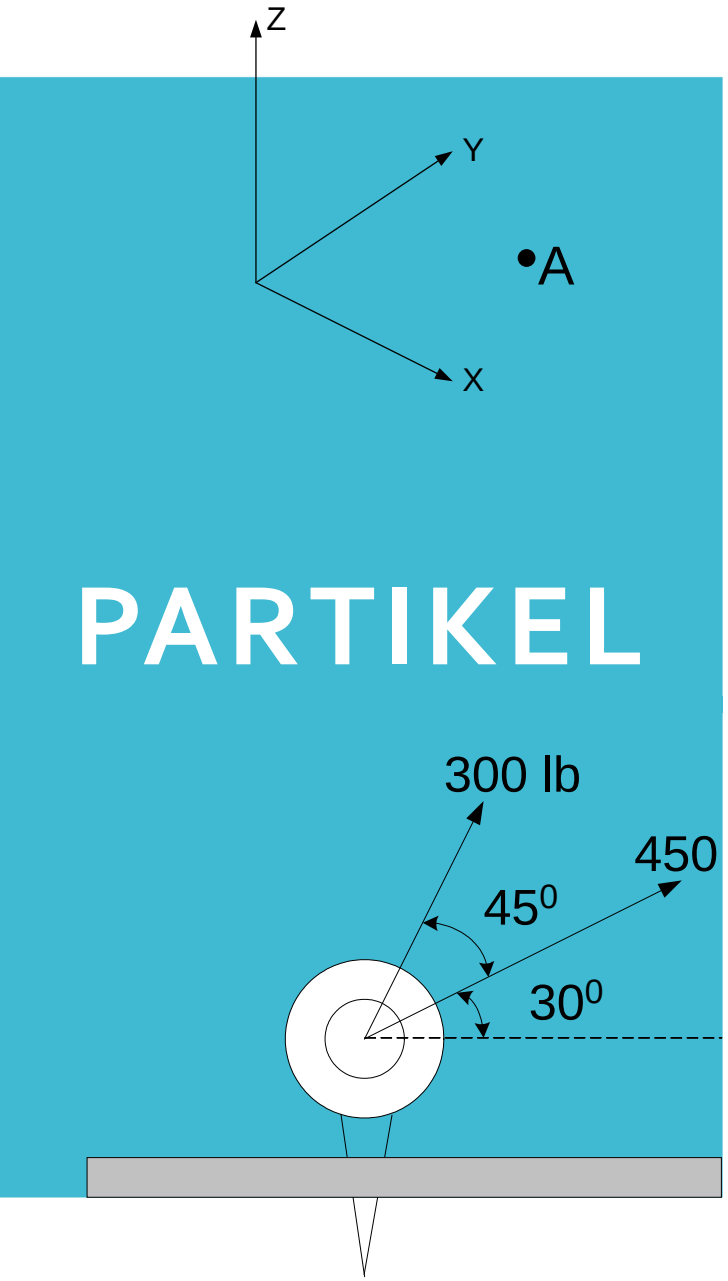
UBAYA
UNIVERSITAS SURABAYA

UNIVERSITY OF SURABAYA
FACULTY OF ENGINEERING
ManuFaktur
EST 1993
#ProudToBeManufers

STATIKA PARTIKEL

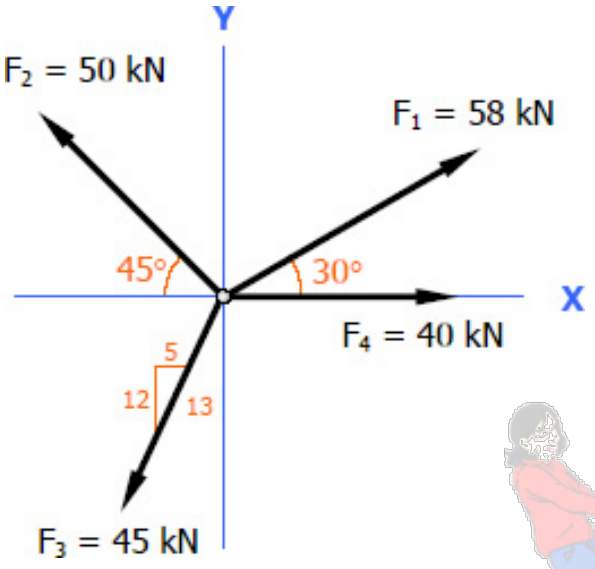
PRODUCT DESIGN LABORATORY
mechanical & manufacturing engineering

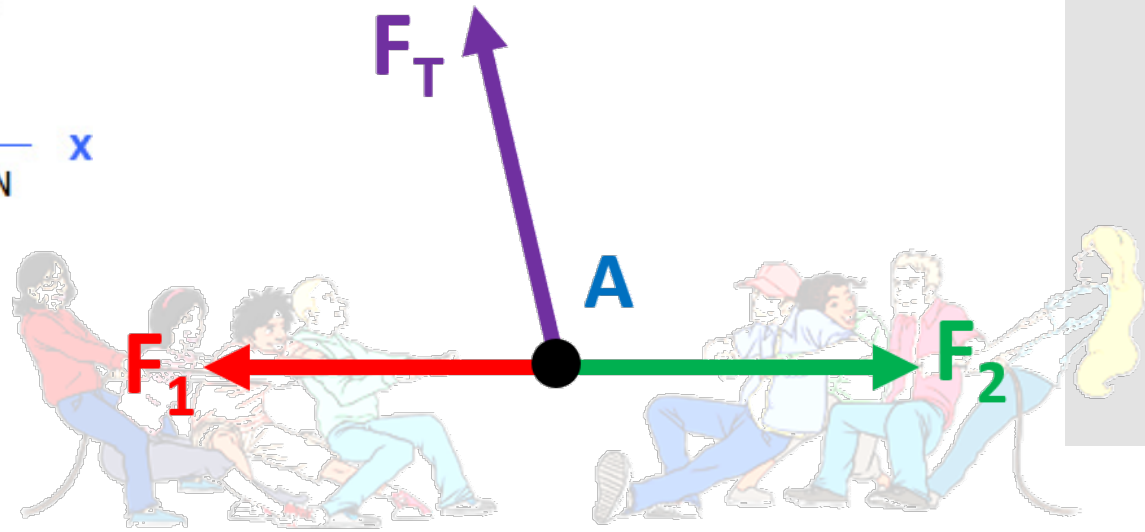
Sunardi Tjandra

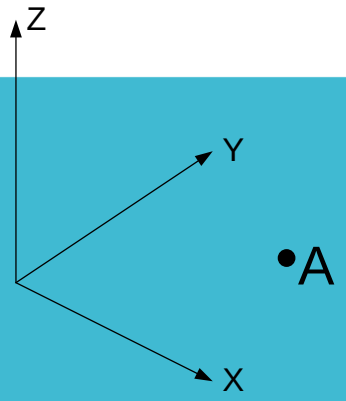


PARTIKEL

- Merupakan *rigid body* (benda tegar) yang dianggap sebuah titik
- Memiliki tempat kedudukan (posisi)
- Semua gaya dianggap bekerja pada satu titik yang sama







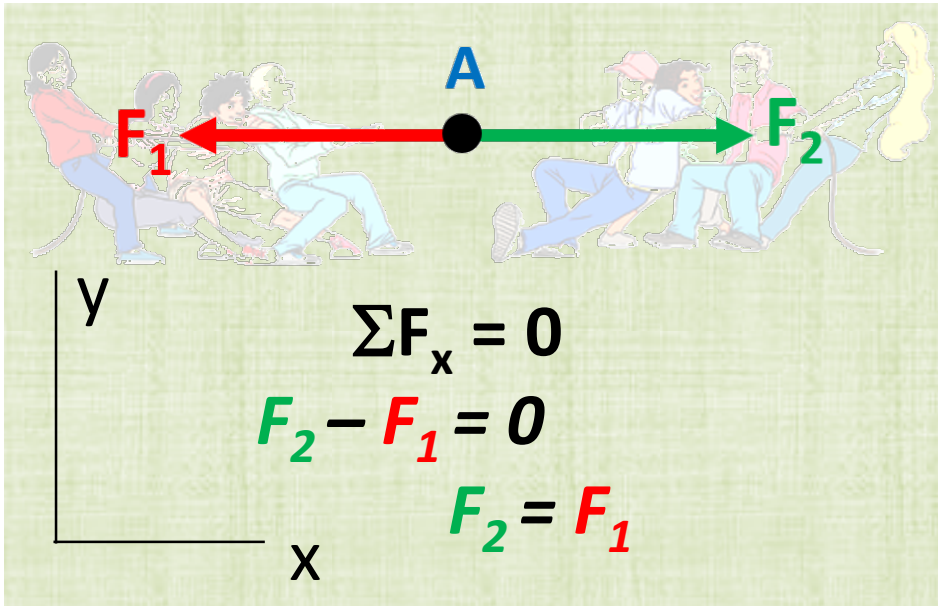
kesetimbangan partikel

- Bila **resultan semua gaya** yang bekerja pada suatu partikel adalah **nol**, maka partikel tersebut dalam keadaan **seimbang**

$$\sum F = 0$$

$$\sum F_x = 0$$

$$\sum F_y = 0$$

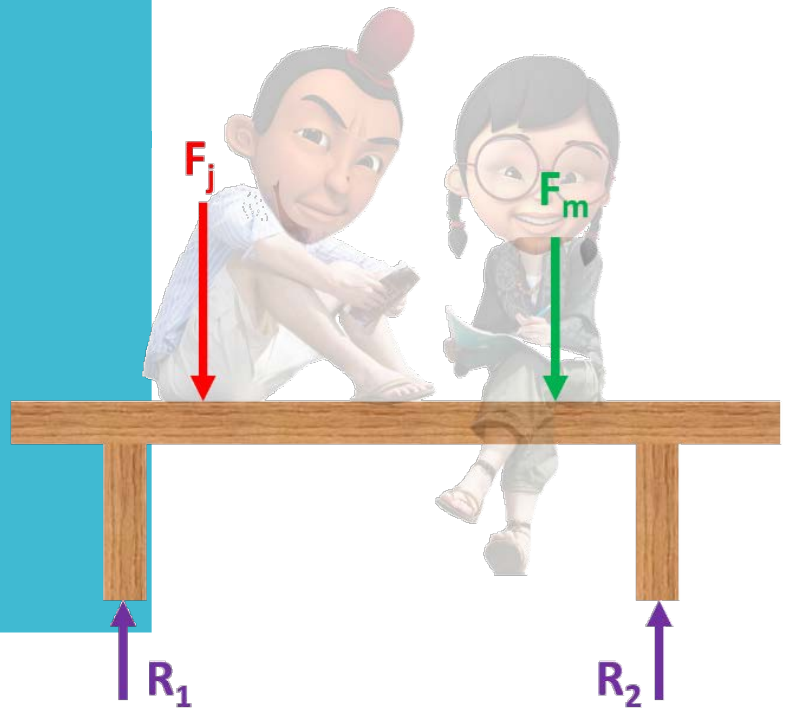


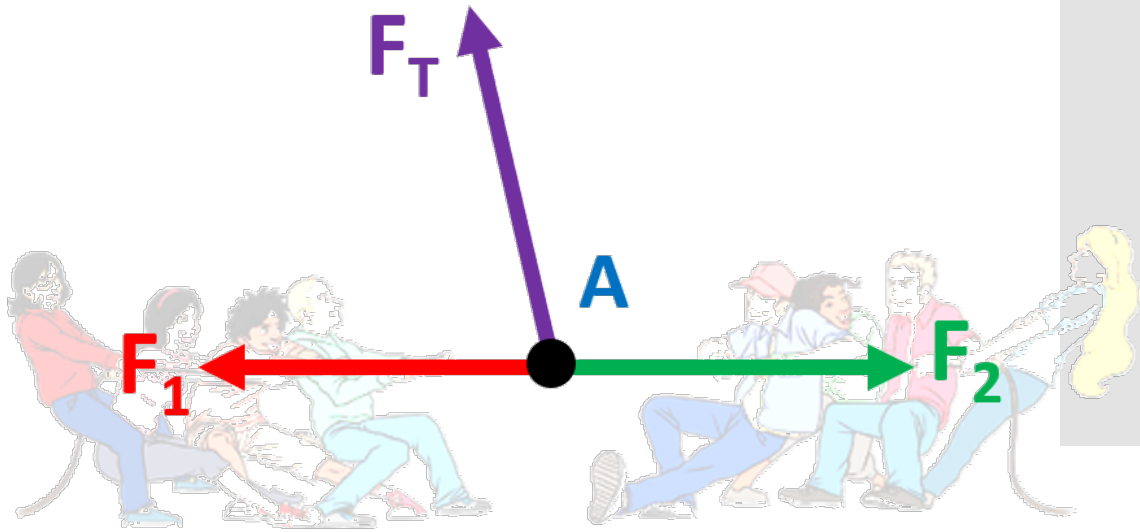
free body diagram (FBD)

DIAGRAM BENDA BEBAS

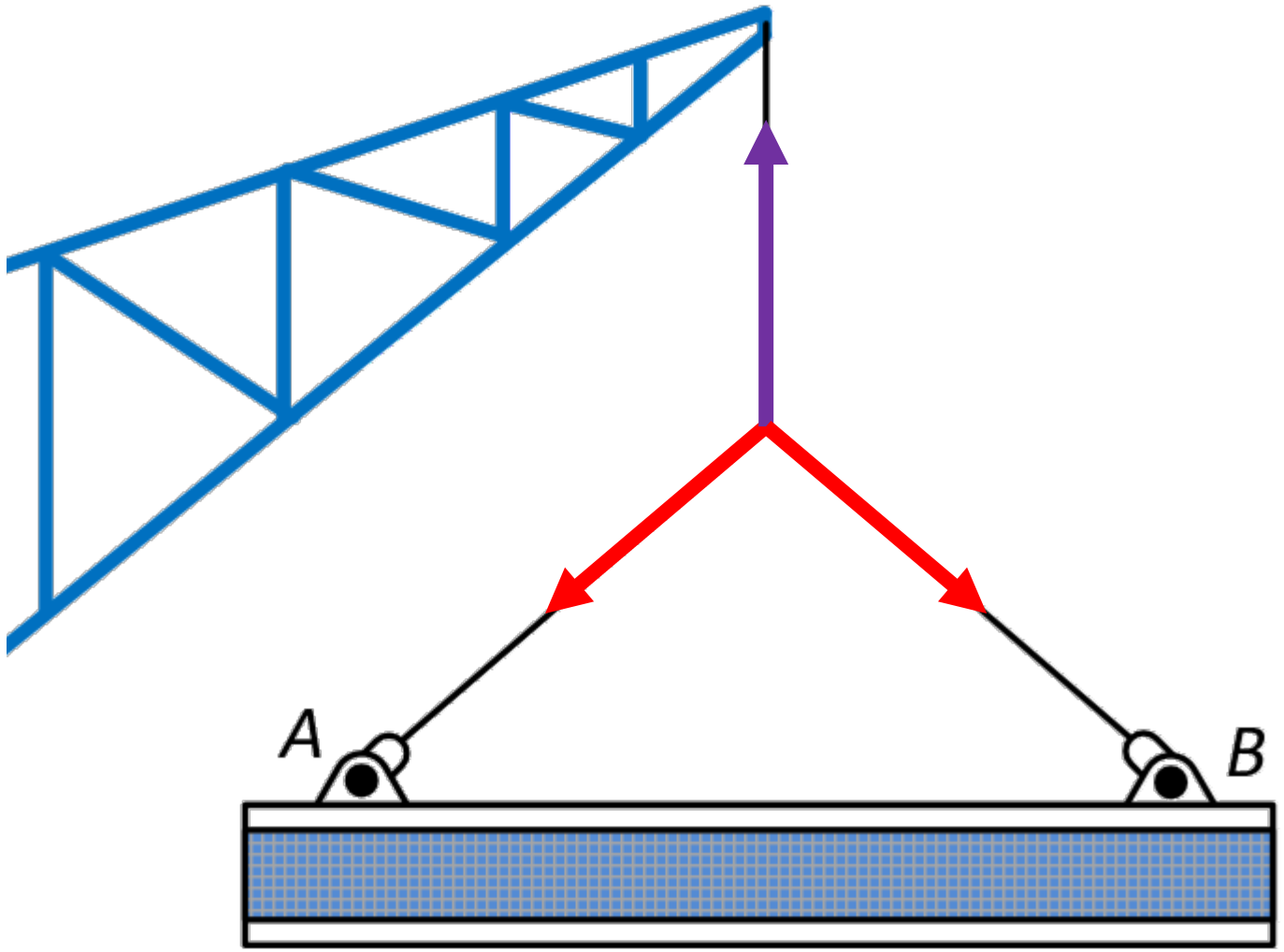
FBD

- Diagram yang menggambarkan posisi dan arah gaya serta momen yang bekerja pada sebuah partikel atau benda tegar
- FBD juga menggambarkan gaya reaksi yang muncul akibat adanya gaya aksi

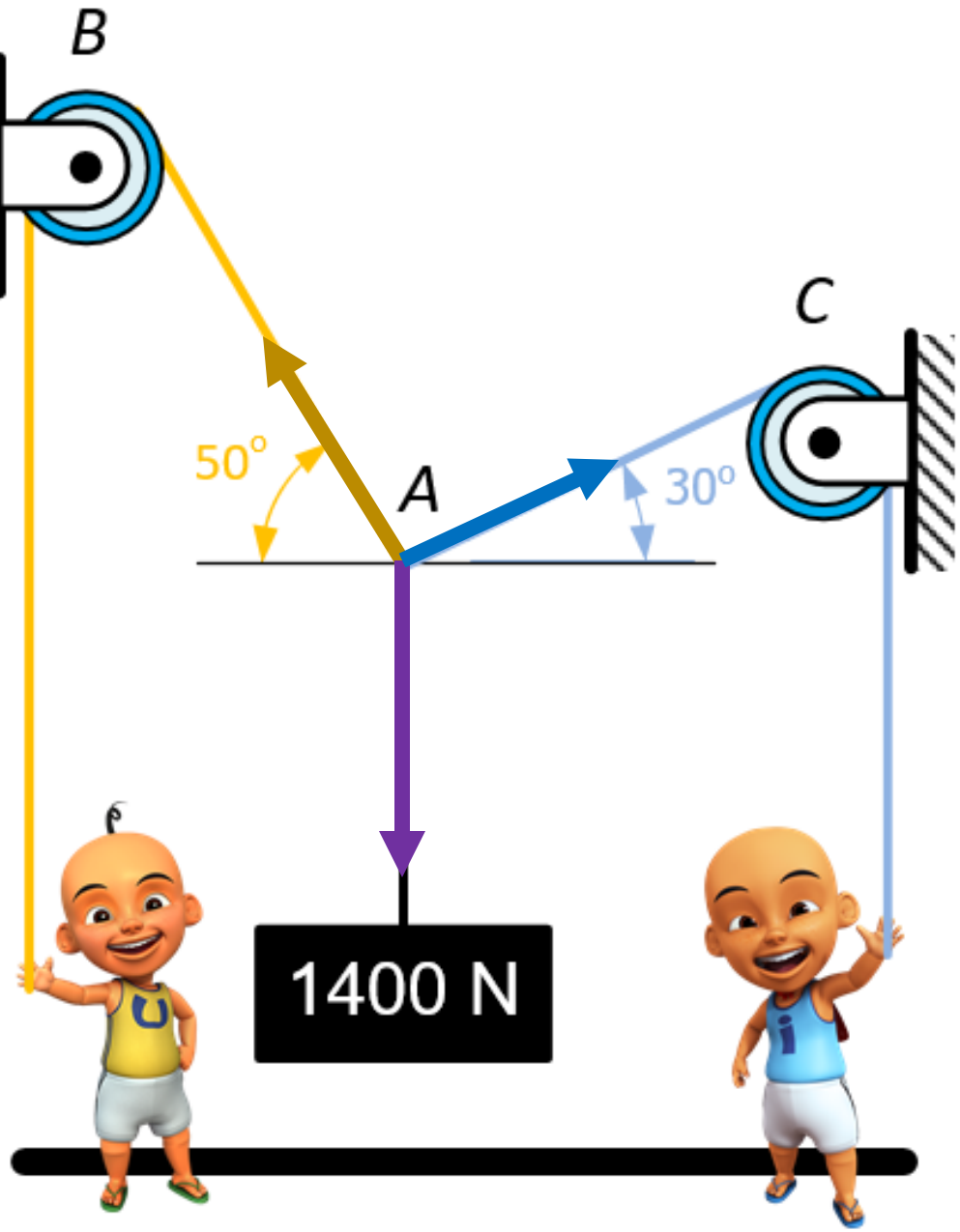




FBD



FBD

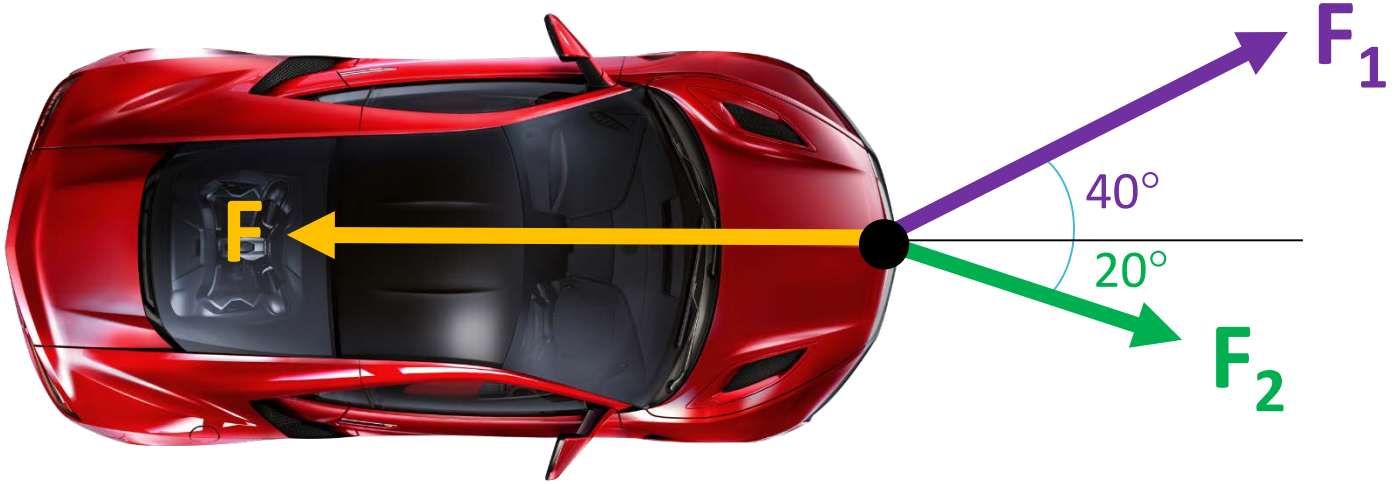


T_{AB}

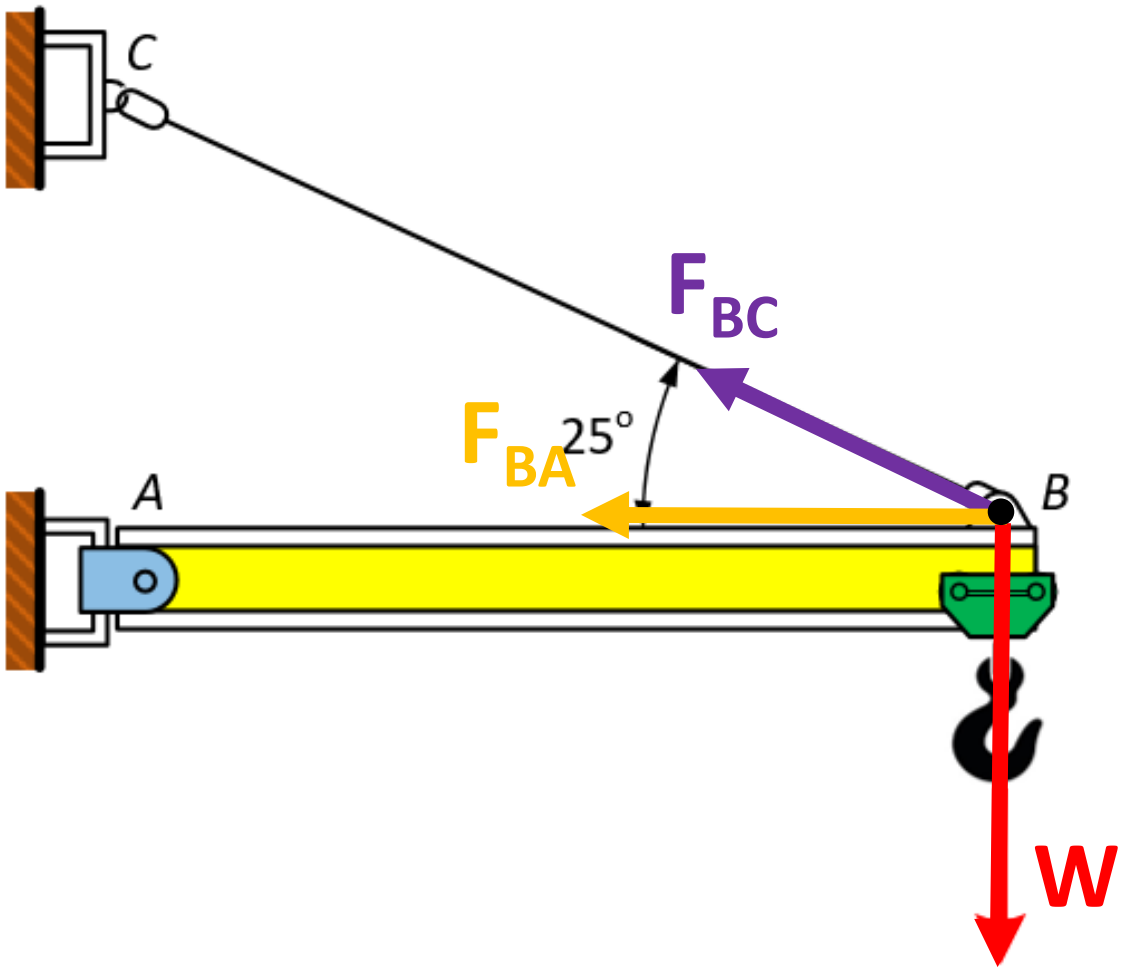
T_{AC}

1400 N

FBD

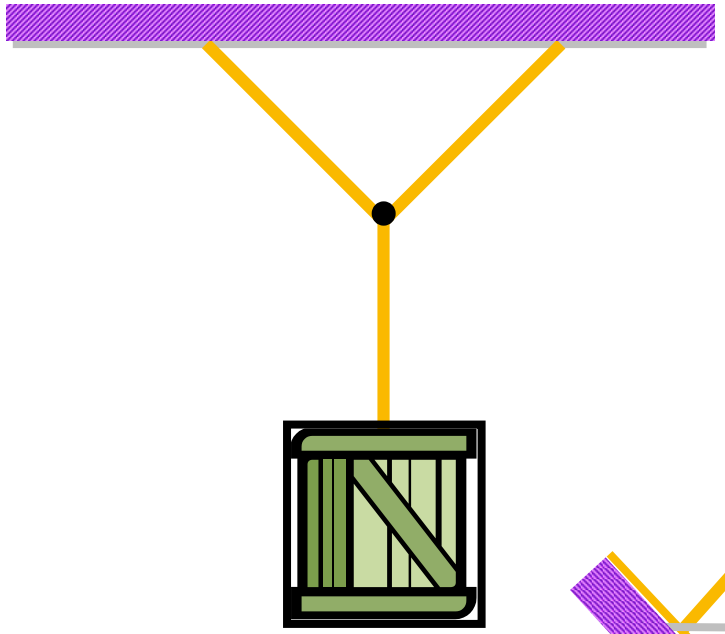


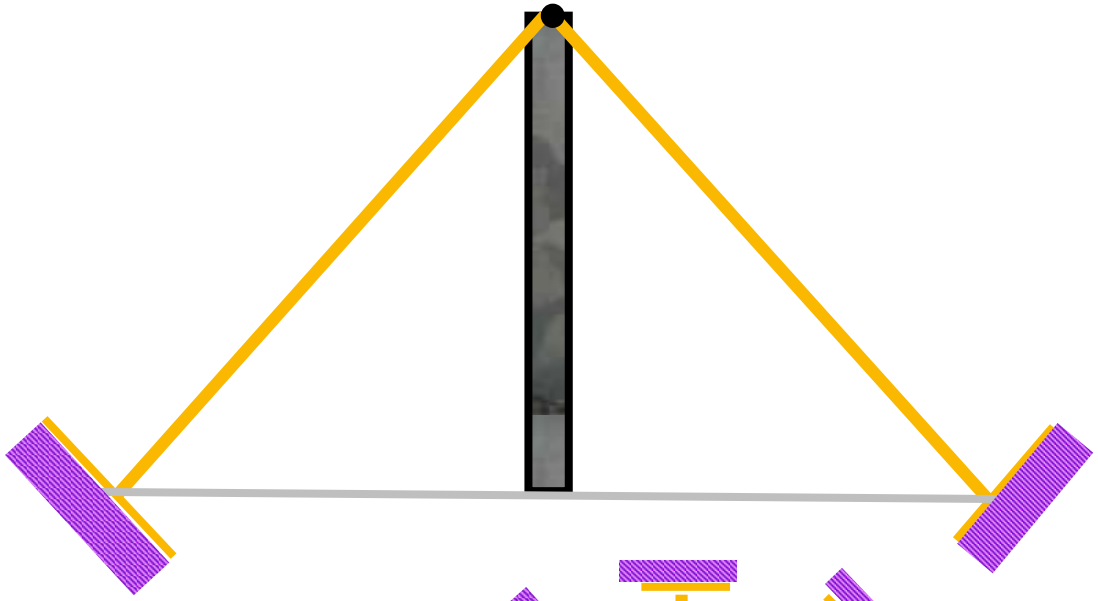
FBD

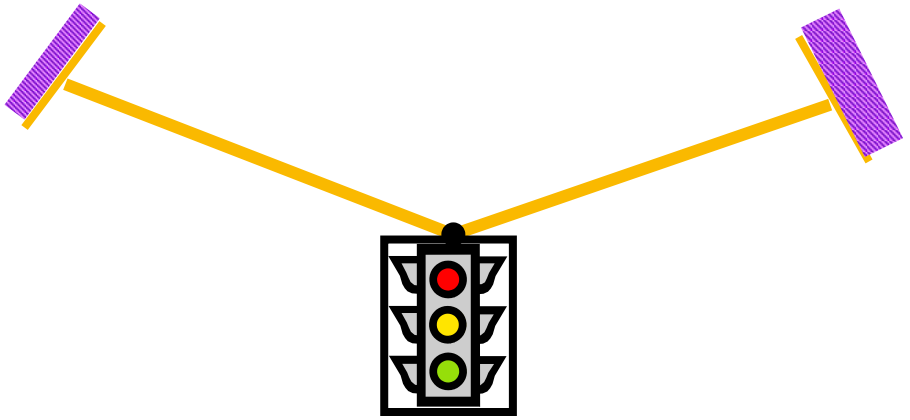


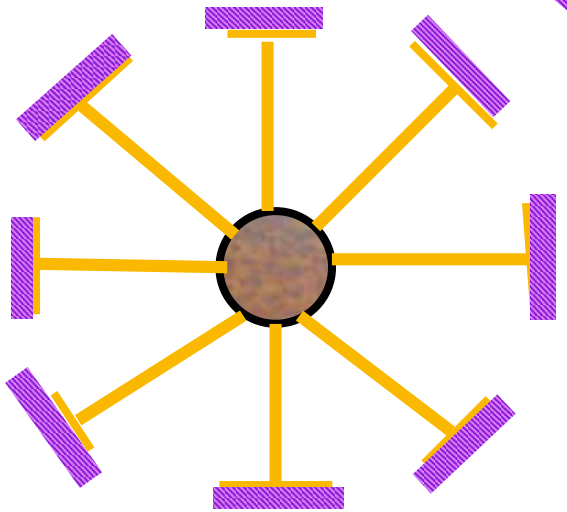
FBD

Draw the Free Body Diagrams

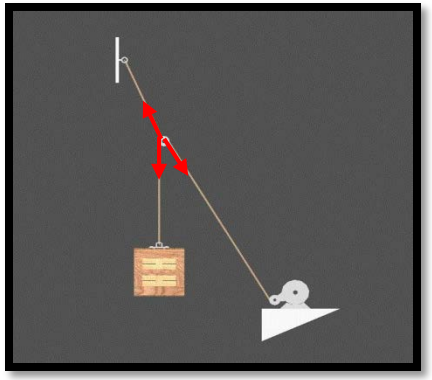


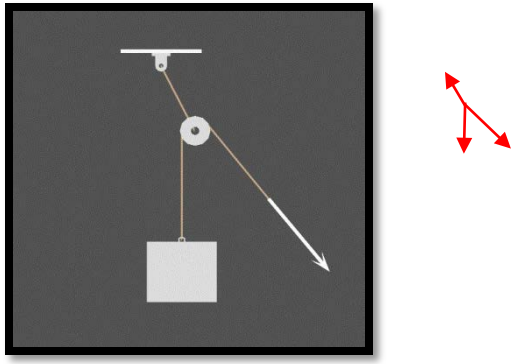


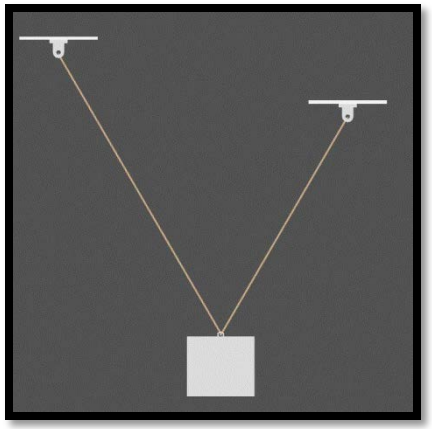


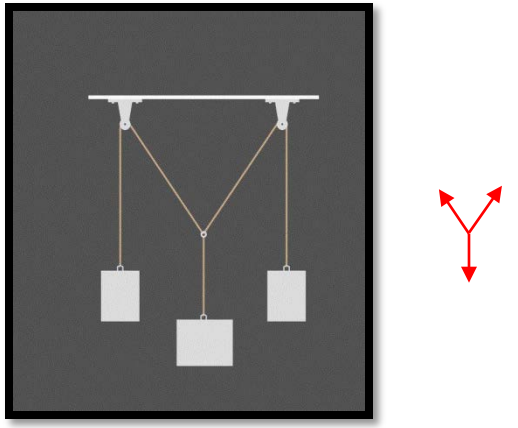


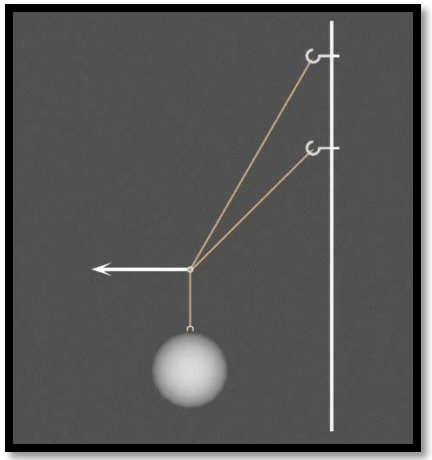
FBD

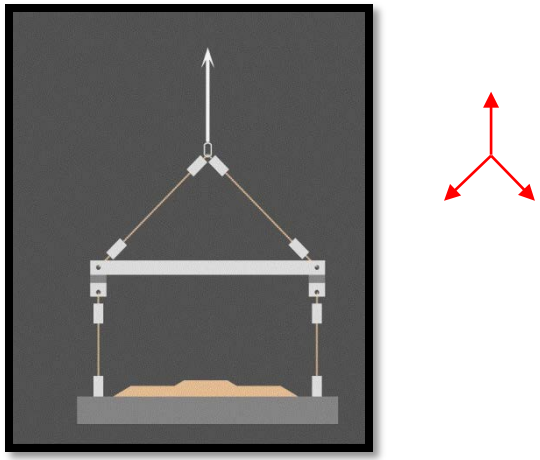




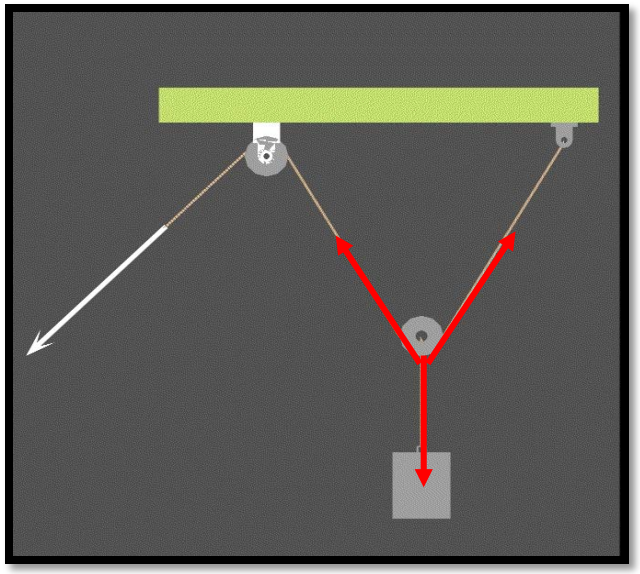


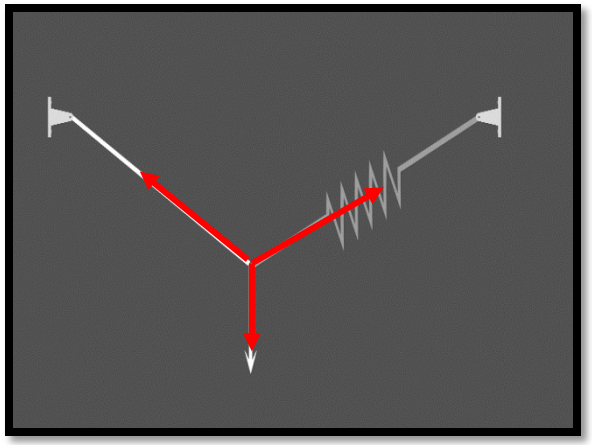






FBD

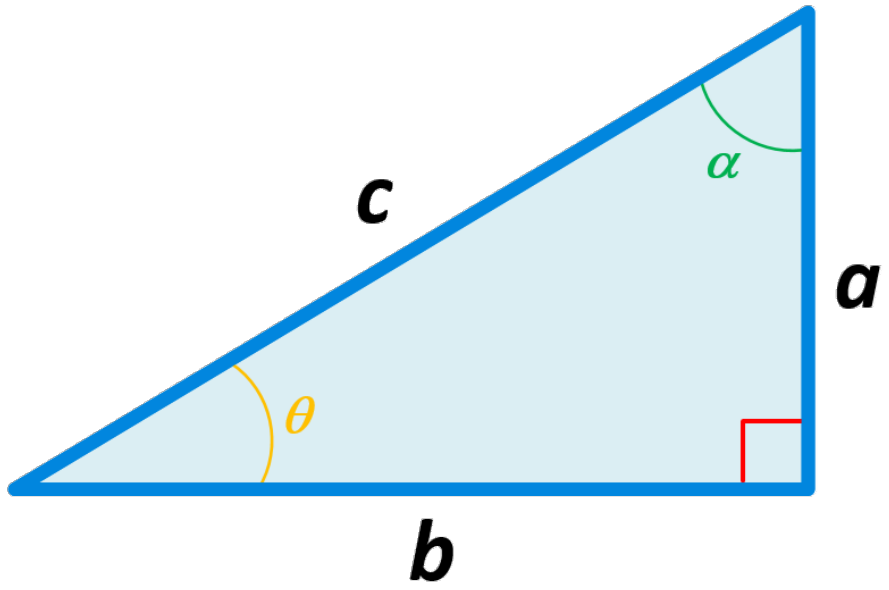




PENGURAIAN GAYA

DALAM KOMPONEN TEGAK LURUS

trigonometri



$$\sin\theta = \frac{a}{c}$$

$$\cos\theta = \frac{b}{c}$$

$$\tan\theta = \frac{a}{b}$$

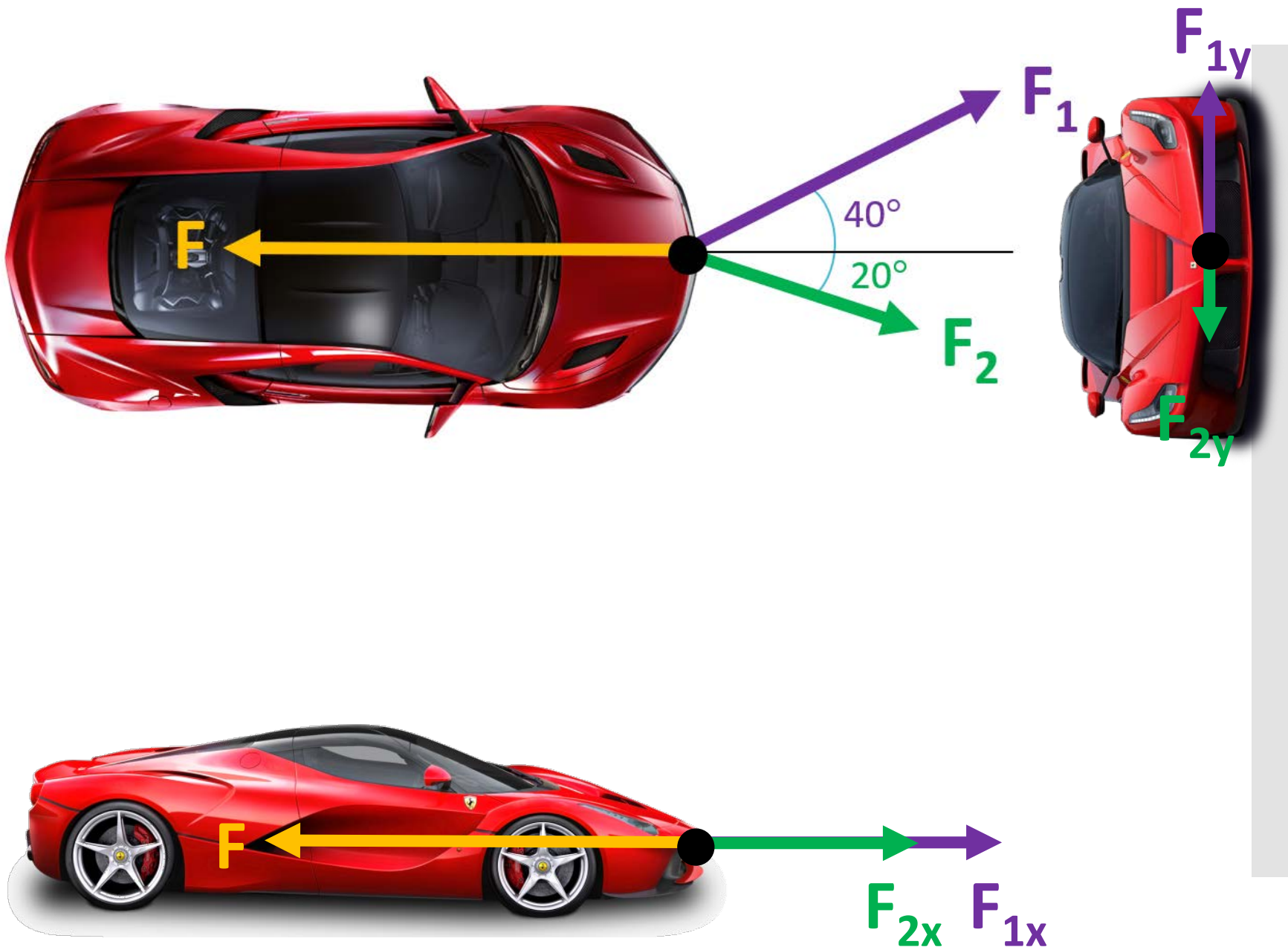
$$a^2 + b^2 = c^2$$

$$a = \sqrt{c^2 - b^2}$$

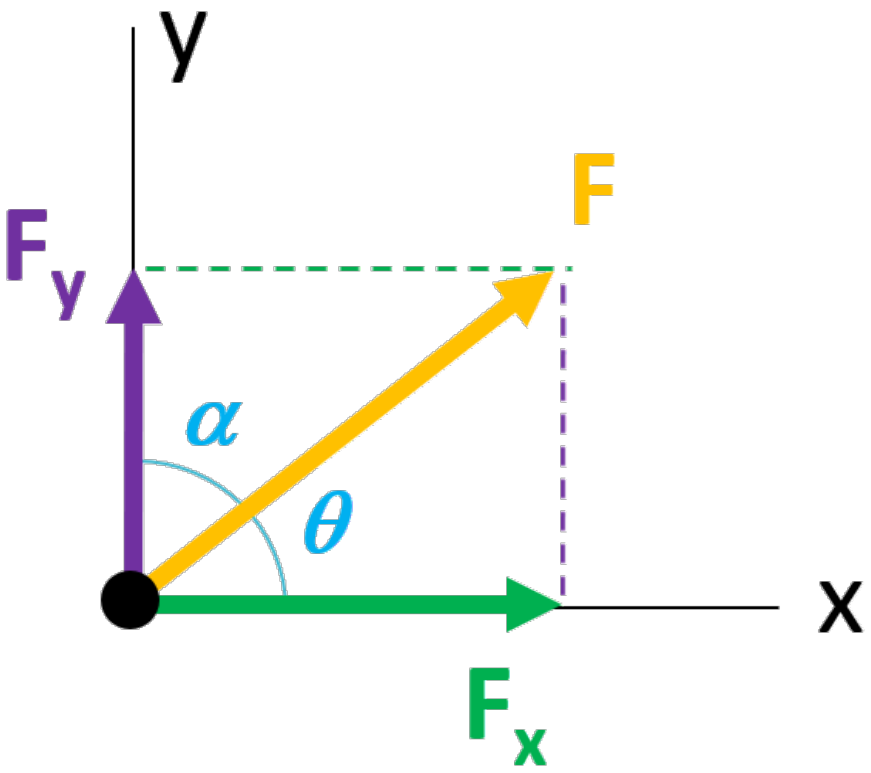
$$c = \sqrt{a^2 + b^2}$$

$$b = \sqrt{c^2 - a^2}$$

penguraian gaya



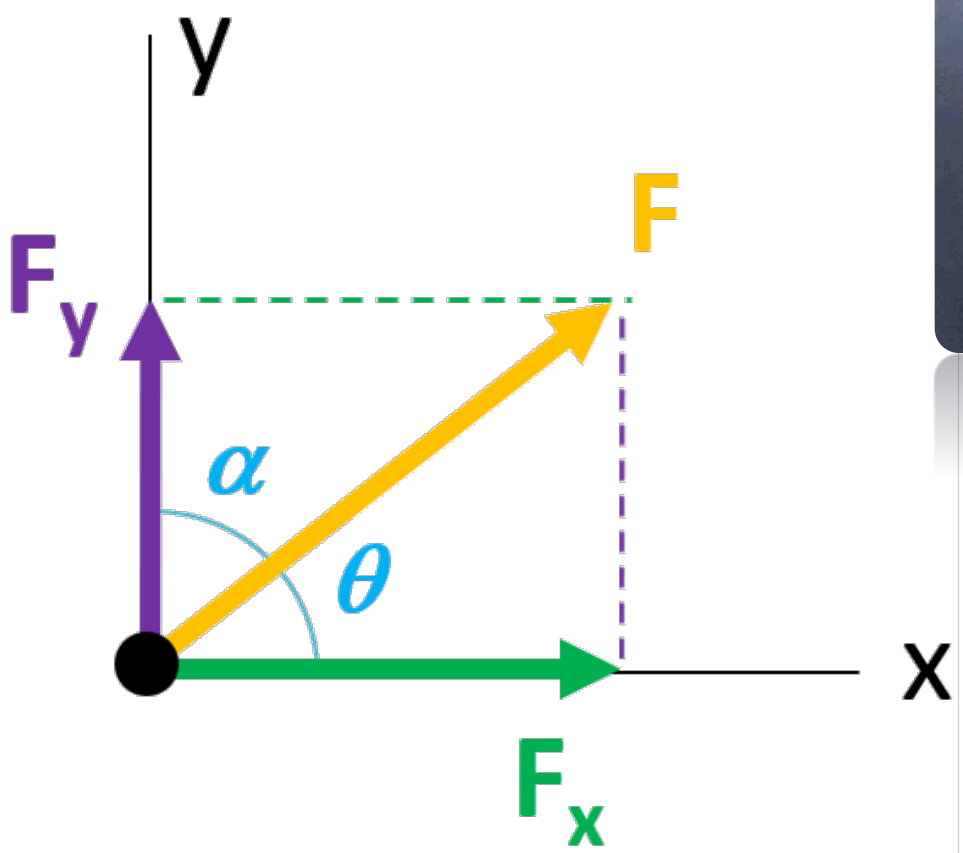
penguraian gaya



$$F_x = F \cdot \cos\theta$$
$$F_y = F \cdot \sin\theta$$

$$\tan\theta = \frac{F_y}{F_x}$$

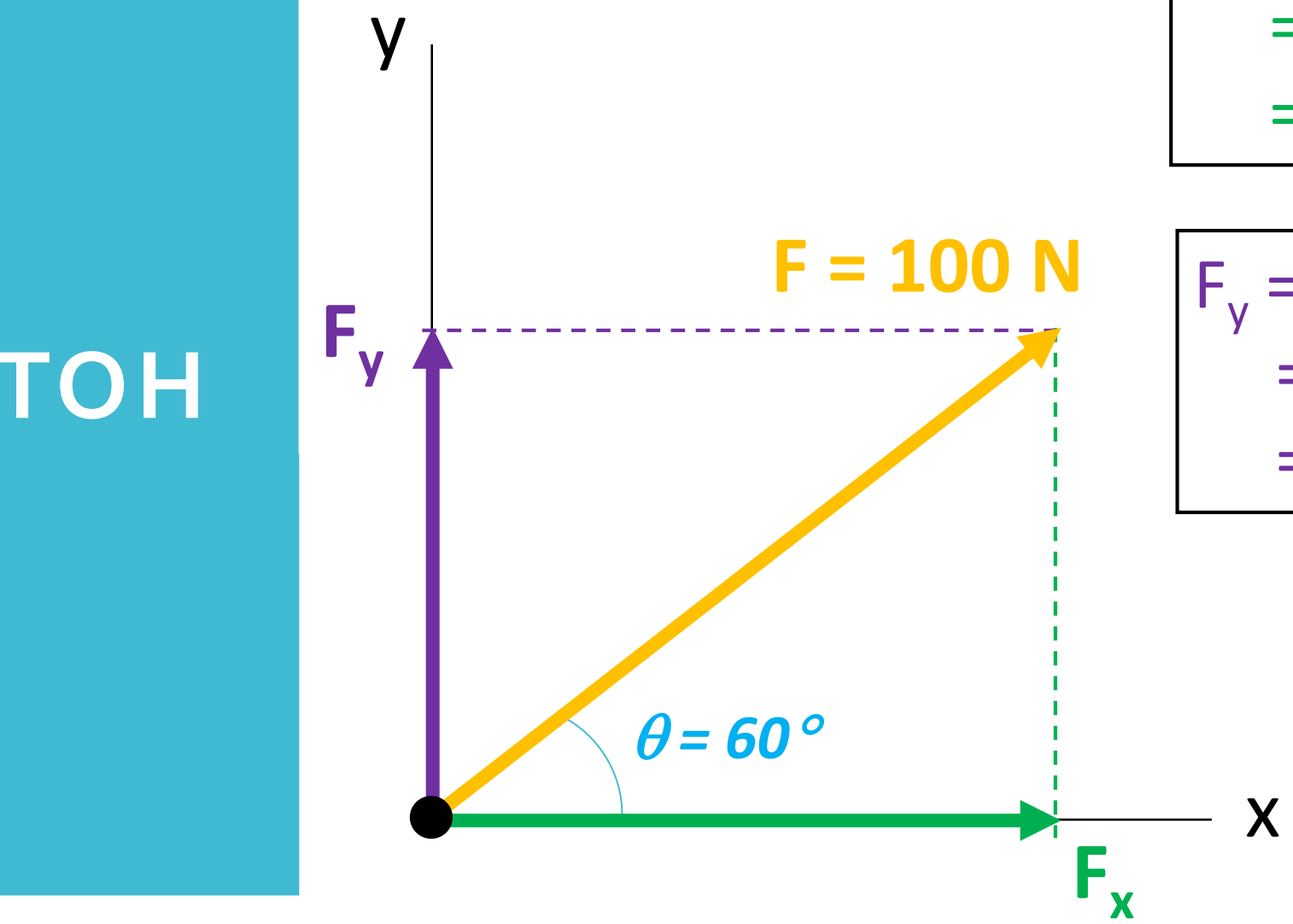
penguraian gaya



$$F_x = F \cdot \cos\theta$$
$$F_y = F \cdot \sin\theta$$

$$\tan\theta = \frac{F_y}{F_x}$$

CONTOH

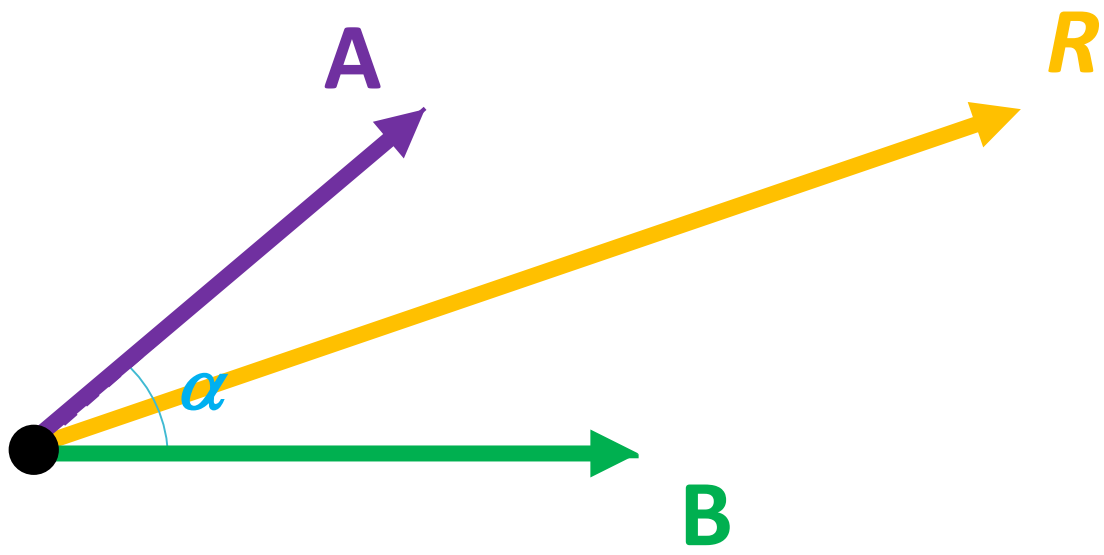


$F_x = F \cdot \cos \theta$
$= 100 \cdot \text{Cos } 60°$
$= 50 \text{ N}$

$F_y = F \cdot \sin \theta$
$= 100 \cdot \text{Sin } 60°$
$= 86{,}6 \text{ N}$

resultan gaya

- Resultan gaya jika sudut antara 2 gaya (vektor) tidak siku-siku (tegak lurus)



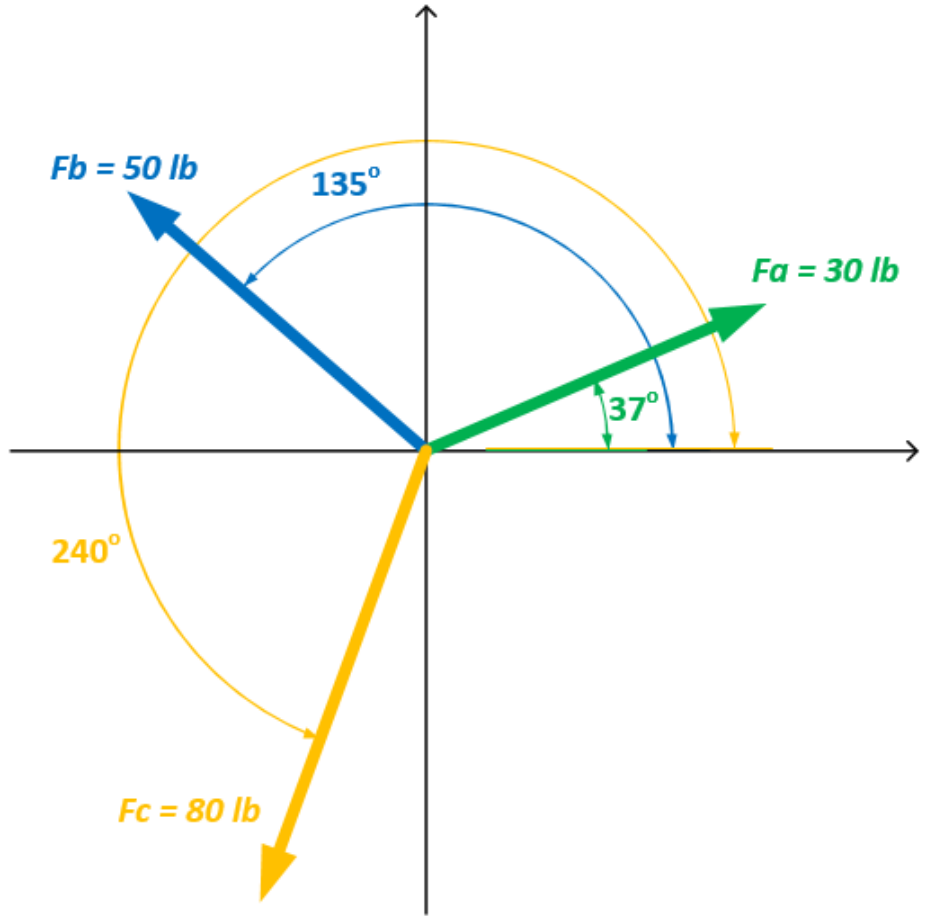
$$R = \sqrt{A^2 + B^2 + 2.A.B.\cos\alpha}$$

LATIHAN & SOAL

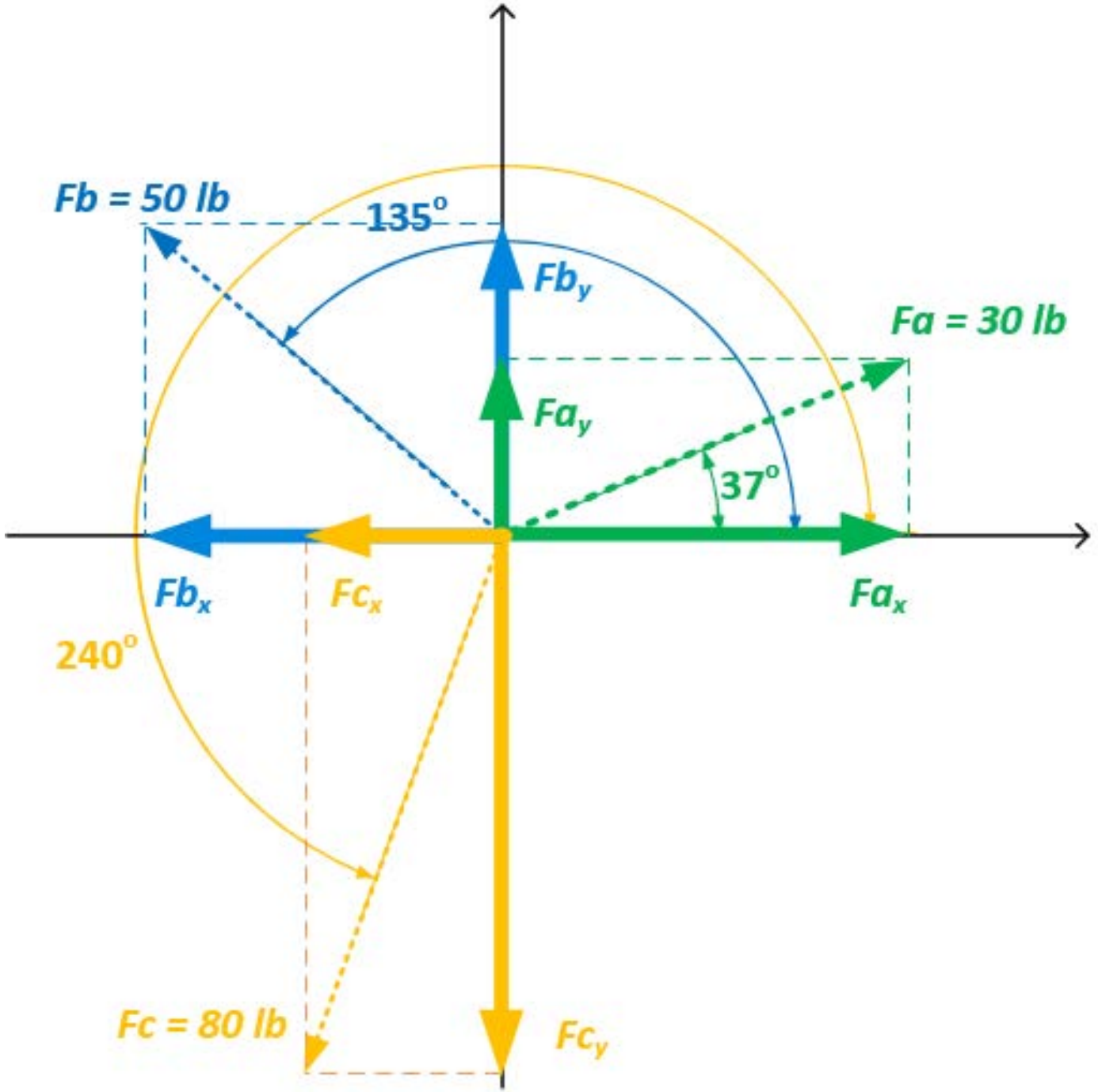
KESETIMBANGAN PARTIKEL

LATIHAN 1

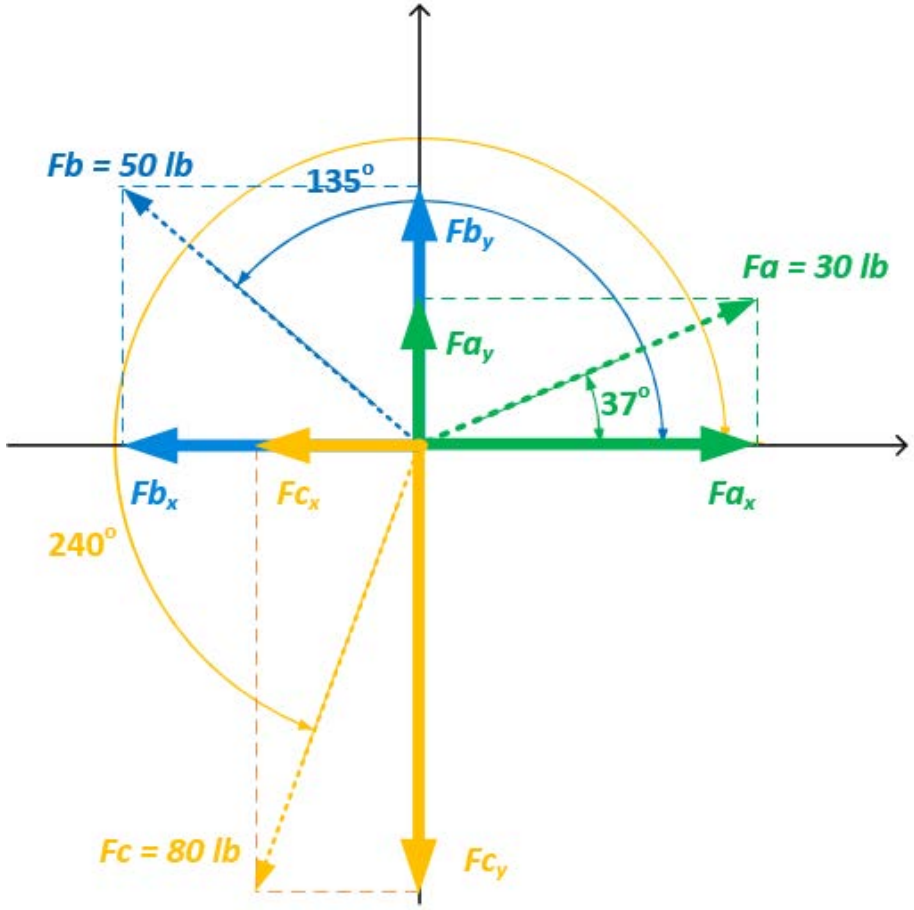
- Uraikan gaya-gaya berikut ini pada sumbu *x* – *y*, serta hitunglah besar masing-masing gaya tersebut
- Hitung besar Resultan gaya beserta arahnya.



LATIHAN 1



LATIHAN 1



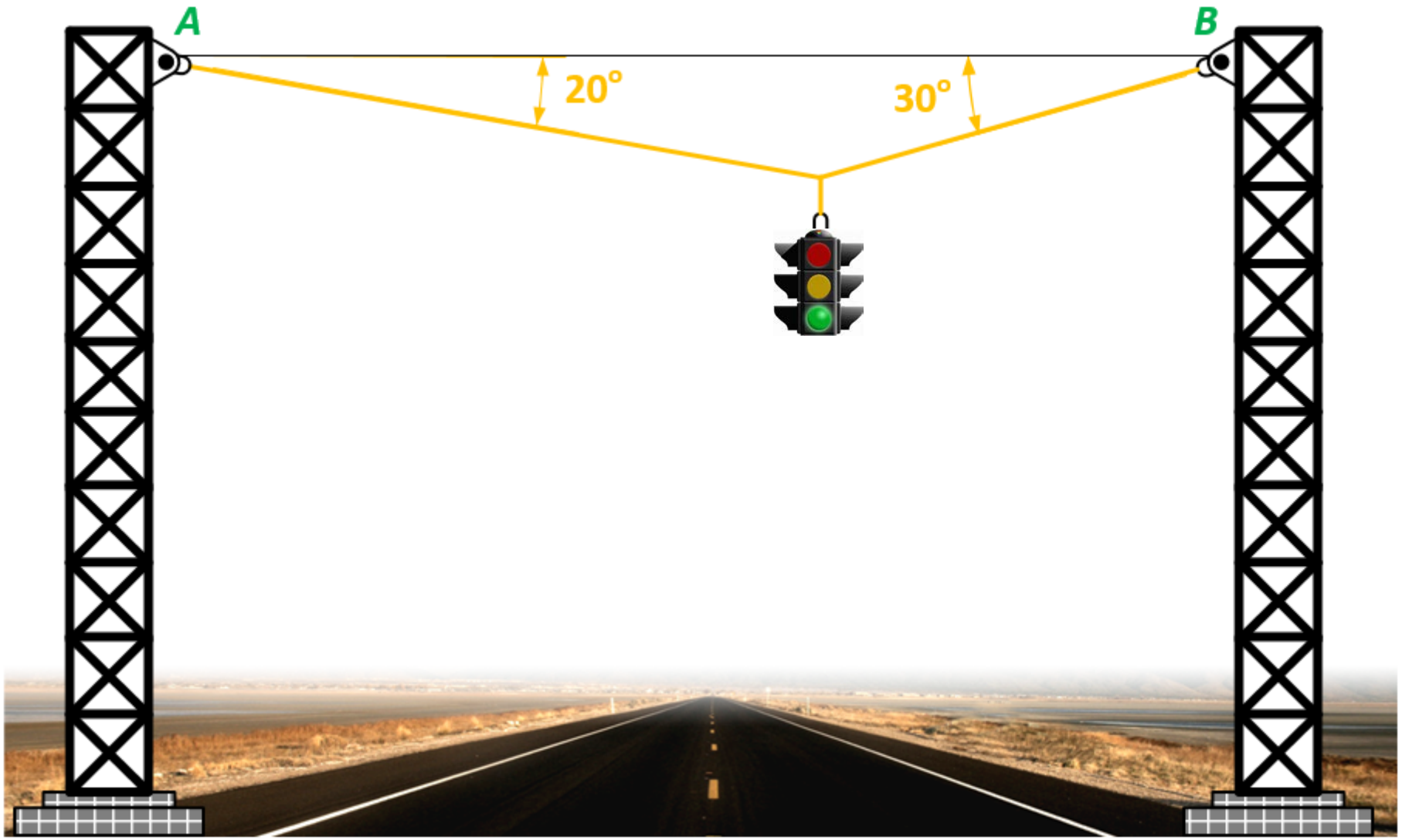
Fax = Fa . cos 37°
= 23,96 lb
Fay = Fa . sin 37°
= 18,05 lb

Fbx = Fb . cos 45°
= 35,36 lb
Fby = Fb . sin 45°
= 35,36 lb

Fcx = Fc . cos 60°
= 40 lb
Fcy = Fc . sin 60°
= 69,28 lb

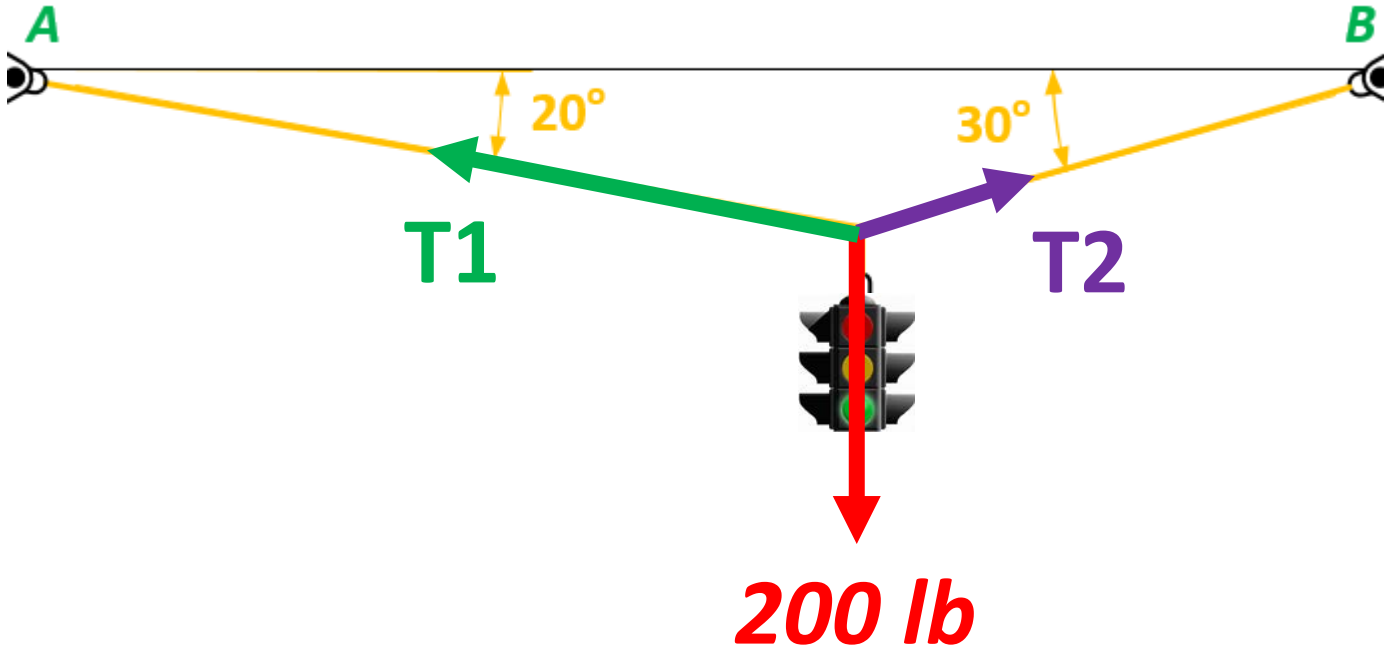
LATIHAN 2

- Sebuah *traffic light* dengan berat 200 lb ditumpu oleh dua buah kabel baja. Hitunglah tegangan pada dua kabel baja tersebut.



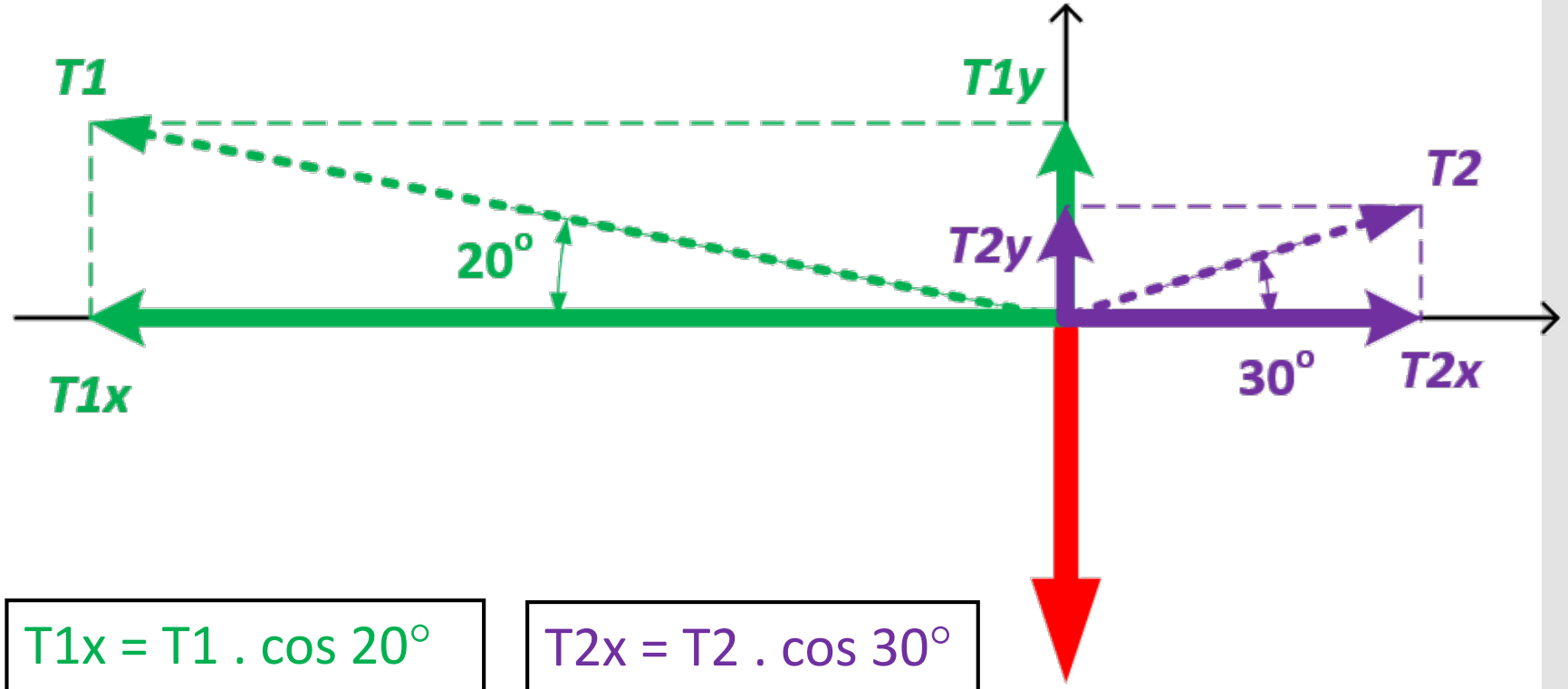
LATIHAN 2

1. Membuat Free Body Diagram (FBD)



LATIHAN 2

2. Menguraikan gaya-gaya ke arah sumbu *X* dan *Y*



T1x = T1 . cos 20°
= T1 . 0,9396
T1y = T1 . sin 20°
= T1 . 0,342

T2x = T2 . cos 30°
= T2 . 0,866
T2y = T2 . sin 30°
= T2 . 0,5

LATIHAN 2

3. Menghitung gaya-gaya menggunakan prinsip kesetimbangan partikel

$\Sigma F_x = 0$; pemisalan arah: → (+)

$T2x - T1x = 0$

$T2x = T1x$

$T2 \cdot 0{,}866 = T1 \cdot 0{,}9396$

$T2 = 1{,}085.T1$ → (1)

$\Sigma F_y = 0$; pemisalan arah: ↓ (+)

$200 - T1y - T2y = 0$

$T1y + T2y = 200$

$T1 \cdot 0{,}342 + T2 \cdot 0{,}5 = 200$ → (2)

SUBSTITUSI persamaan 1 ke dalam persamaan 2

LATIHAN 2

3. Menghitung gaya-gaya menggunakan prinsip kesetimbangan partikel (lanjutan)

$T1 \cdot 0{,}342 + (1{,}085 \cdot T1) \cdot 0{,}5 = 200$

$0{,}8845 \cdot T_1 = 200$

$\mathbf{T_1 = 226{,}12\ lb}$

Dari persamaan 1 didapatkan:

$T2 = 1{,}085 \cdot T1$

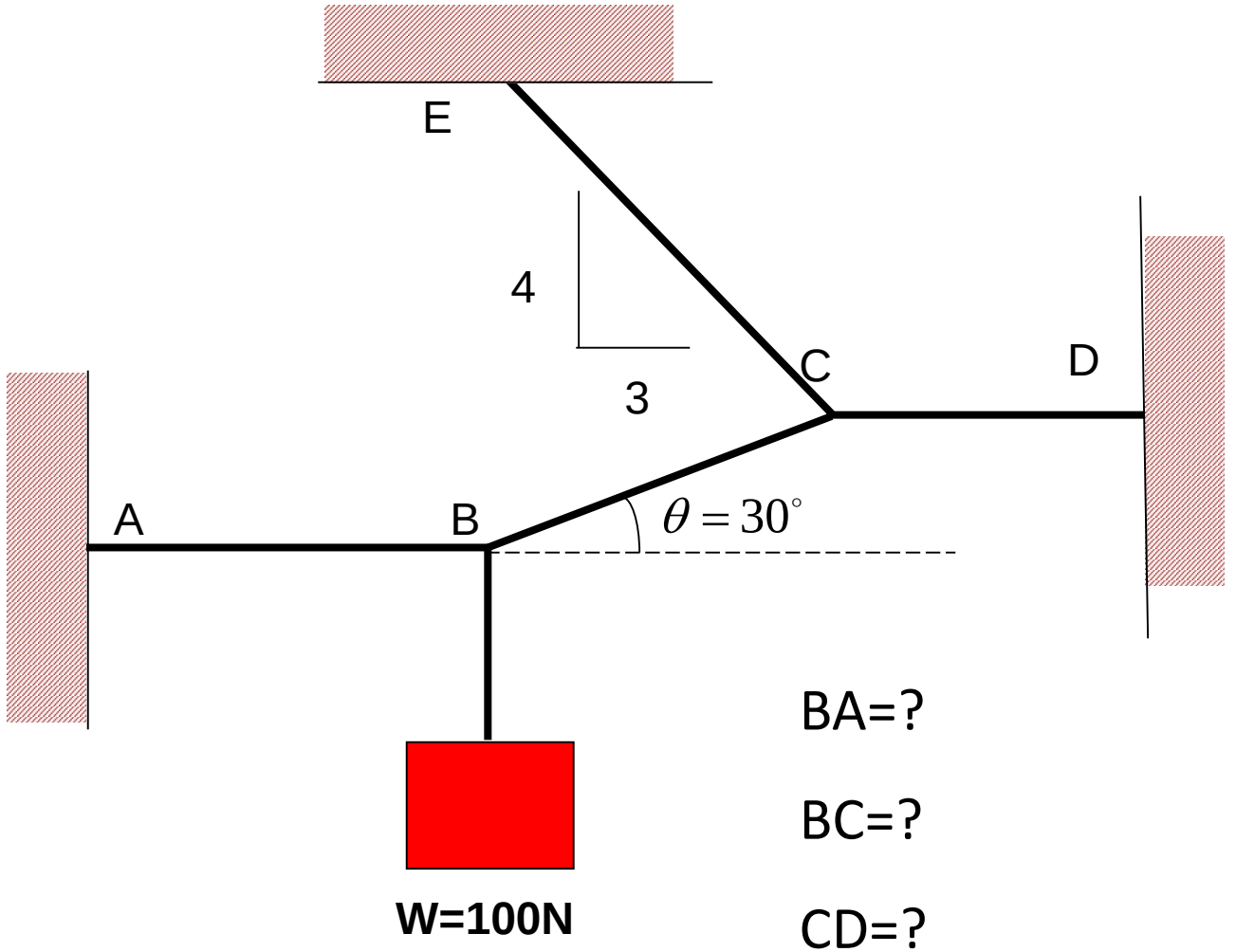
$= 1{,}085 \cdot 226{,}12$

T2 = 245,34 lb

Tegangan Kabel A (T1) = 226,12 lb

Tegangan Kabel B (T2) = 245,34 lb

LATIHAN 3



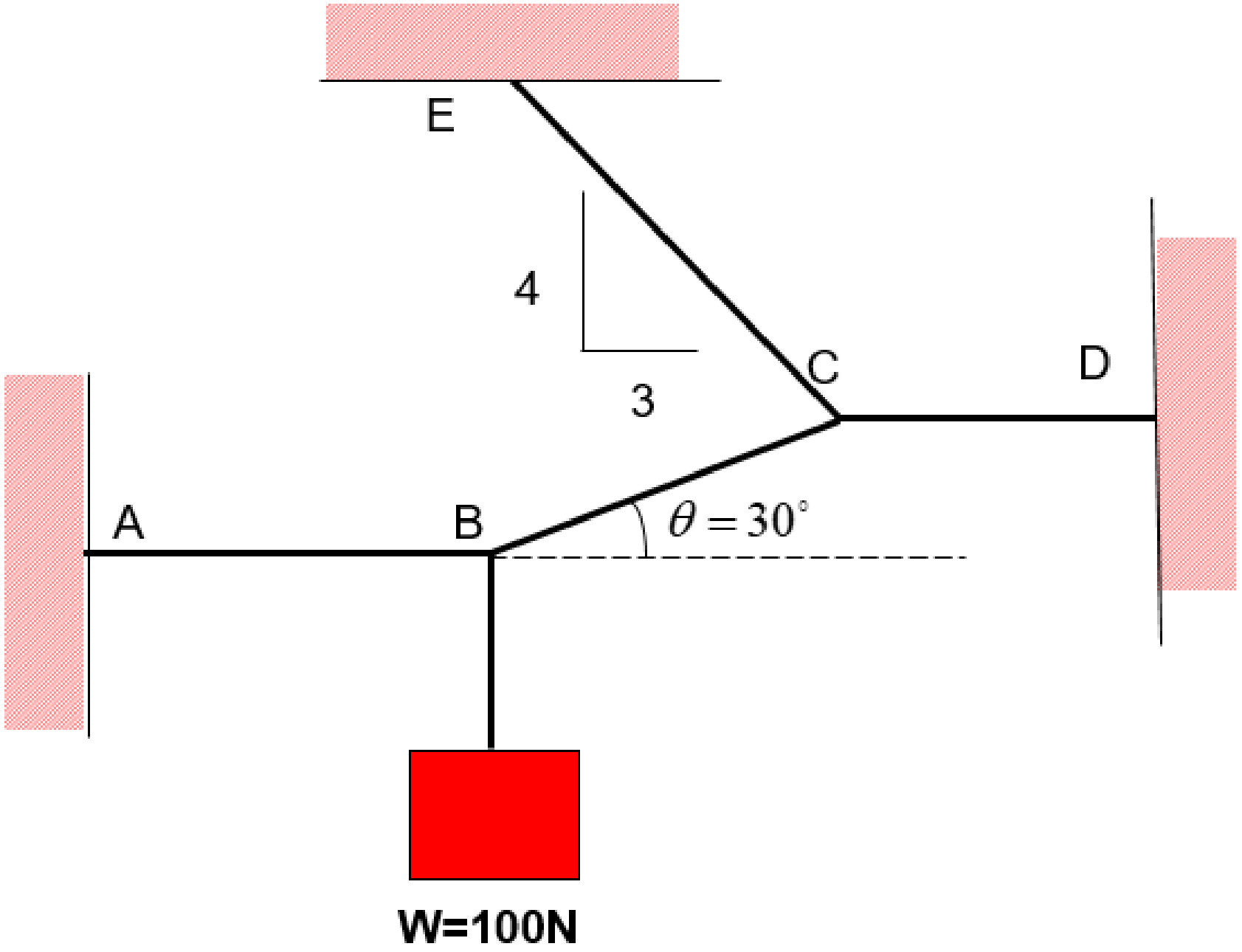
BA=?

BC=?

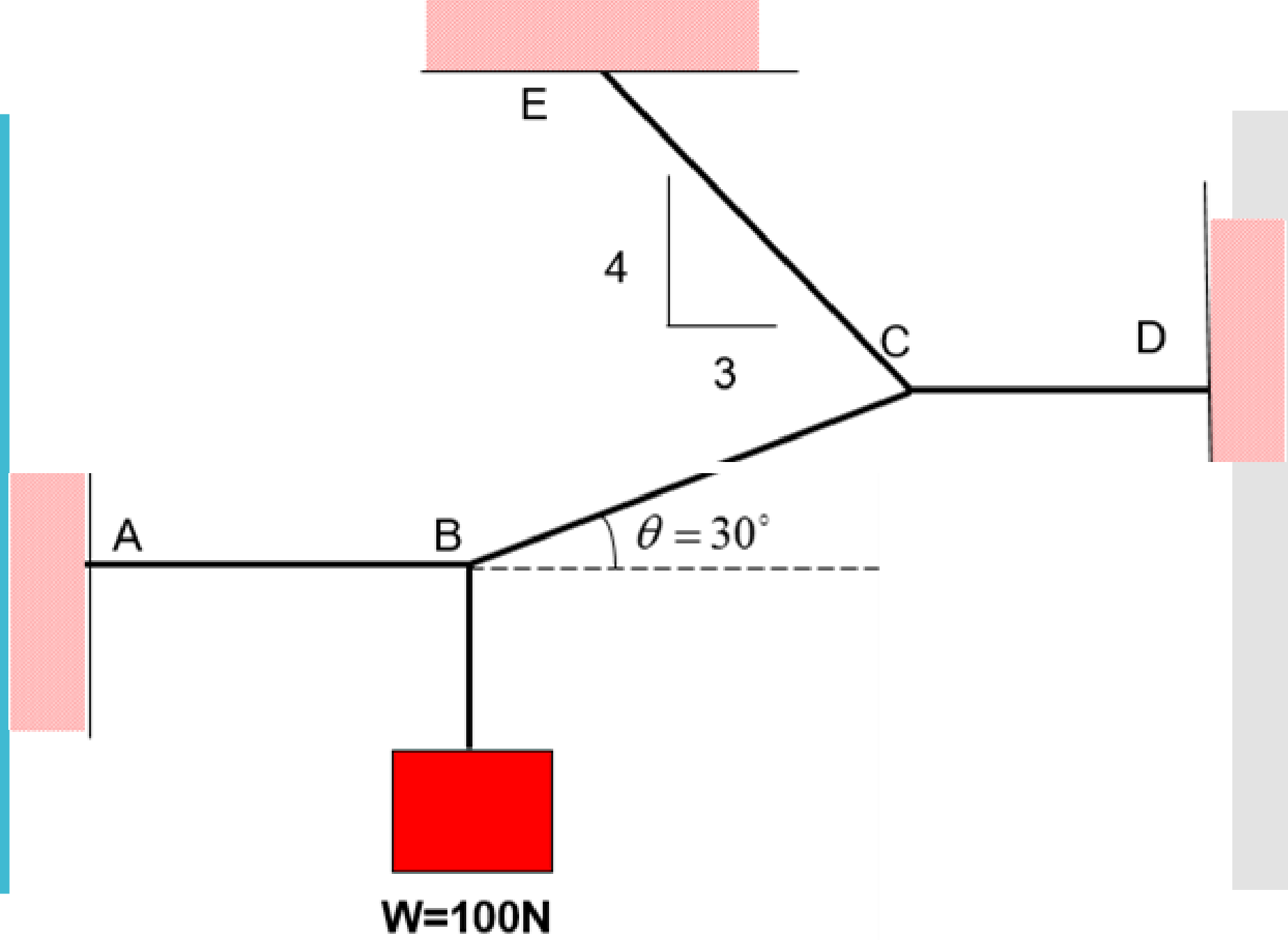
CD=?

CE=?

LATIHAN 3

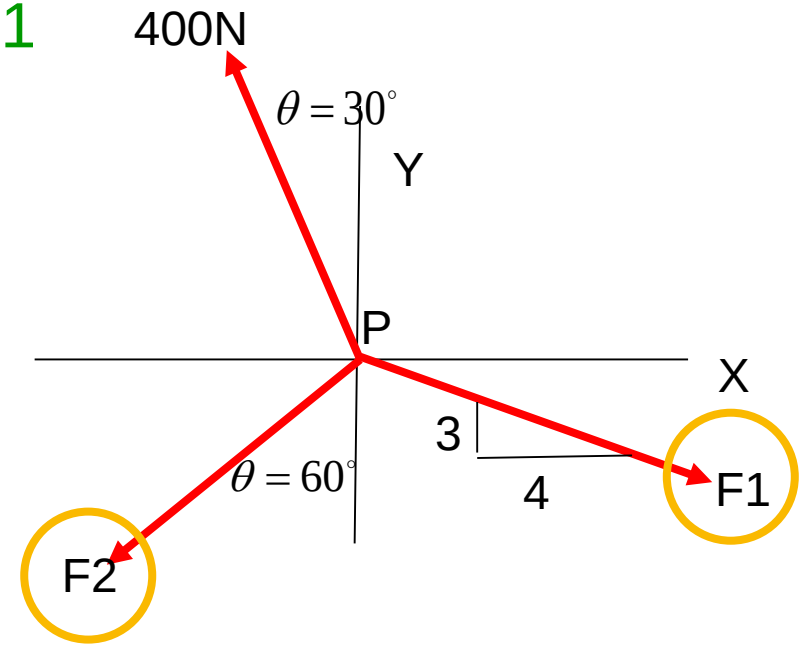


LATIHAN 3



LATIHAN 4

1



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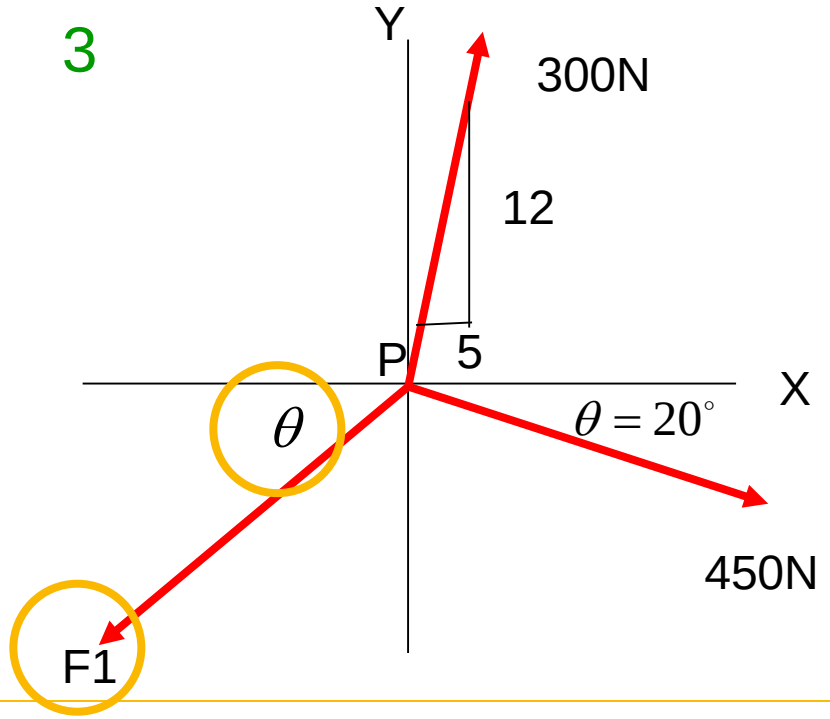

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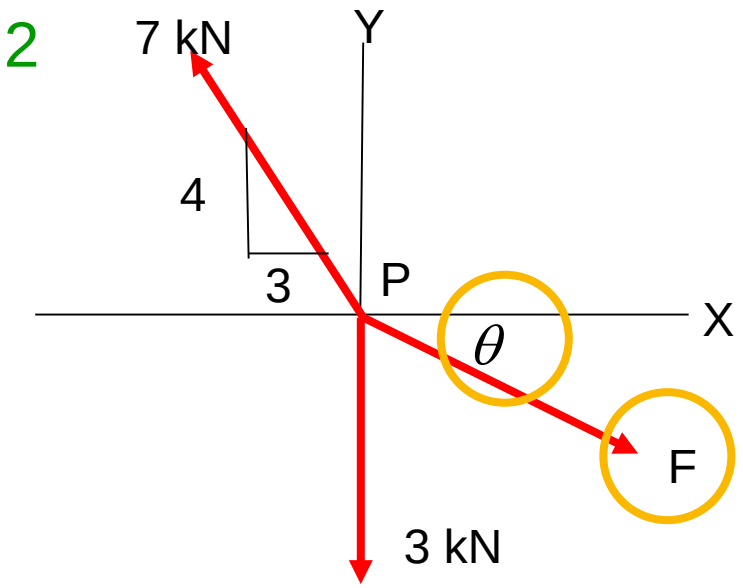

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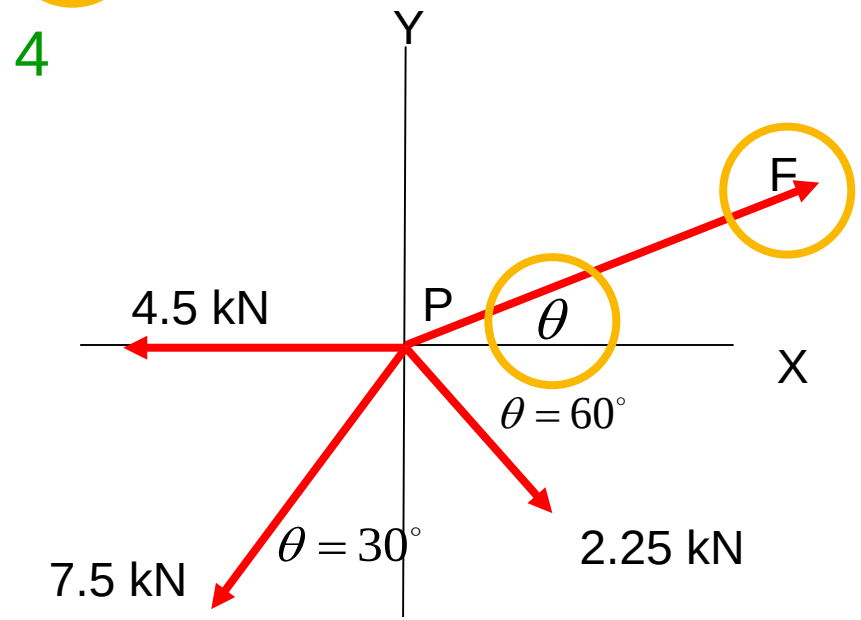
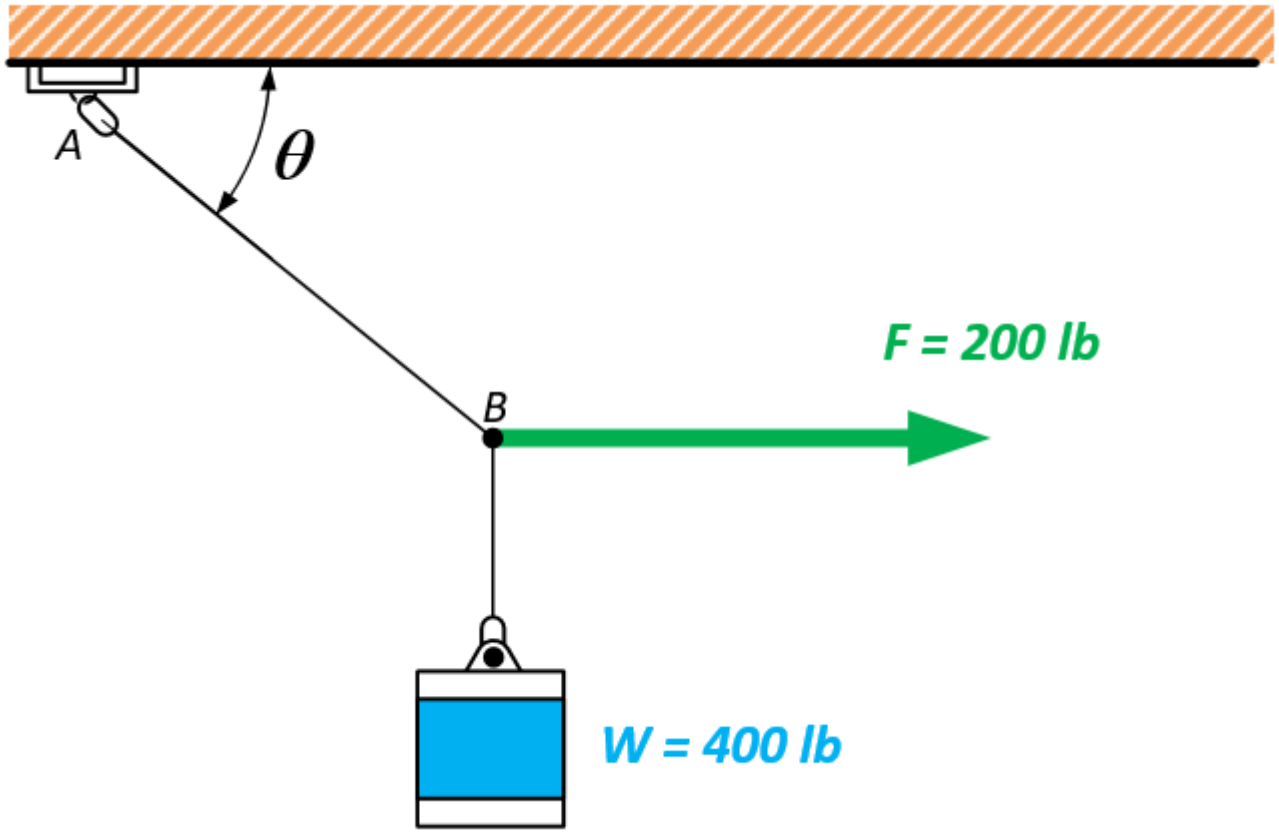
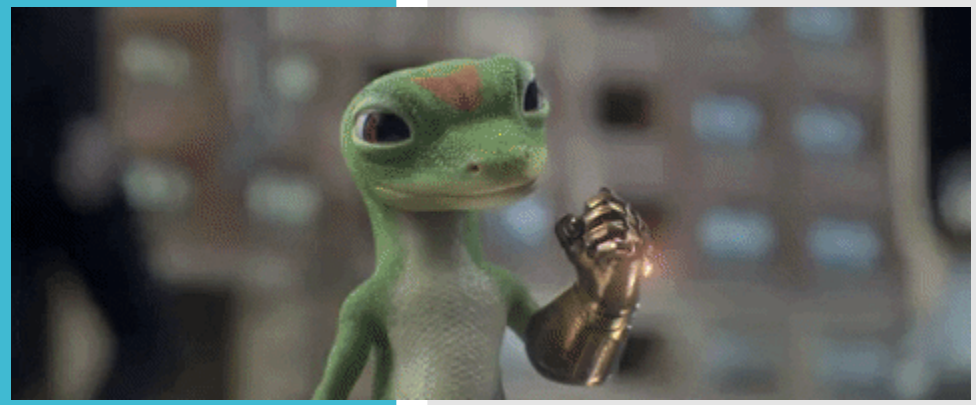


LATIHAN 5

- Berapakah besar sudut θ pada sistem kesetimbangan partikel berikut ini?





THANK YOU

END OF CHAPTER 2

MECHANICAL & MANUFACTURING ENGINEERING UBAYA