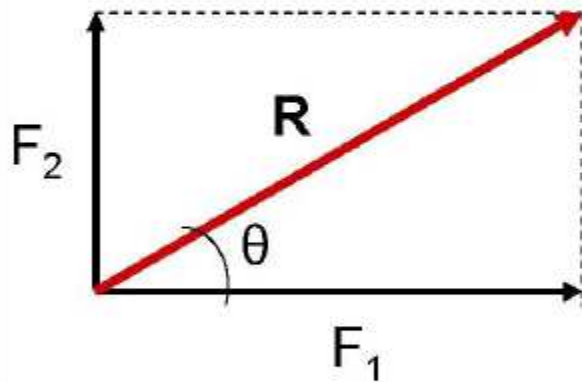


RESULTAN GAYA

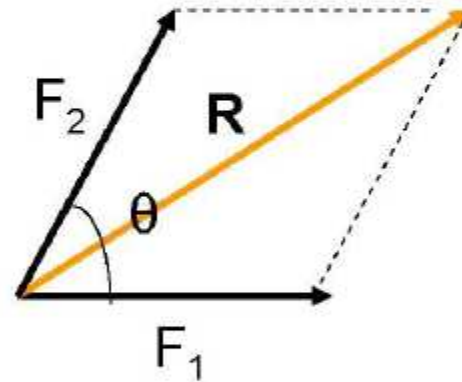
Mencari resultan gaya-gaya:

Cara aljabar



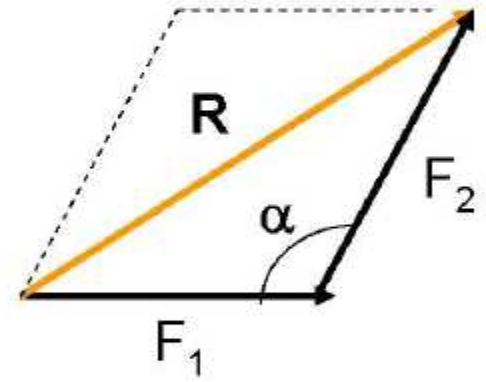
$$R = \sqrt{F_1^2 + F_2^2}$$

$$\tan \theta = F_2 / F_1$$



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

$$R = \sqrt{F_1^2 + F_2^2 - 2F_1F_2 \cos \alpha}$$

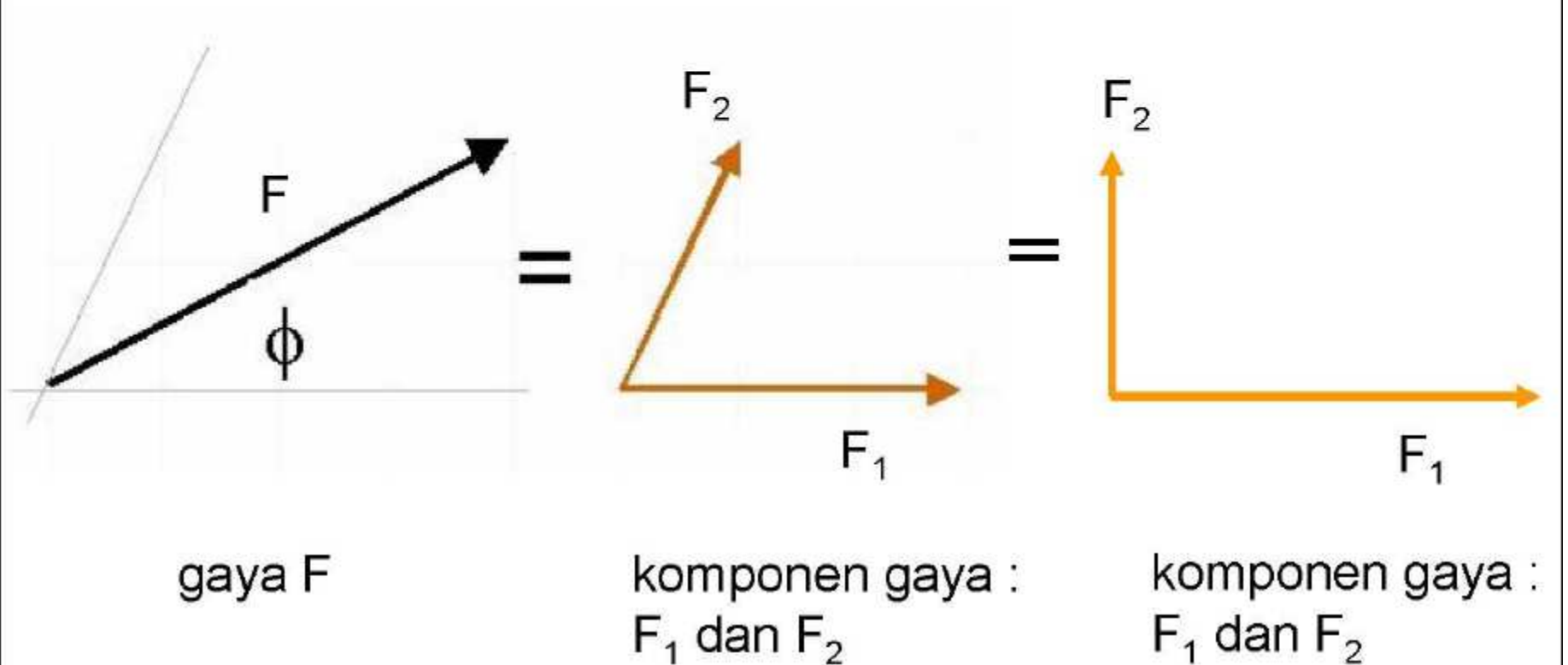


KOMPONEN GAYA

Komponen Gaya

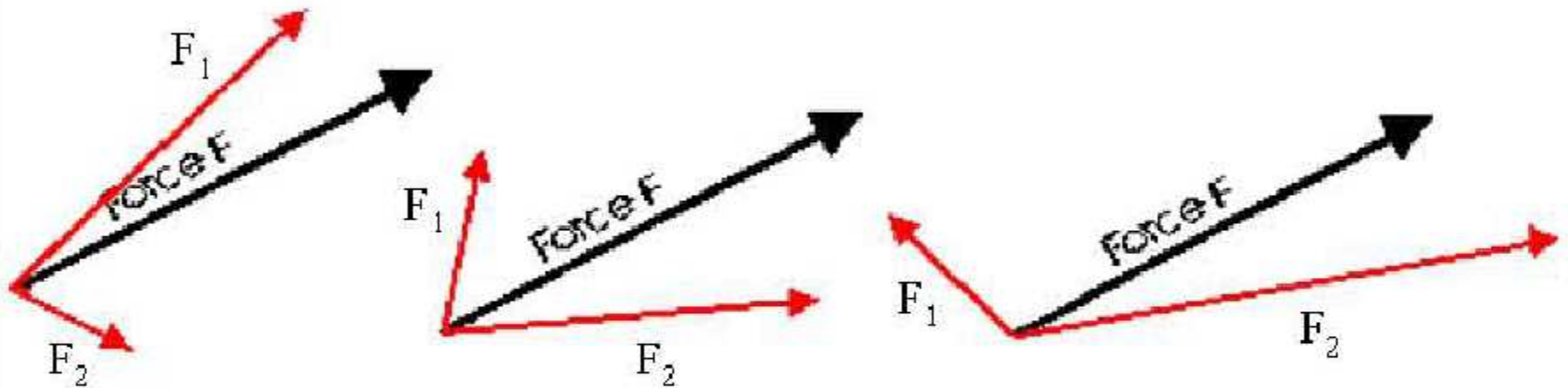
Resolusi gaya :

Adalah penguraian gaya menjadi komponen-komponennya.



KOMPONEN GAYA

Mencari komponen gaya:
Cara grafis

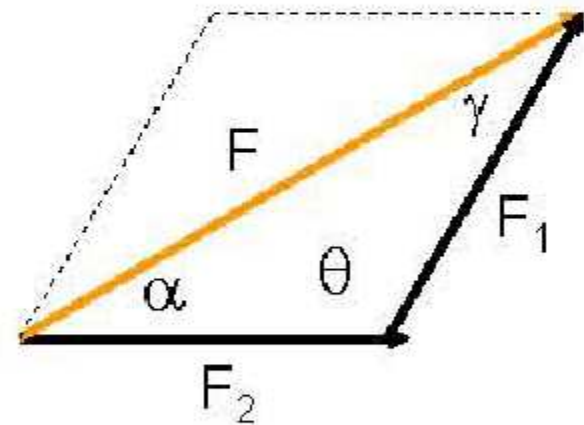
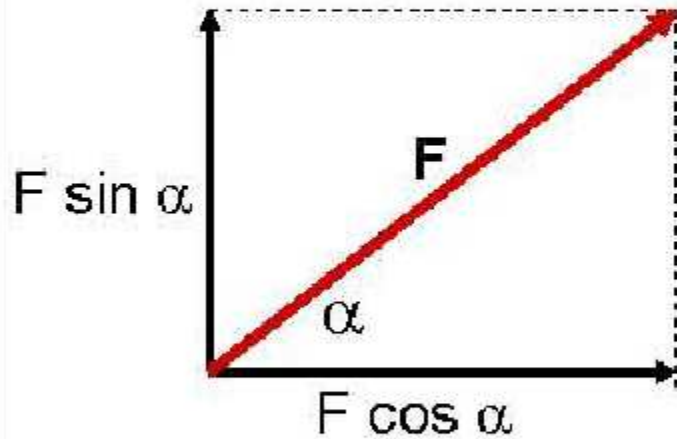


F_1 dan F_2 adalah komponen gaya dari gaya F

Sebuah gaya dapat diuraikan menjadi sistem komponen gaya yang berbeda-beda.

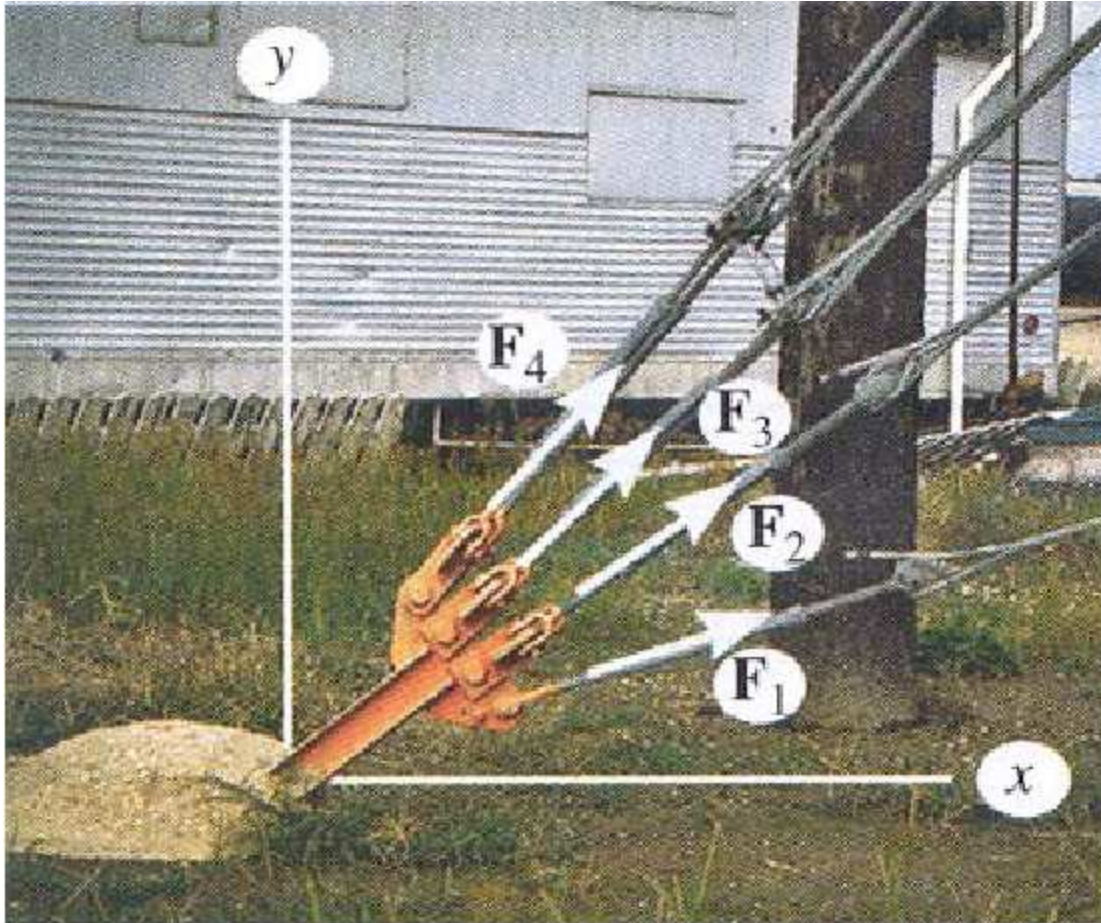
KOMPONEN GAYA

Mencari komponen gaya:
Cara aljabar



$$\frac{F_1}{\sin \alpha} = \frac{F_2}{\sin \gamma} = \frac{F}{\sin \theta}$$

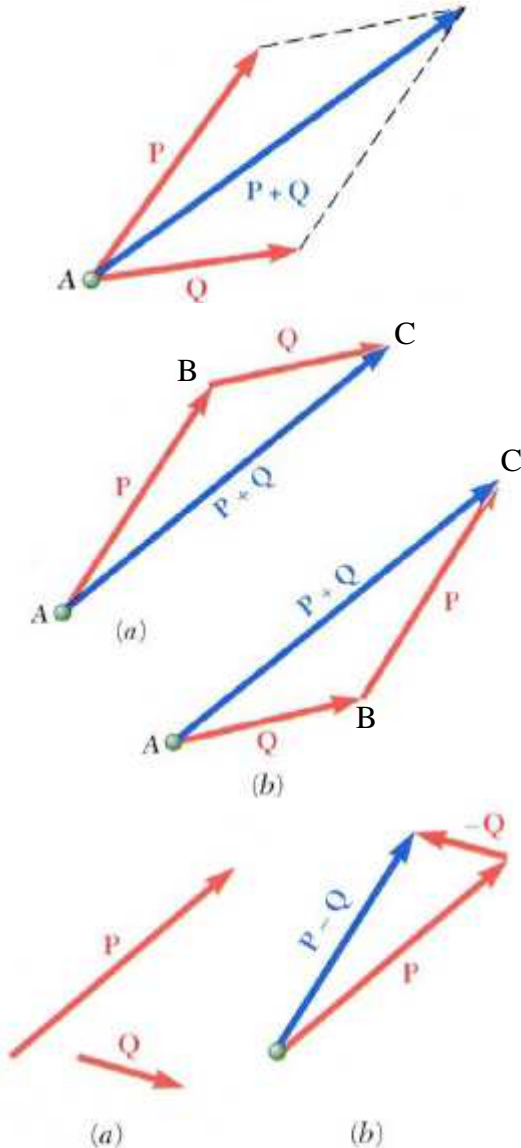
APPLICATION OF VECTOR ADDITION



There are four concurrent cable forces acting on the bracket.

How do you determine the resultant force acting on the bracket ?

Addition of Vectors



- Trapezoid rule for vector addition

- Triangle rule for vector addition

- Law of cosines,

$$R^2 = P^2 + Q^2 - 2PQ \cos B$$

$$R = P + Q$$

- Law of sines,

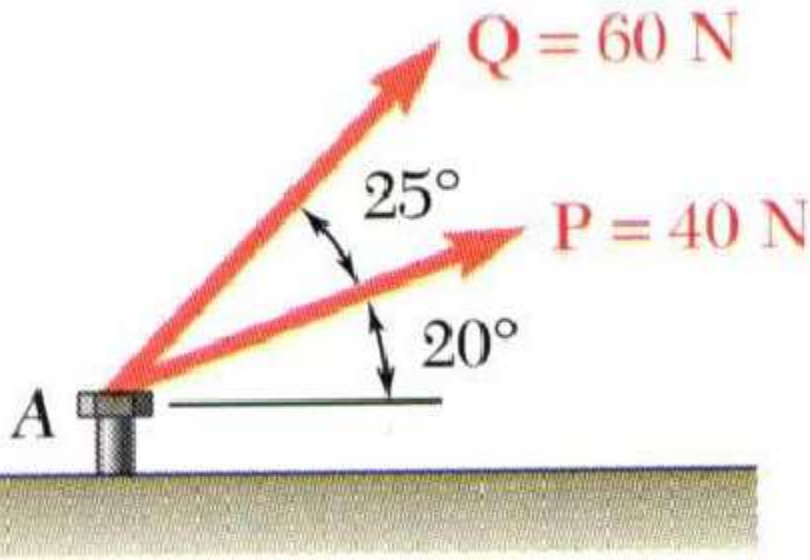
$$\frac{\sin A}{Q} = \frac{\sin B}{R} = \frac{\sin C}{P}$$

- Vector addition is commutative,

$$P + Q = Q + P$$

- Vector subtraction

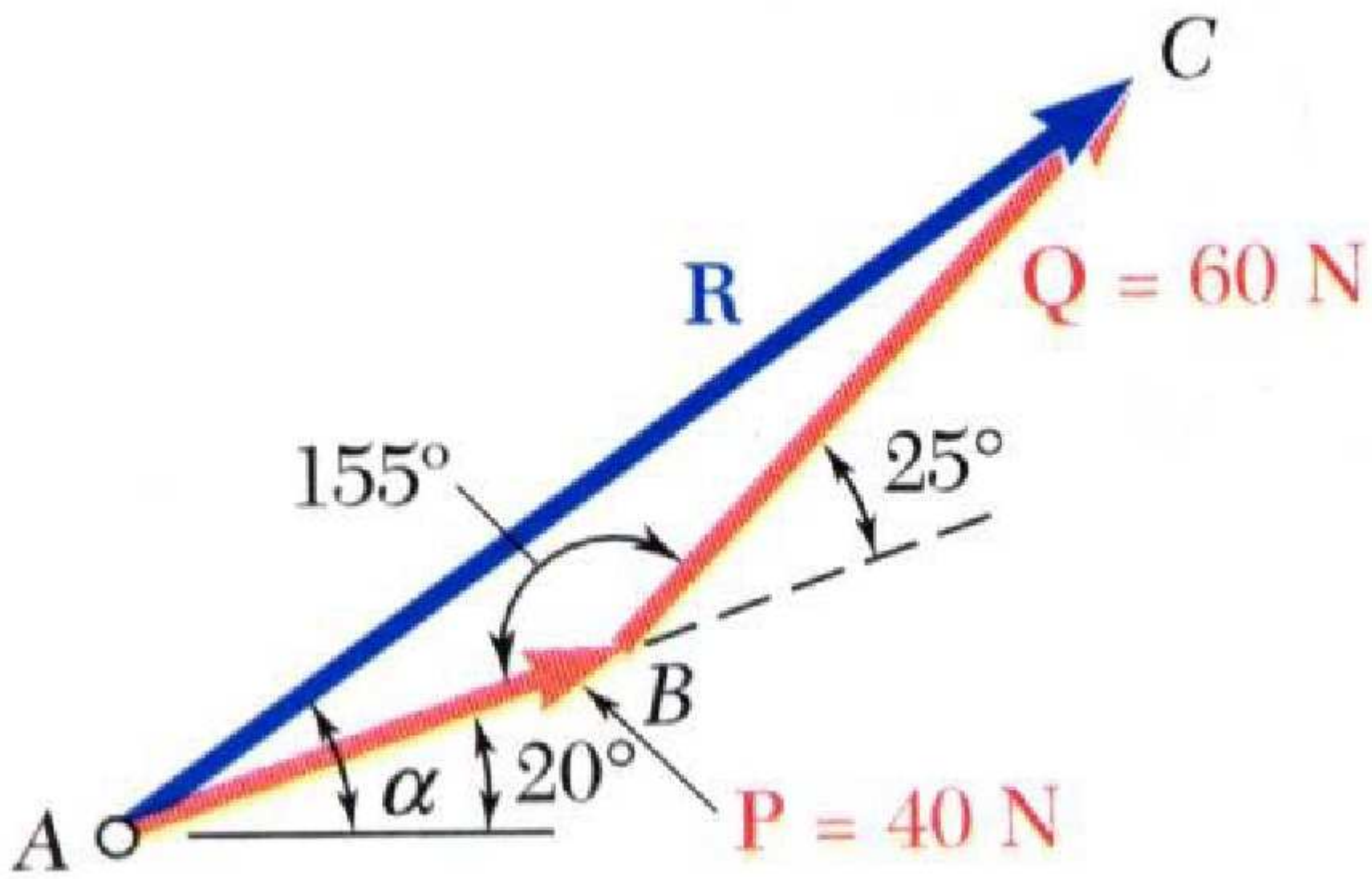
Sample Problem



The two forces act on a bolt at A.
Determine their resultant.

SOLUTION:

- Trigonometric solution - use the triangle rule for vector addition in conjunction with the law of cosines and law of sines to find the resultant.



- Trigonometric solution - Apply the triangle rule.

From the Law of Cosines,

$$\begin{aligned} R^2 &= P^2 + Q^2 - 2PQ \cos B \\ &= (40\text{N})^2 + (60\text{N})^2 - 2(40\text{N})(60\text{N})\cos 155^\circ \end{aligned}$$

$$R = 97.73\text{N}$$

From the Law of Sines,

$$\frac{\sin A}{Q} = \frac{\sin B}{R}$$

$$\sin A = \sin B \frac{Q}{R}$$

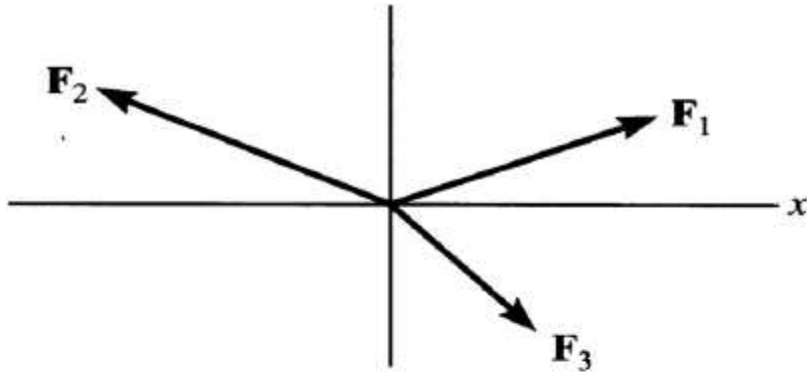
$$= \sin 155^\circ \frac{60\text{N}}{97.73\text{N}}$$

$$A = 15.04^\circ$$

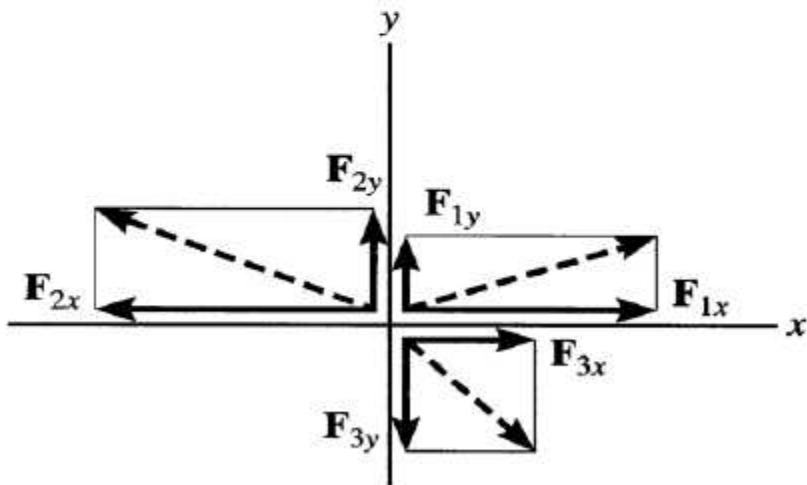
$$\angle = 20^\circ + A$$

$$\angle = 35.04^\circ$$

ADDITION OF SEVERAL VECTORS



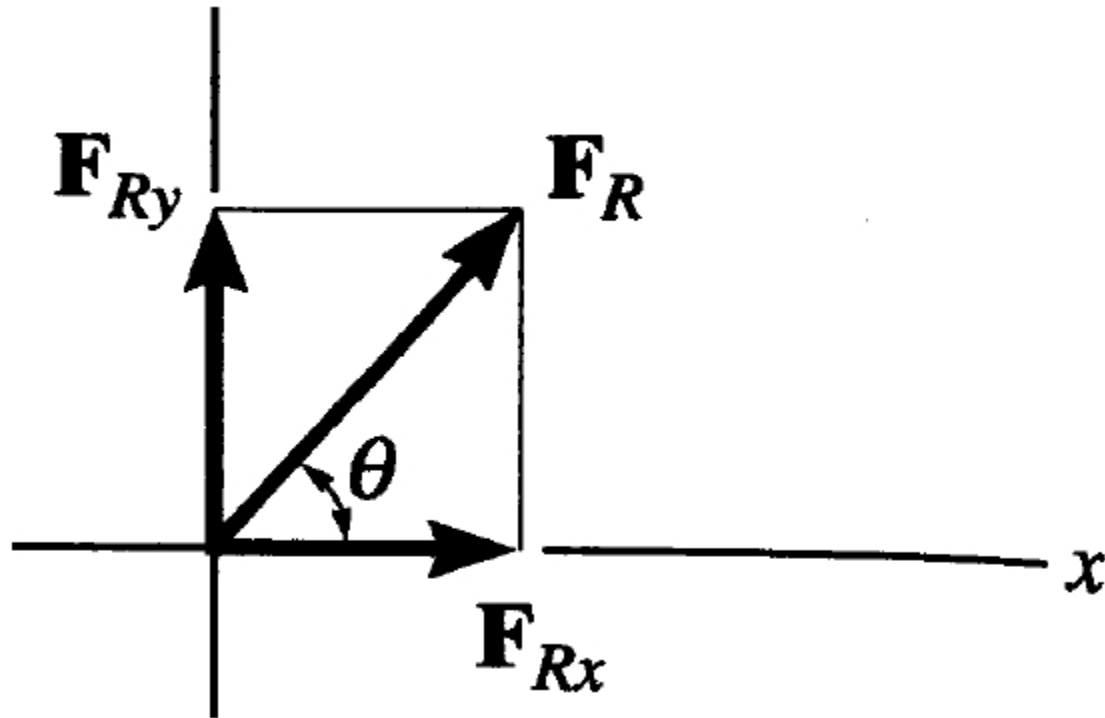
(a)



(b)

- Step 1 is to resolve each force into its components
- Step 2 is to add all the x components together and add all the y components together. These two totals become the resultant vector.
- Step 3 is to find the magnitude and angle of the resultant vector.

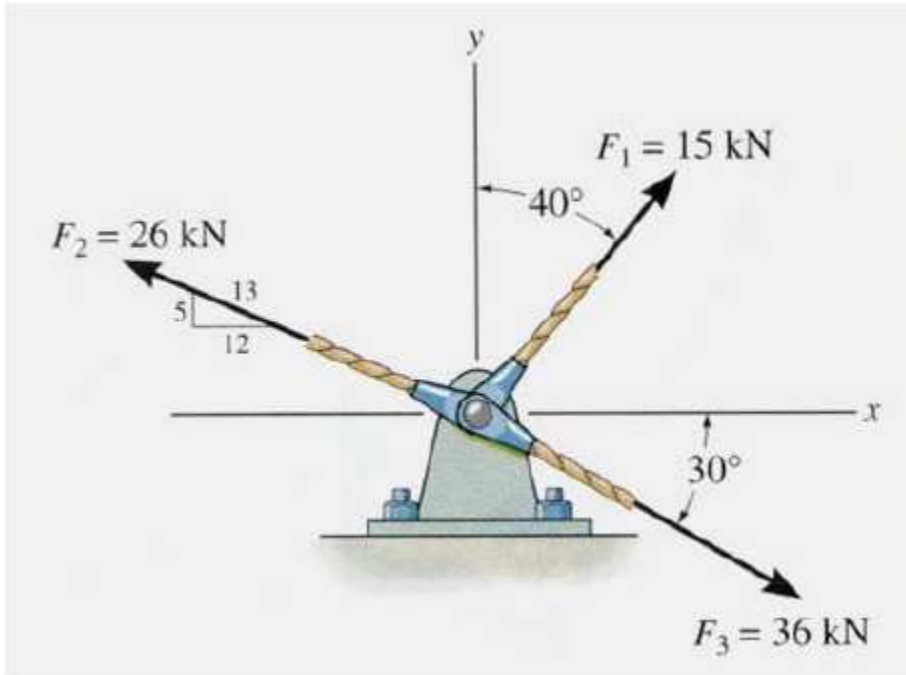
You can also represent a 2-D vector with a magnitude and angle.



$$F_R = \sqrt{F_{Rx}^2 + F_{Ry}^2}$$

$$\theta = \tan^{-1} \left| \frac{F_{Ry}}{F_{Rx}} \right|$$

EXAMPLE



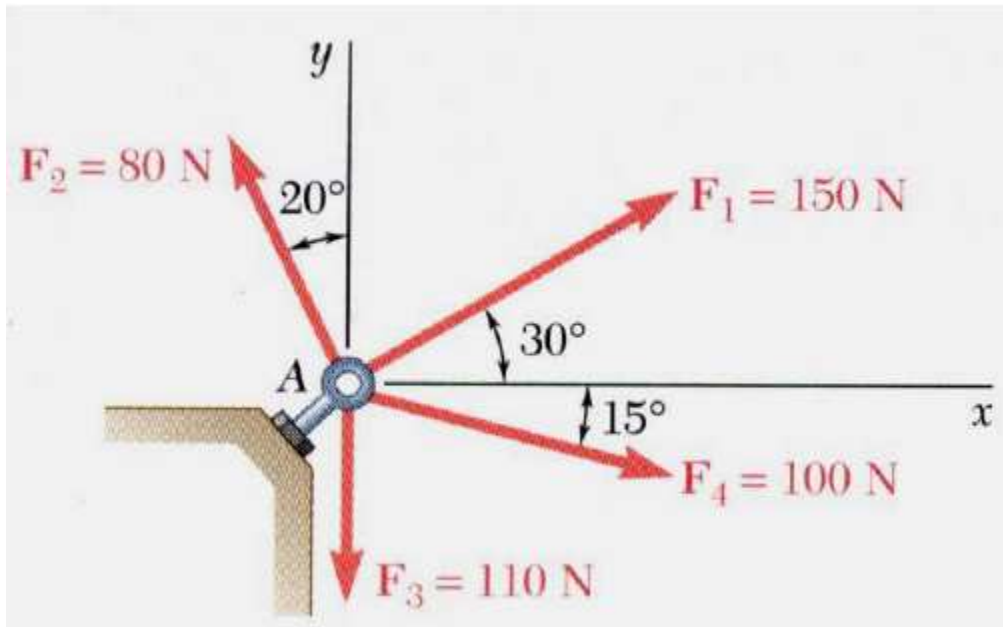
Given: Three concurrent forces acting on a bracket.

Find: The magnitude and angle of the resultant force.

Plan:

- Resolve the forces in their x-y components.
- Add the respective components to get the resultant vector.
- Find magnitude and angle from the resultant components.

Sample Problem



Four forces act on bolt A as shown. Determine the resultant of the force on the bolt.

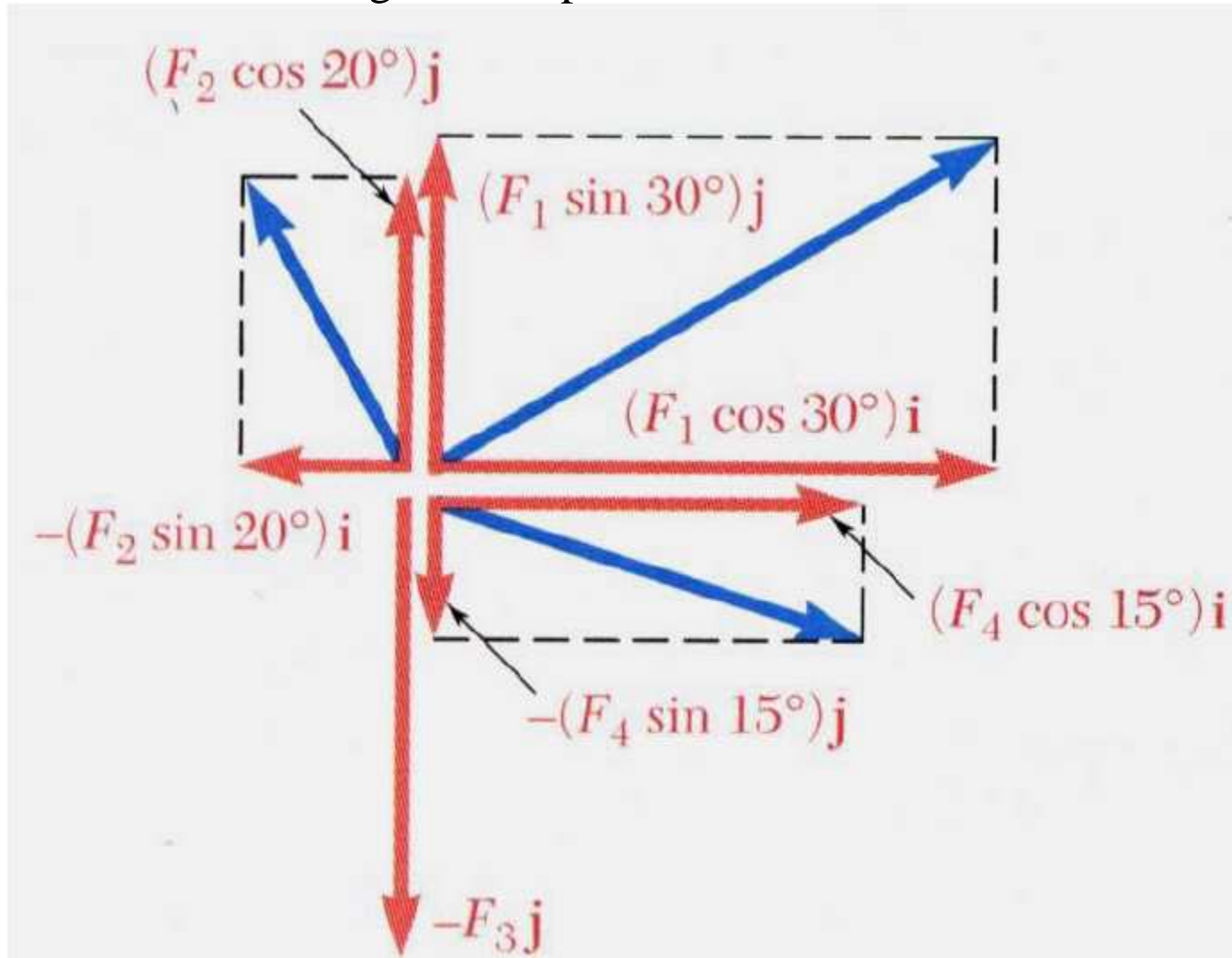
SOLUTION:

- Resolve each force into rectangular components.
- Determine the components of the resultant by adding the corresponding force components.
- Calculate the magnitude and direction of the resultant.

Sample Problem (cont')

SOLUTION:

- Resolve each force into rectangular components.



Sample Problem (cont')

<i>force</i>	<i>mag</i>	<i>x comp</i>	<i>y comp</i>
\vec{F}_1	150	+ 129 . 9	+ 75 . 0
\vec{F}_2	80	- 27 . 4	+ 75 . 2
\vec{F}_3	110	0	- 110 . 0
\vec{F}_4	100	+ 96 . 6	- 25 . 9
		$R_x = +199.1$	$R_y = +14.3$