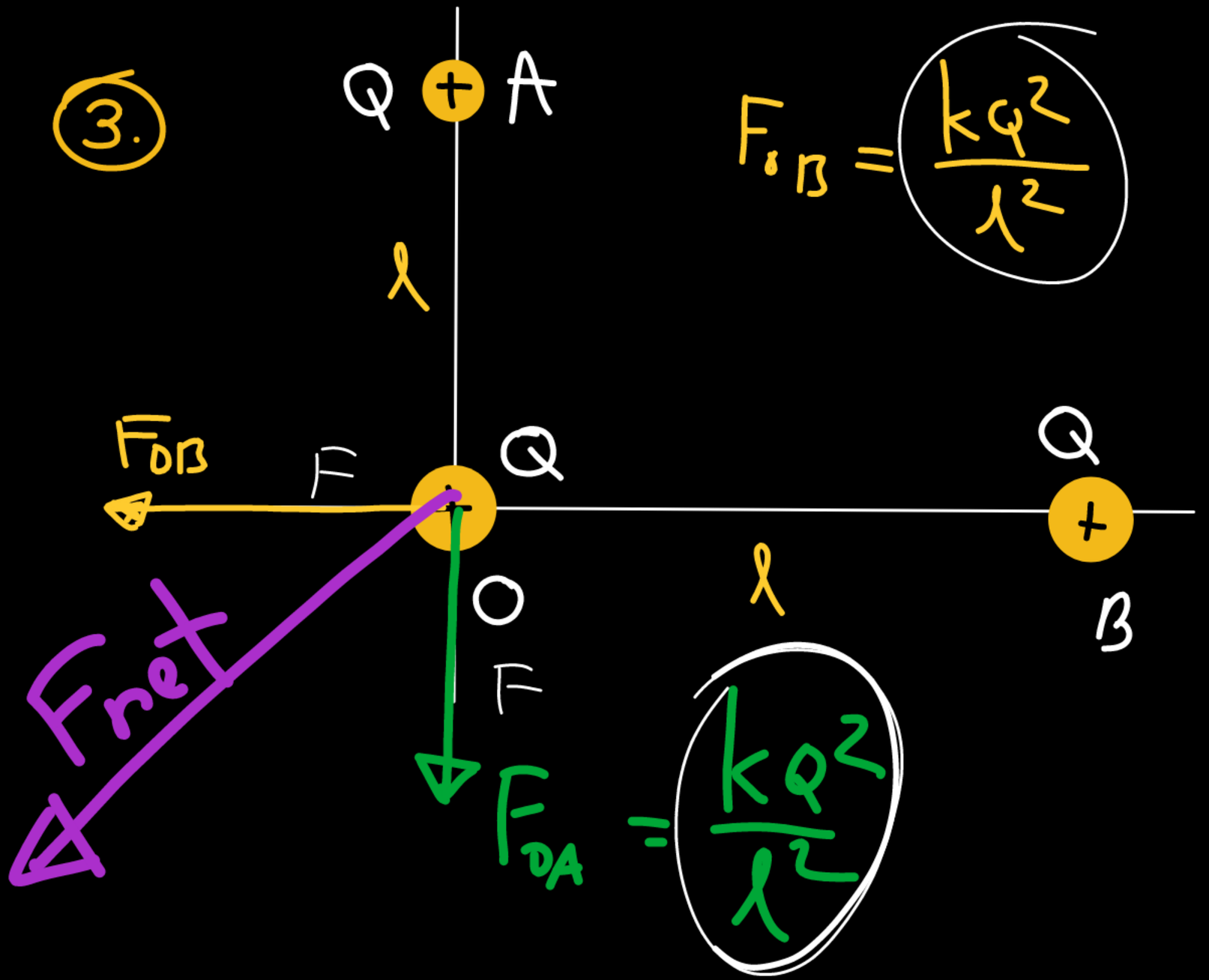


$$F_{OA} = \frac{kQ^2}{l^2}$$

$$F_{net} = F_{OA} + F_{OB}$$

$$= \frac{kQ^2}{l^2} + \frac{kQ^2}{l^2} = \boxed{\frac{2kQ^2}{l^2}}$$

3.



$$F_{AB} = \frac{kQ^2}{l^2}$$

$$F_{net} = \sqrt{2}\,F$$

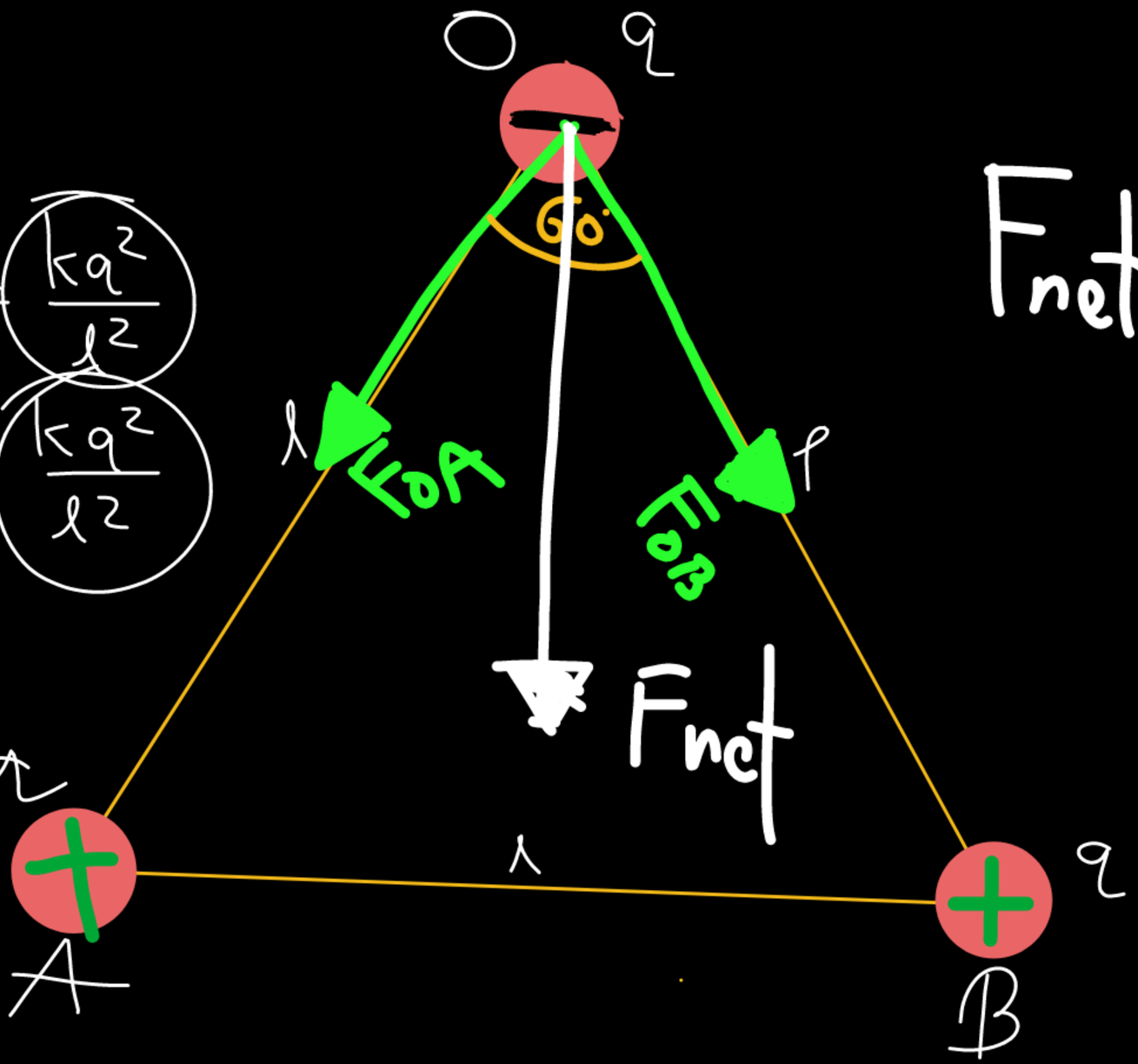
$$= \sqrt{2}\,\frac{kQ^2}{l^2}$$

$$F_{OA} = \frac{kQ^2}{l^2}$$

③

$F_{OA} = \frac{kq^2}{l^2}$

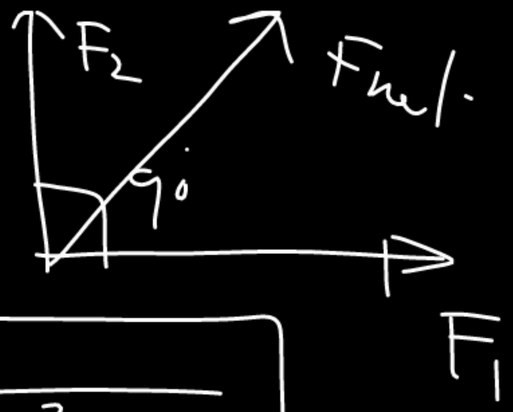
$F_{OB} = \frac{kq^2}{l^2}$



$$F_{net} = \sqrt{3}\, F$$

$$= \sqrt{3}\, \frac{kq^2}{l^2}$$

* $\theta = 90^\circ$



$$F_{net} = \sqrt{F_1^2 + F_2^2}$$