

YAKEEN NEET 2.0

2026

Vectors

Physics

Lecture - 2

By- Manish Raj (MR Sir)



Today's Goal

→ Revision (H/W)

→ Component of vector (vector को तोड़ना)

→ Magnitude of vector (vector को ज्ञाना)

Padha dunga

1 theory

7 chapters

20 mint
only

(a) Live

(b) Recorded

5 PM

- | | one formula
play with |
|------------------|--------------------------|
| ① Kinematics | |
| ② N.L.M | |
| ③ Gravitation | |
| ④ electrostatics | |
| ⑤ C.O.M | |
| ⑥ magnetism | |
| ⑦ modern ph | |
| ⑧ Rotation | |

Question



H/W

A. Physical quantity which ^{*}does not have direction must be scalar.

B. Physical quantity which have direction must be vector. → false

→ Ex-current

→ True ✓

1 Both are true ✗

2 Both are false

3 A true B false ✓✓

4 A false B true

Scalar

→ Having magnitude only.

Ex - distⁿ / speed / energy

→ follow simple addition

$$2 + 3 = 5$$

$$4 - 2 = 2$$

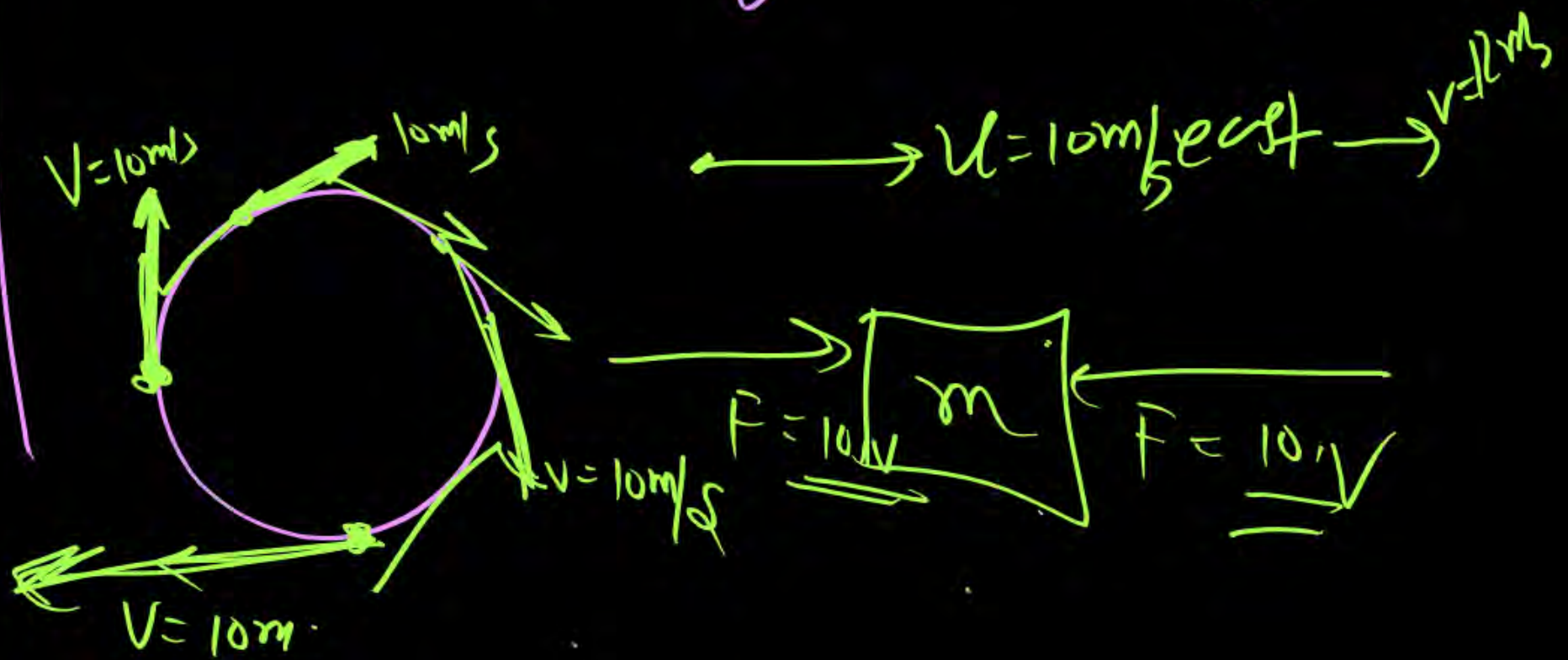
→ change by changing only
magnitude

Vector


Having magnitude & dirⁿ follow Triangle law of vector addition

→ velocity ✓ / force ✓

→ Vector can be change
by magnitude, dirⁿ any
but.



Representation



Tail

head

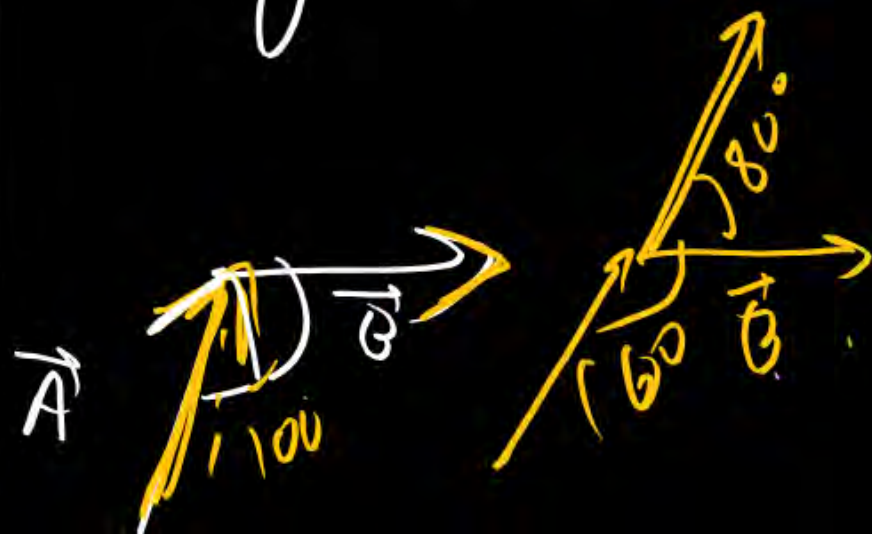
magnitude = length

$$\vec{F} = \underbrace{F}_{\text{magn}} \underbrace{\hat{F}}_{\text{dir}} = |\vec{F}| \hat{F}$$

$$|\vec{F}| = F = \text{magnit of force}$$



angle b/w vector



$$\vec{A} = \vec{0}$$

$$\vec{A} = -\vec{B}$$

Start Kare??

zero vector (Null vector)

magnitude = 0

$$\vec{0} = \vec{0} \text{ (zero vector)}$$

Negative vector $\vec{A} = 10i$

$$-\vec{A} = -10i$$

Lab 2rd

$$\vec{A} + (-\vec{A}) = 10i - 10i = \text{zero}$$

(Q) If force vector $\vec{F} = 30\text{N}\hat{i}$ then find.

direction ka
magnitude
det ||.

(a) $3\vec{F}$

$\vec{F} = 30\text{N}\hat{i}$

(b) $|\vec{F}| = 30\text{N}$

$3\vec{F} = 3(\vec{F}) = 3 \times 30\text{N}\hat{i} = 90\text{N}\hat{i}$

(c) $\hat{F} = \frac{\vec{F}}{|\vec{F}|} = \frac{30\text{N}\hat{i}}{30\text{N}} = \hat{i}$

(d) $-\vec{F}$

$-\vec{F} = -30\text{N}\hat{i}$

(f) $\frac{\vec{F}}{2} = \frac{30\text{N}\hat{i}}{2} = 15\text{N}\hat{i}$

(E) $-5\vec{F} = -5(30\text{N}\hat{i}) = -150\text{N}\hat{i}$

Q1 Some forces are given then draw them.

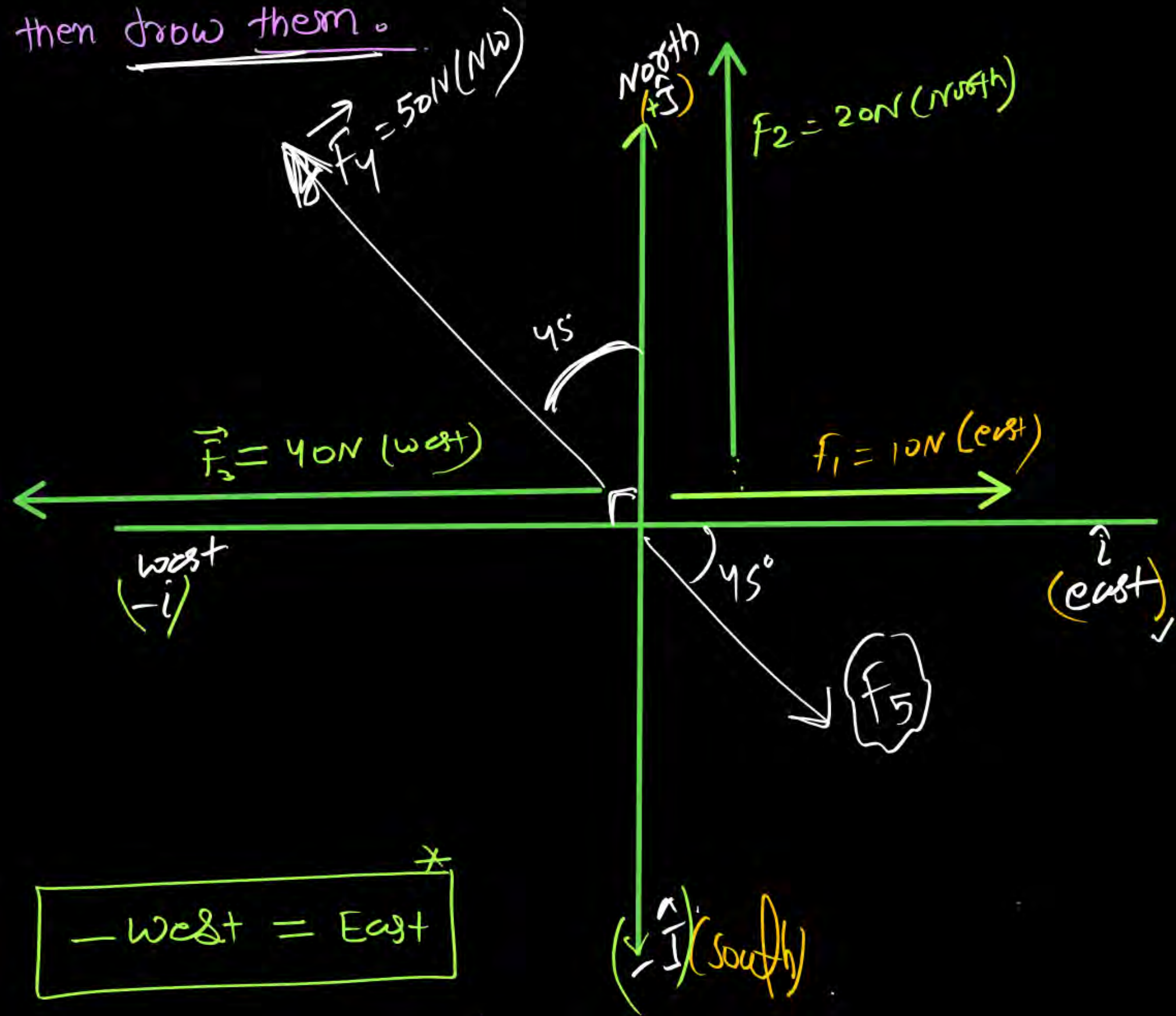
① $\vec{F}_1 = 10\text{N}$ along east

② $\vec{F}_2 = 20\text{N}$ along North

③ $\vec{F}_3 = 40\text{N}$ west
 $= -40\text{N} \hat{i}$

④ $\vec{F}_4 = 50\text{N}$ North-west

⑤ $\vec{F}_5 = 10\text{N}$ (South-east)



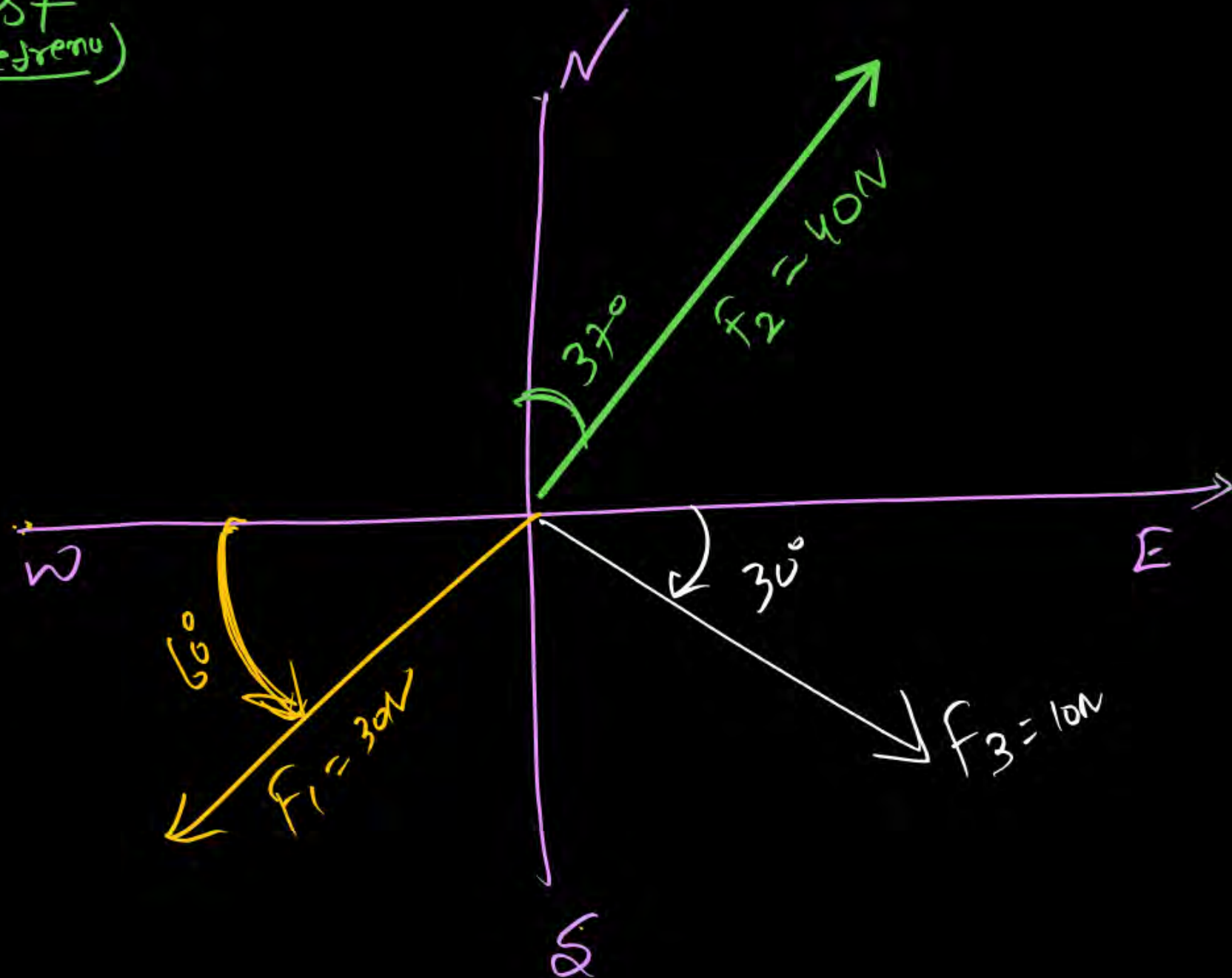
$\vec{F}_1 = 30\text{N}$, 60° South of West (redimu)

(MR*Box)

Jo last me hai waha biath Jao
or Pichhe Chalo.

$\vec{F}_2 = 40\text{N}$ at 37° East of (North)

⊕ $\vec{F}_3 = 10\text{N}$ (East 30° South)

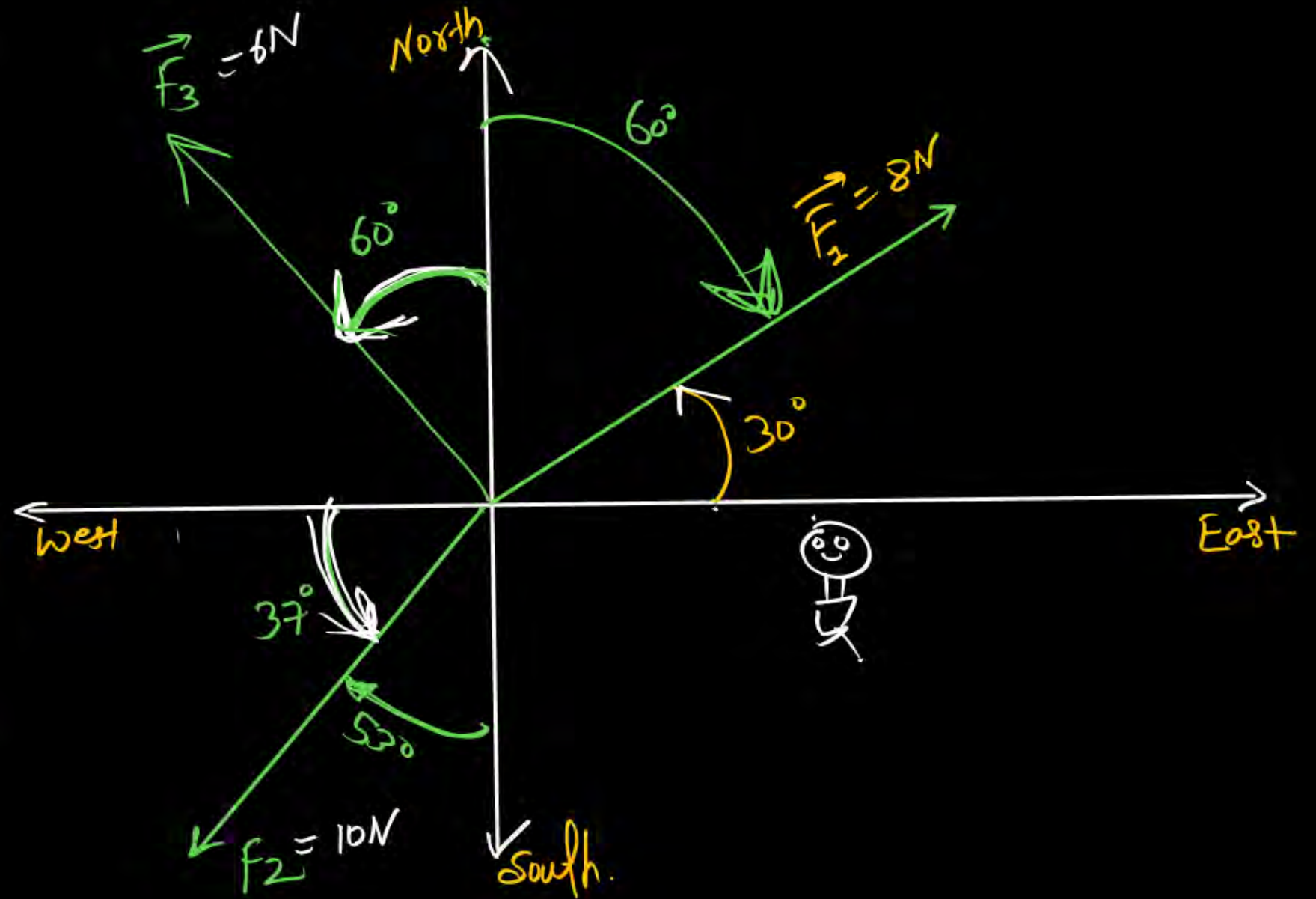


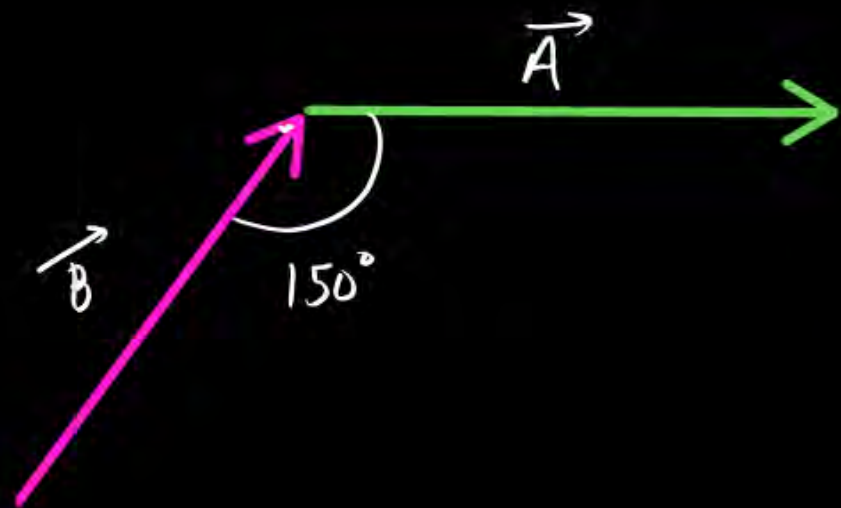
write vector with direction.

$\left\{ \begin{array}{l} \vec{F}_1 = 8N, 30^\circ \text{ North of East} \\ \vec{F}_1 = 8N, 60^\circ \text{ East of North} \\ F_1 = 8N, \text{ East } 30^\circ \text{ North} \end{array} \right.$

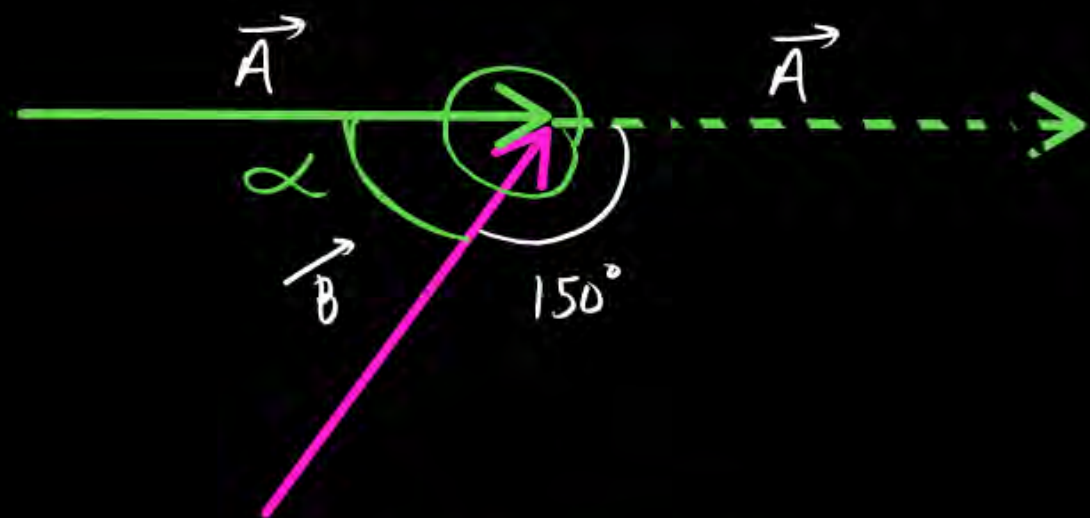
$\left\{ \begin{array}{l} F_2 = 10N, \text{ at } 37^\circ \text{ South of West} \\ F_2 = 10N \text{ at } 53^\circ \text{ West of South} \end{array} \right.$

$\left\{ \begin{array}{l} F_3 = 6N \text{ at } 60^\circ \text{ West of North} \\ = 6N \text{ at } 30^\circ \text{ North of West} \end{array} \right.$

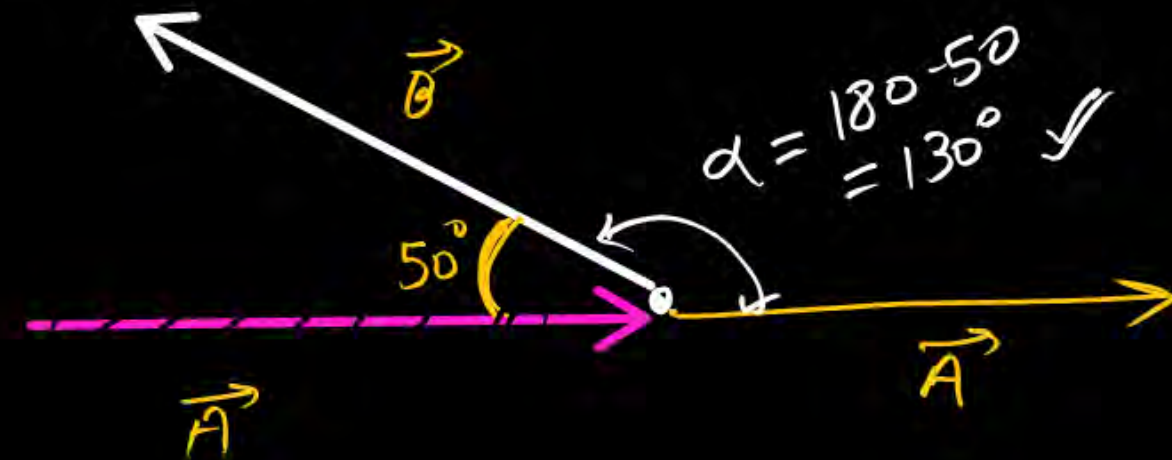




Find Angle θ w \vec{A} & \vec{B}



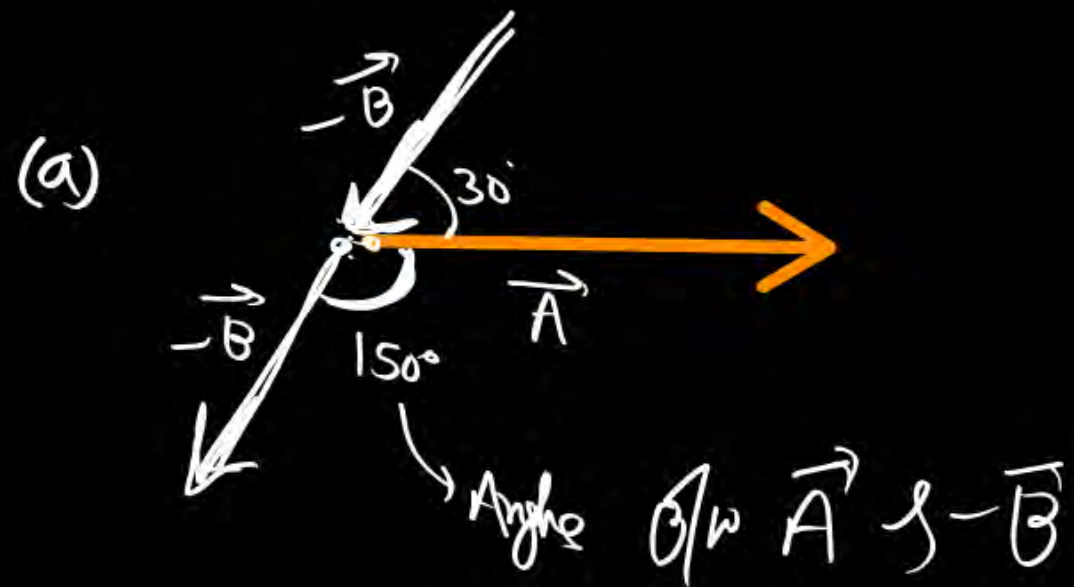
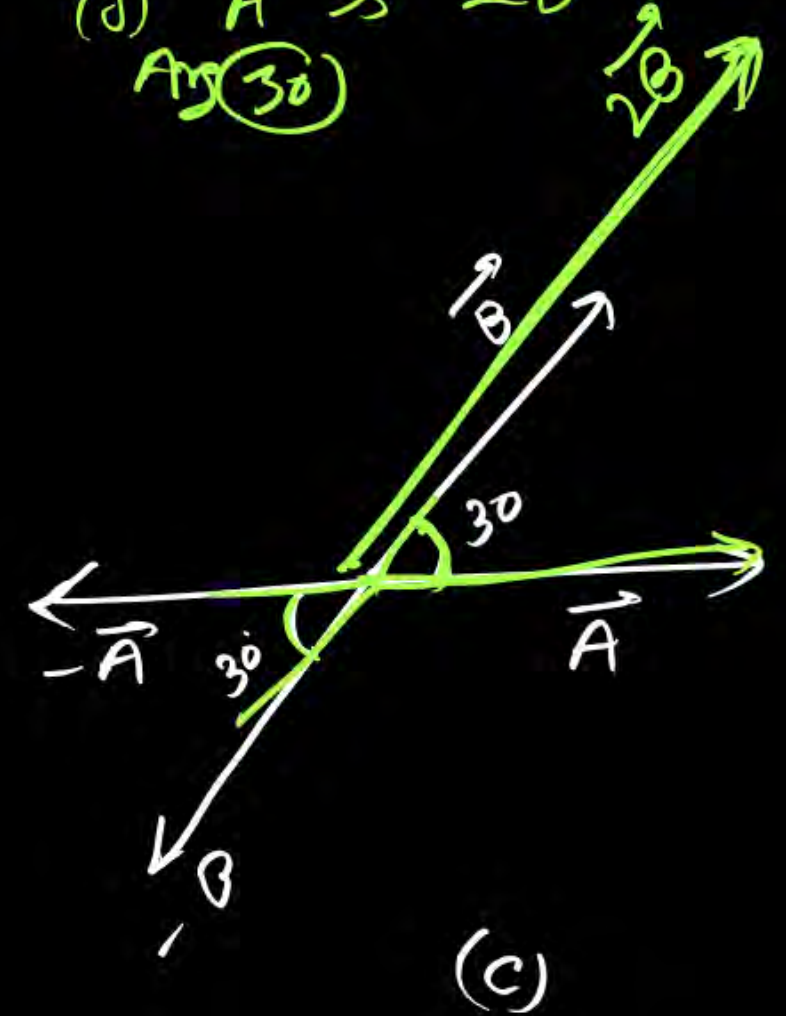
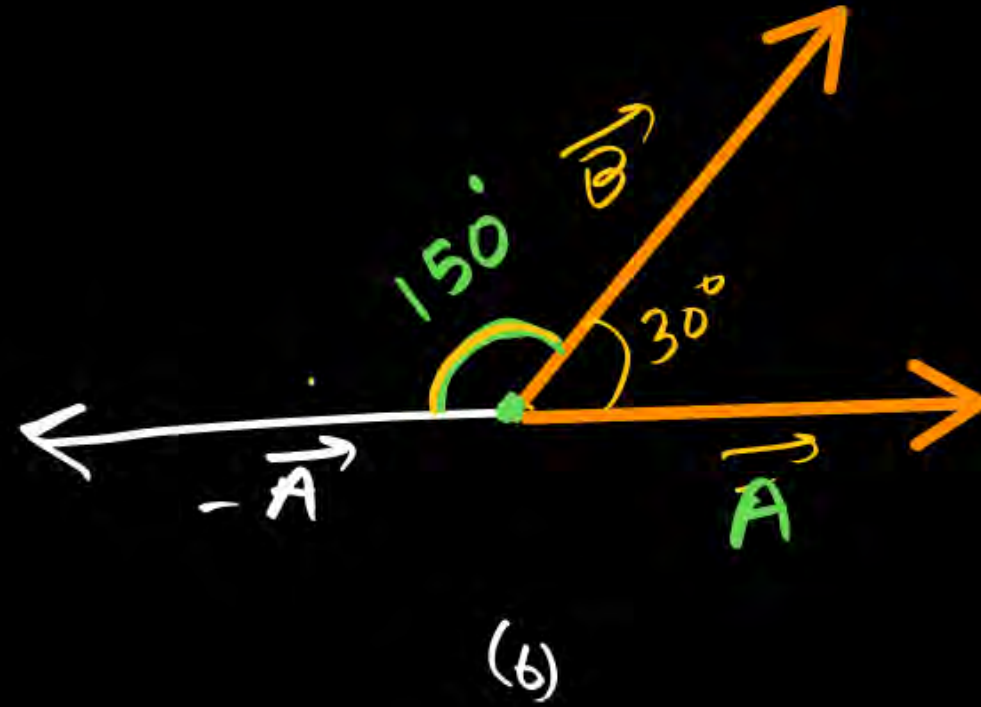
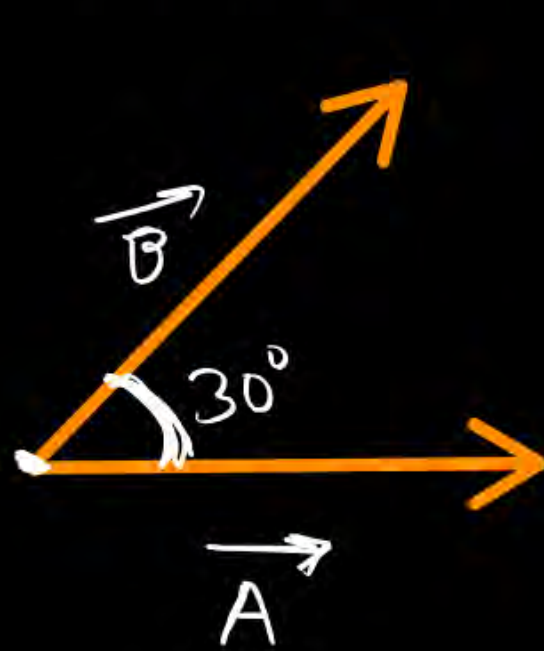
$$\begin{aligned}\alpha &= 180 - 150 \\ &= \underline{\underline{30^\circ}}\end{aligned}$$

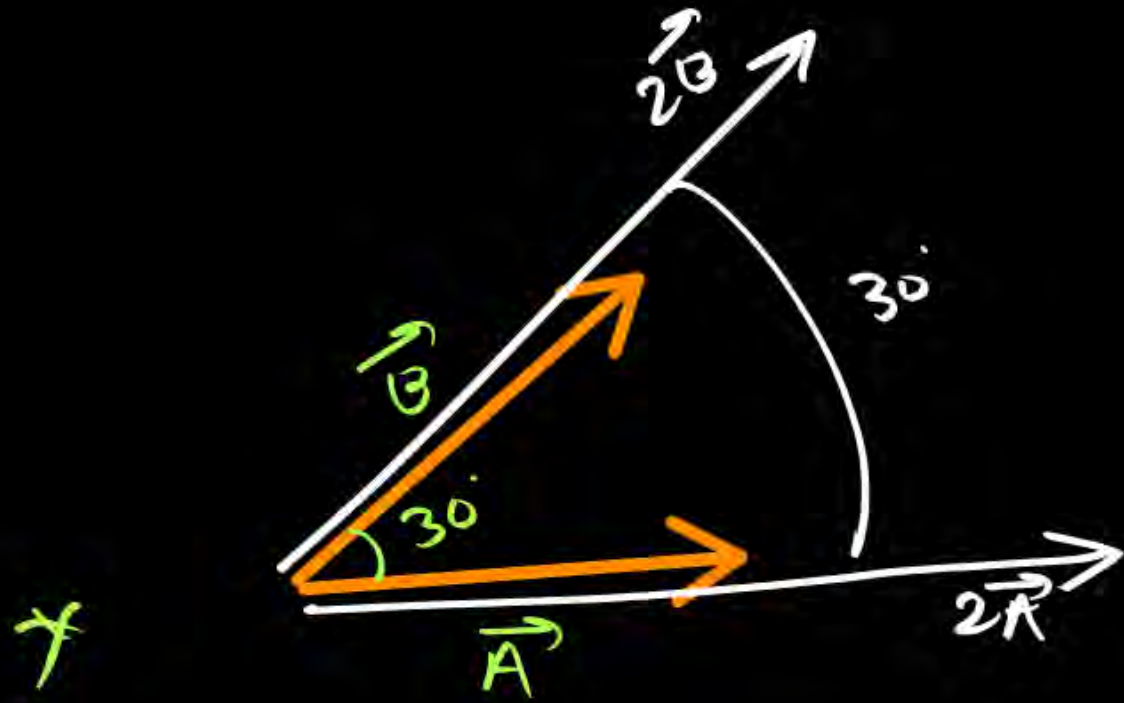


(Q) If Angle b/w vector \vec{A} & \vec{B} is 30° then find Angle b/w

- (a) \vec{A} & $-\vec{B}$ (b) $-\vec{A}$ & \vec{B} (c) $-\vec{A}$ & $-\vec{B}$ (d) \vec{A} & $2\vec{B}$
 Ans (30)

Soln





If Angle b/w \vec{A} & \vec{B} is 30°
 then Angle b/w $2\vec{A}$ & $2\vec{B} = 30^\circ$

✓

Type of vector

✓ 1. Parallel vector \rightarrow (one condition only)
 \rightarrow Angle b/w vector zero. (same direction)

✓ 2. equal vector \rightarrow (Two condition)
 Angle same (same dir)
 magnitude same

✓ 3. Anti-Parallel \rightarrow (one condition)
 opposite dirⁿ ($\theta = 180^\circ$)

✓ 4. opposite vector
 $-ve$ vector \rightarrow (Two condition)
 Same Magnitude, opposite direction
 $\theta = 180^\circ$

\rightarrow 5 orthogon $\vec{A} \perp \vec{B}$ ($\theta = 90^\circ$) (one condition)

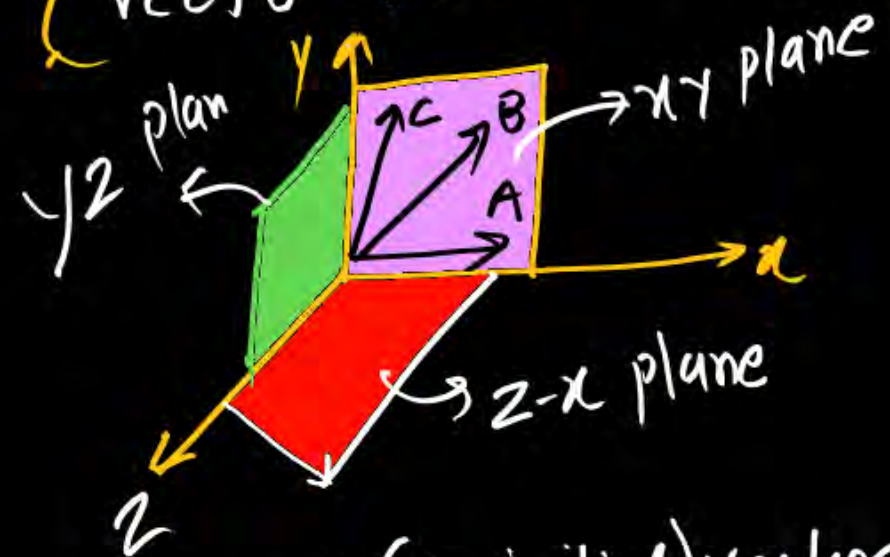
\rightarrow 6 zero vector (null vector) \rightarrow (magnitude zero)

\rightarrow 7 unit vector \rightarrow gt magnitude one, & represent dirⁿ only

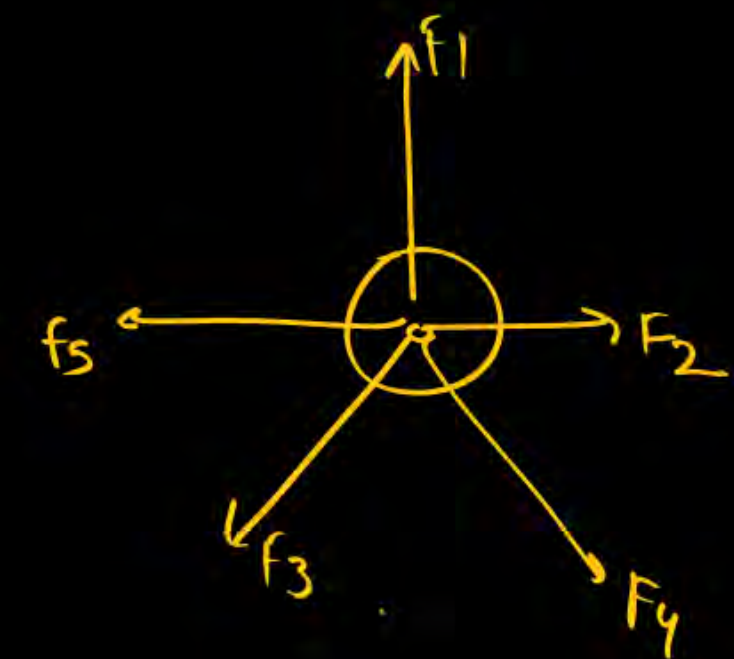
$$\hat{A} = \frac{\vec{A}}{A}$$

8 Co-linear vector \rightarrow
 one condition \rightarrow along (same line)
 ($\theta = 0^\circ, 180^\circ$)

9 Coplanar vector \rightarrow
 (vectors are in same plane)



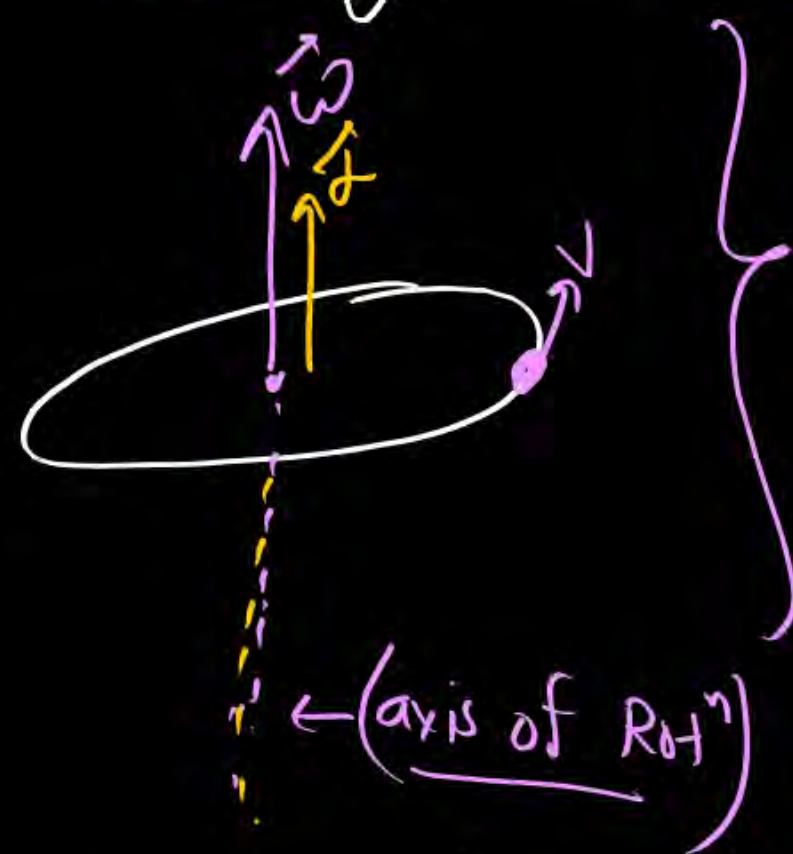
10 Concurrent (co-initial) vector:-
 \hookrightarrow initial point (Tail), or point of action. Same ho *











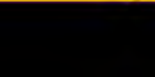
all are concurrent (co-intive) Vectors ✓



ii) axial vector:-
 when object is moving on circular path then it's angular parameter ω (angular velocity), α (accⁿ)



Will study in Rotatⁿ

Type of vector	Magnitude Ka Relation	Angle B/w them
1. Parallel vector	may or may not same	$\theta = 0^\circ$ (dir ⁿ same)
2. Equal vector	Same	$\theta = 0^\circ$ (dir ⁿ same)
3. Antiparallel	may or may not same	$\theta = 180^\circ$
4. Negative or opposite	Same	180°
5. Orthogonal		90°
6. Co-linear vector		$\theta = 0^\circ, 180^\circ$ (along dir)
7. Coplaner vector	  * in same plane $ \vec{A} = 0$	  
8. Zero vector	$ \vec{A} = 1$	
9. Unit vector	→ acting at same point	
10. Concurrent (co-initial)	→ along axis of \mathbb{R}^n (\perp to plane of \mathbb{R}^{n-1})	
11. axial vector		

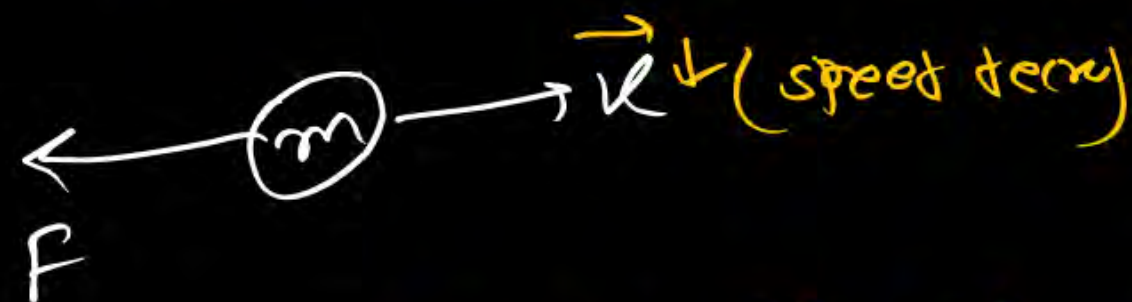


\vec{v} & \vec{F} are
Parallel
vectors.

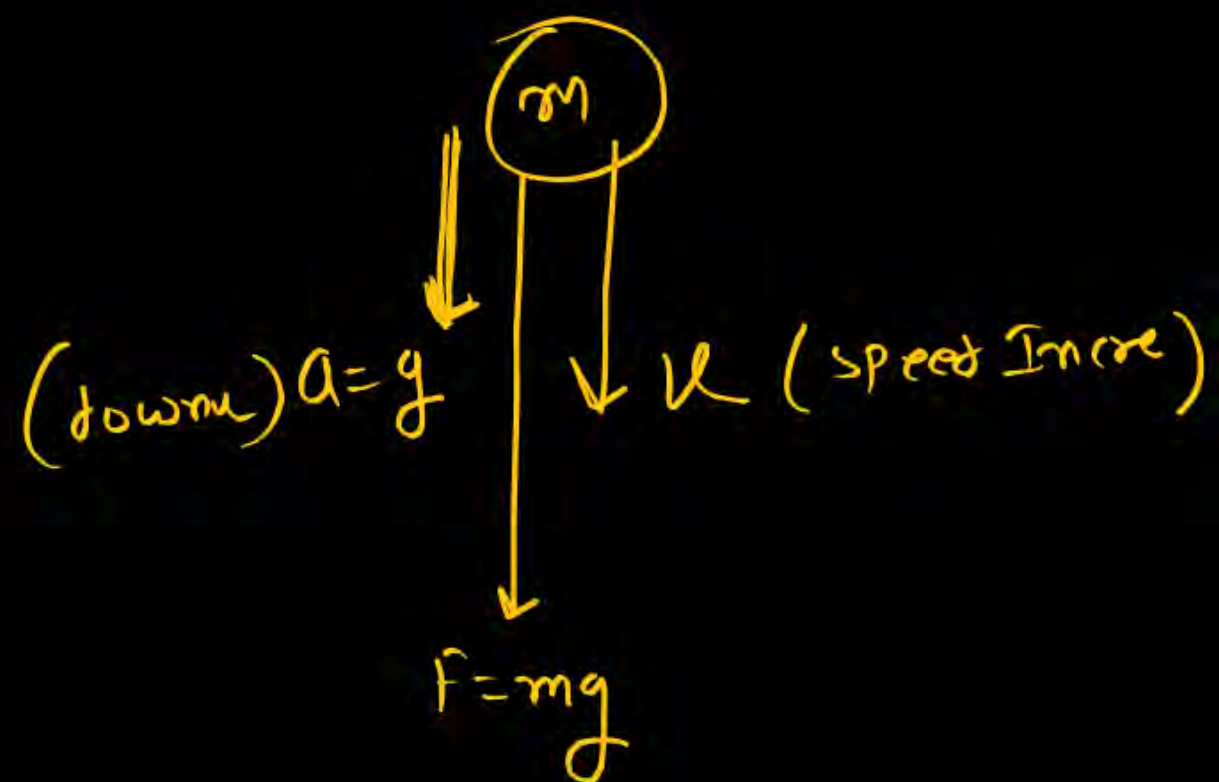
angle b/w \vec{F} & \vec{v} is zero



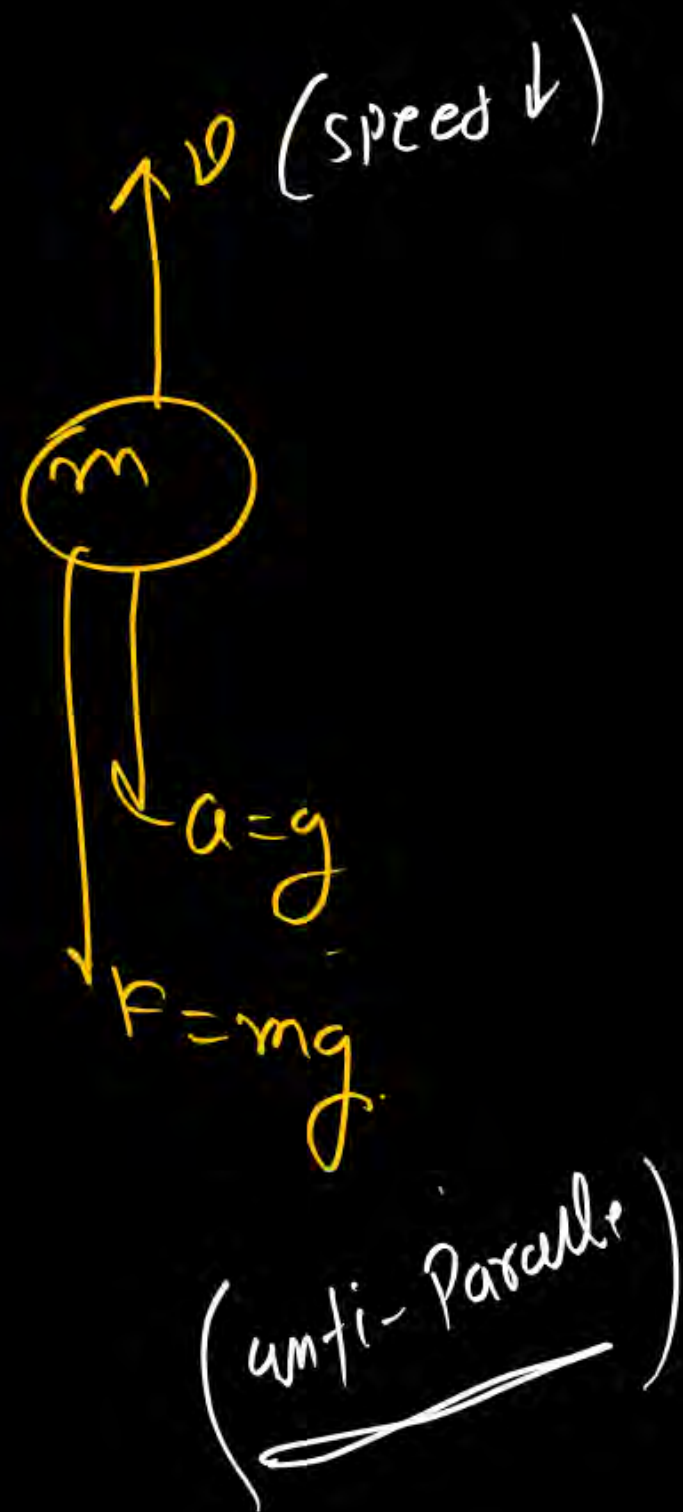
\vec{v} & \vec{F} anti-Parallel



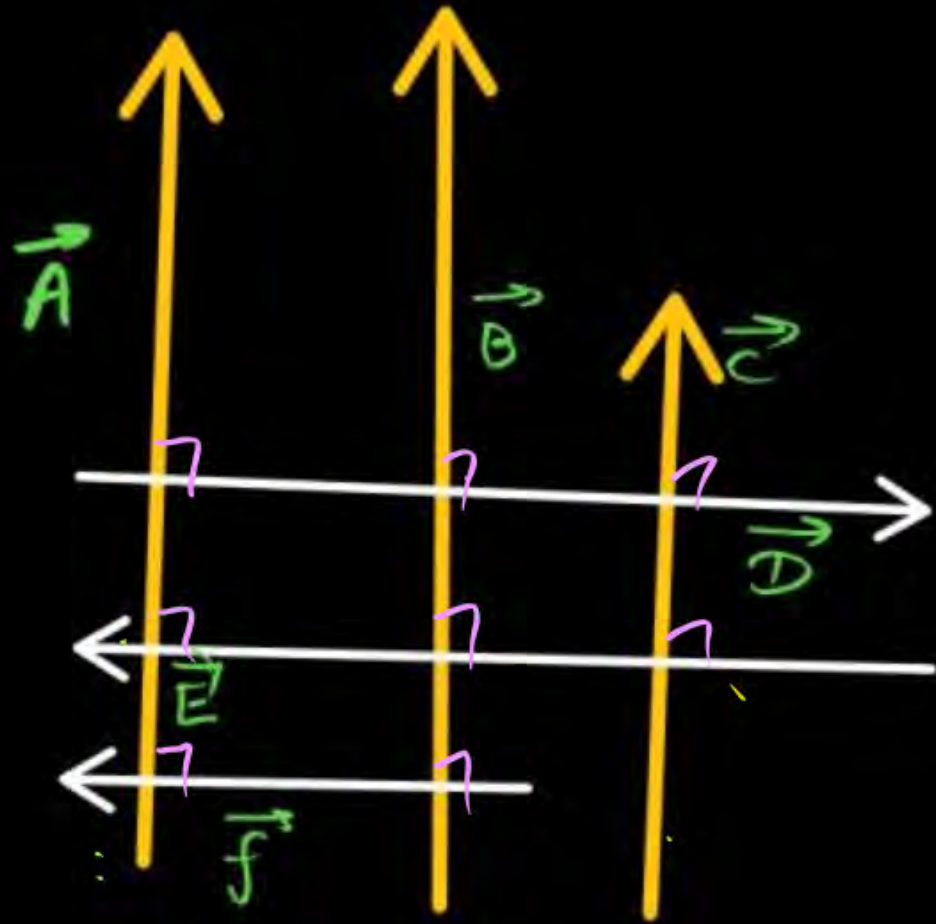
angle b/w \vec{F} & \vec{v} = 180°



Parallel Vectors



H/w
next
lets



- ① Parallel vectors →
- ② Anti-Parallel →
- ③ orthogonal →

Parallel vectors

$$(\vec{A}, \vec{B}) \quad (\vec{B}, \vec{C}) \quad (\vec{C}, \vec{A})$$

$$(\vec{E}, \vec{f})$$

equal vector (\vec{A}, \vec{B})

Anti Parallel (\vec{D}, \vec{E})

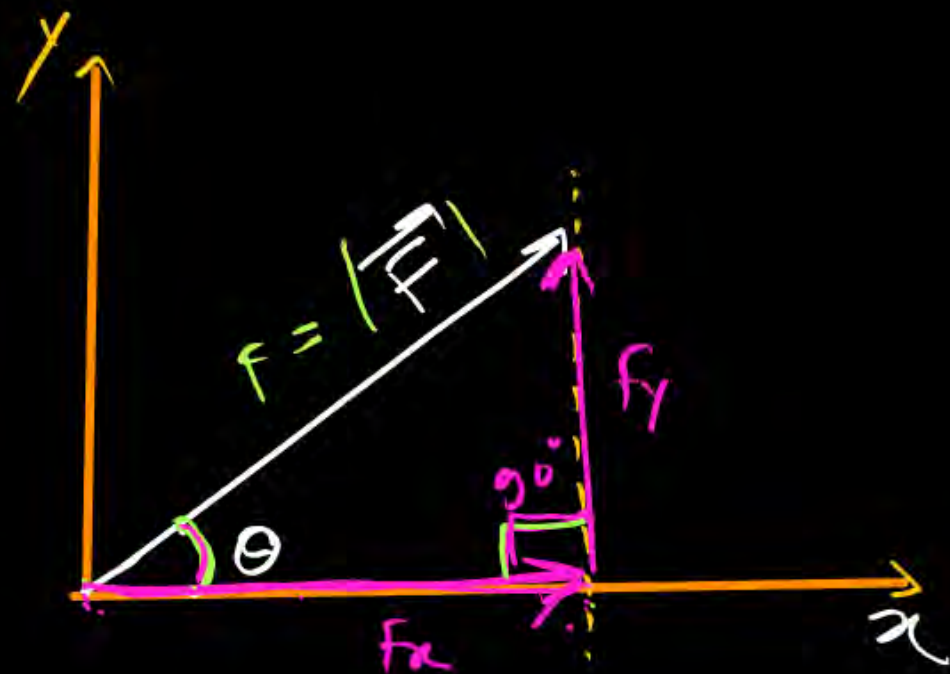
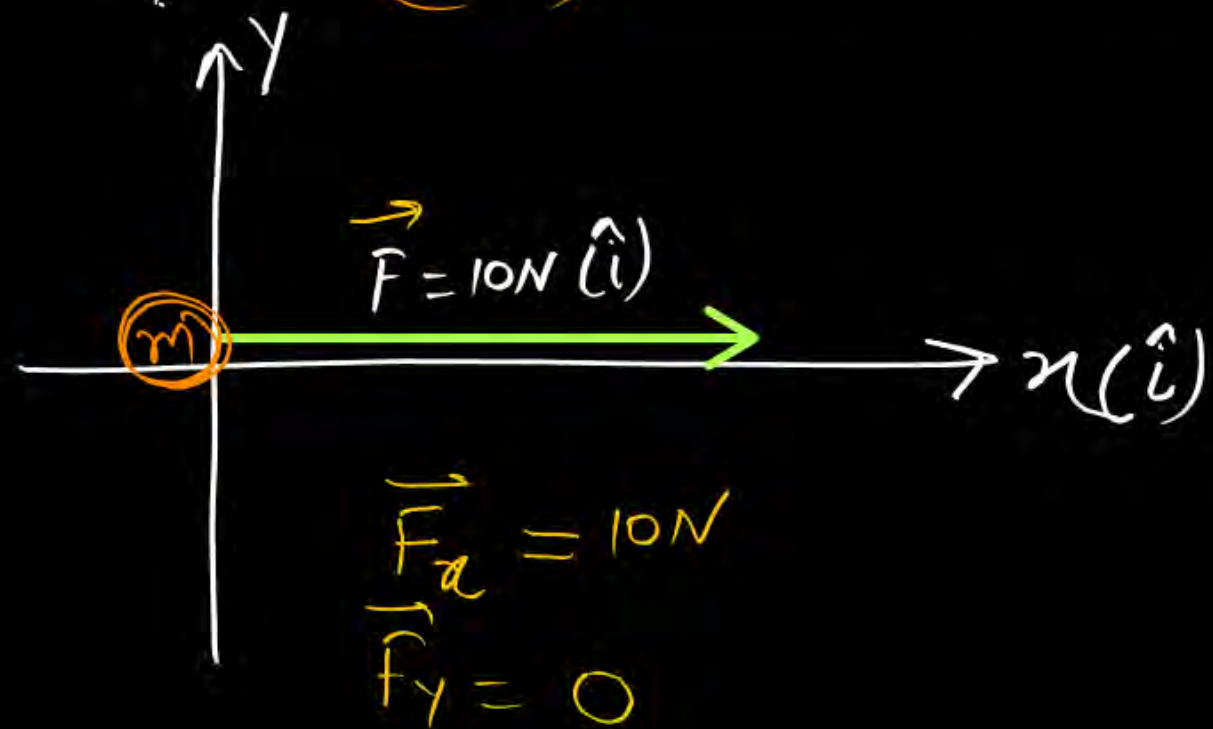
opposite or (Negative) (\vec{D}, \vec{E})

(orthogonal) → (90° pair) (\vec{A}, \vec{D}) (\vec{B}, \vec{f})

$$(\vec{A}, \vec{E}) \quad (\vec{A}, \vec{f}) \quad (\vec{A}, \vec{D})$$

$$(\vec{C}, \vec{D})$$

Component of vector (effect)



$$\cos \theta = \frac{F_x}{F}$$

$$\cos \theta = \frac{F_x}{F}$$

$$\# \boxed{F_x = F \cos \theta} \quad (1)$$

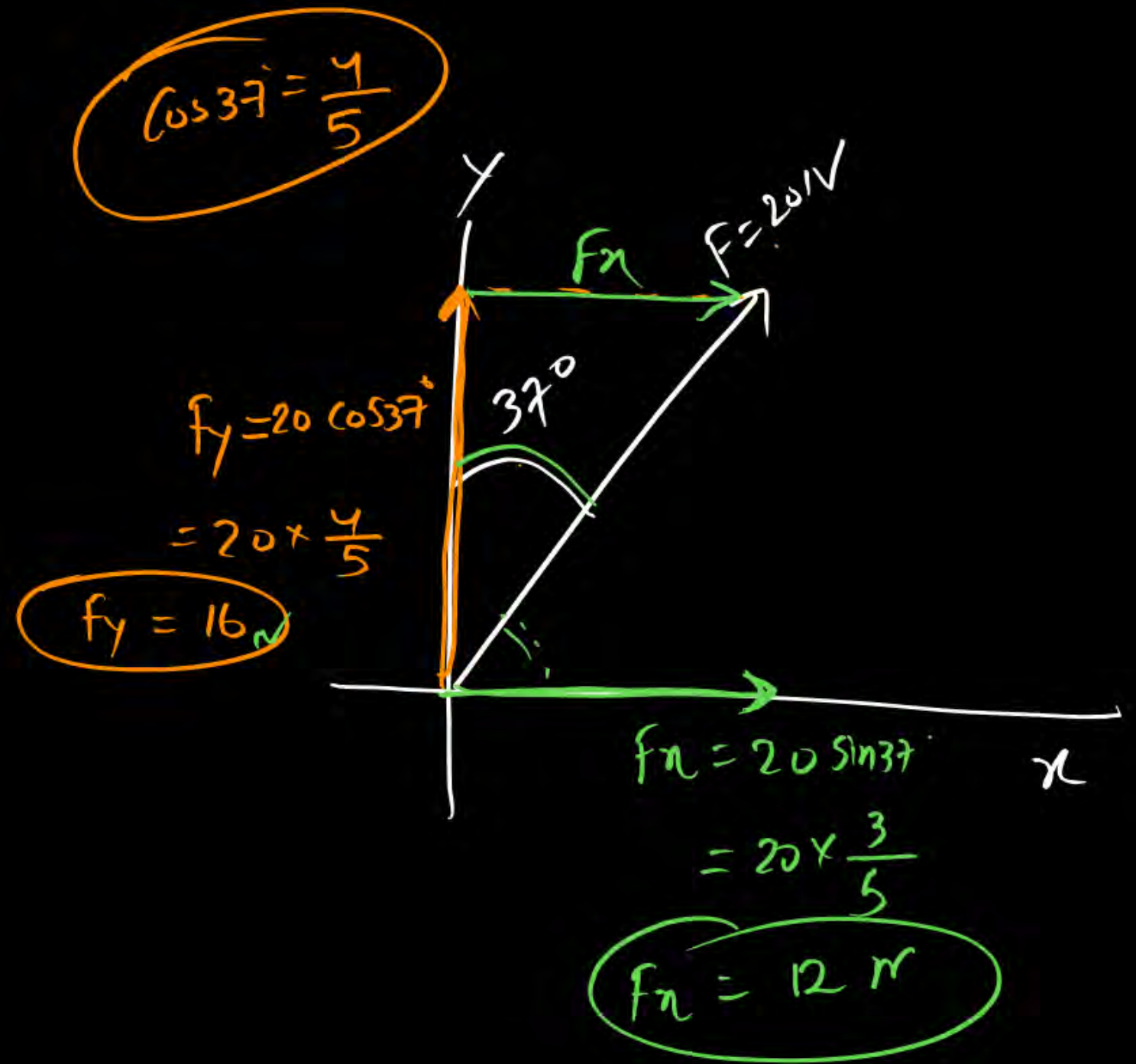
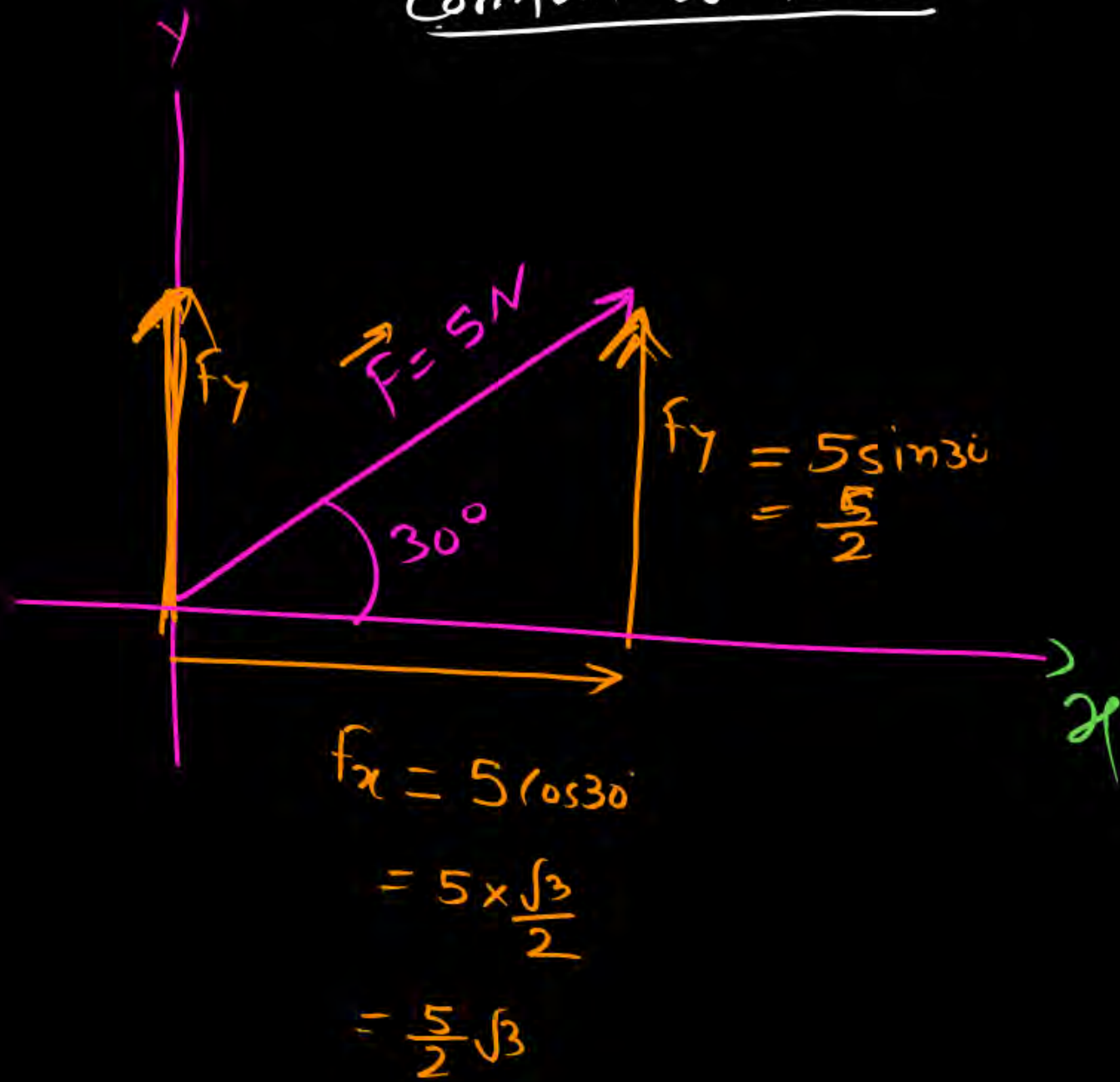
$$\sin \theta = \frac{F_y}{F}$$

$$\# \boxed{F_y = F \sin \theta} \quad (2)$$

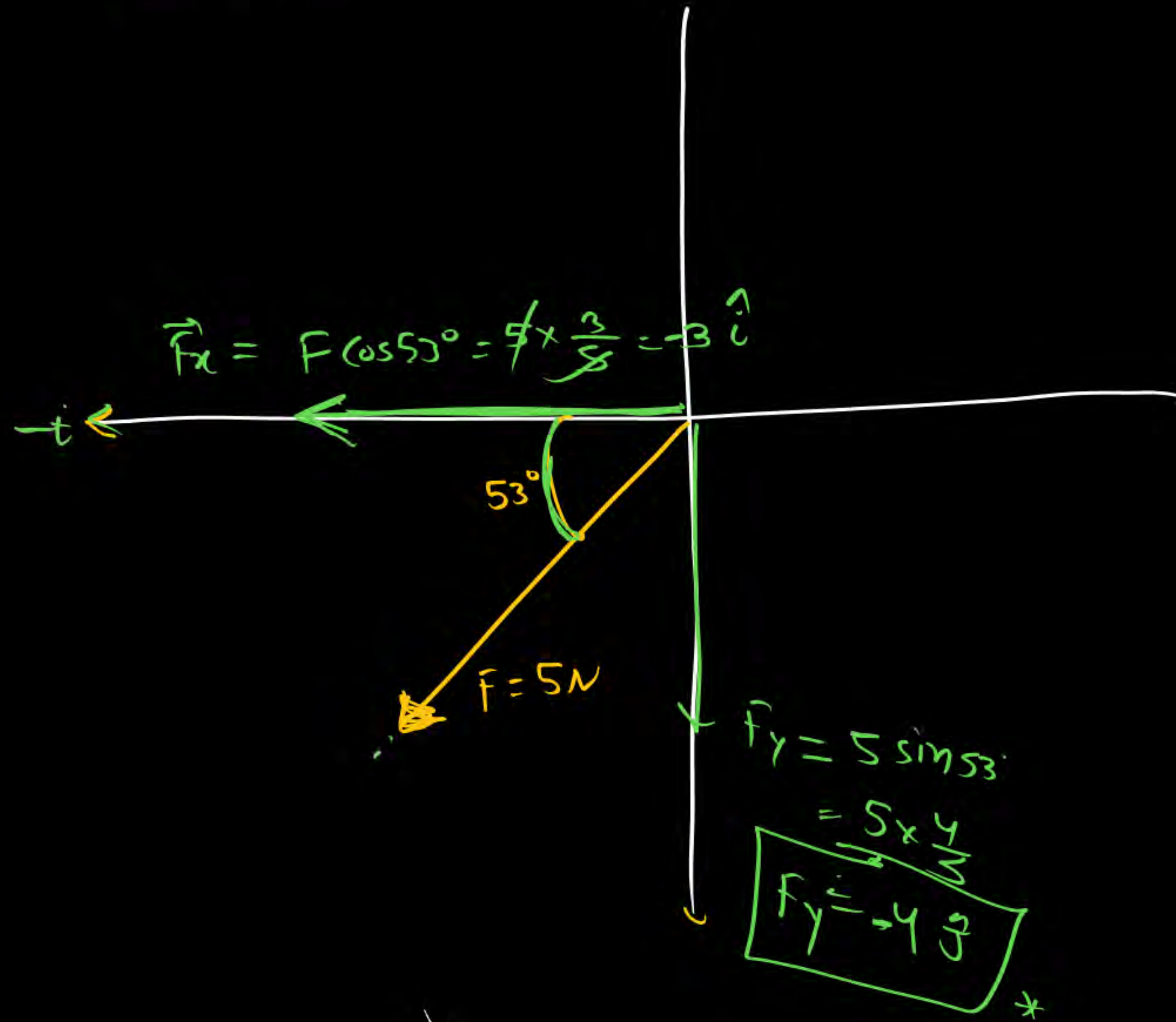
$$\vec{F} = F_x \hat{i} + F_y \hat{j}$$

$$\boxed{F = F \cos \theta \hat{i} + F \sin \theta \hat{j}}$$

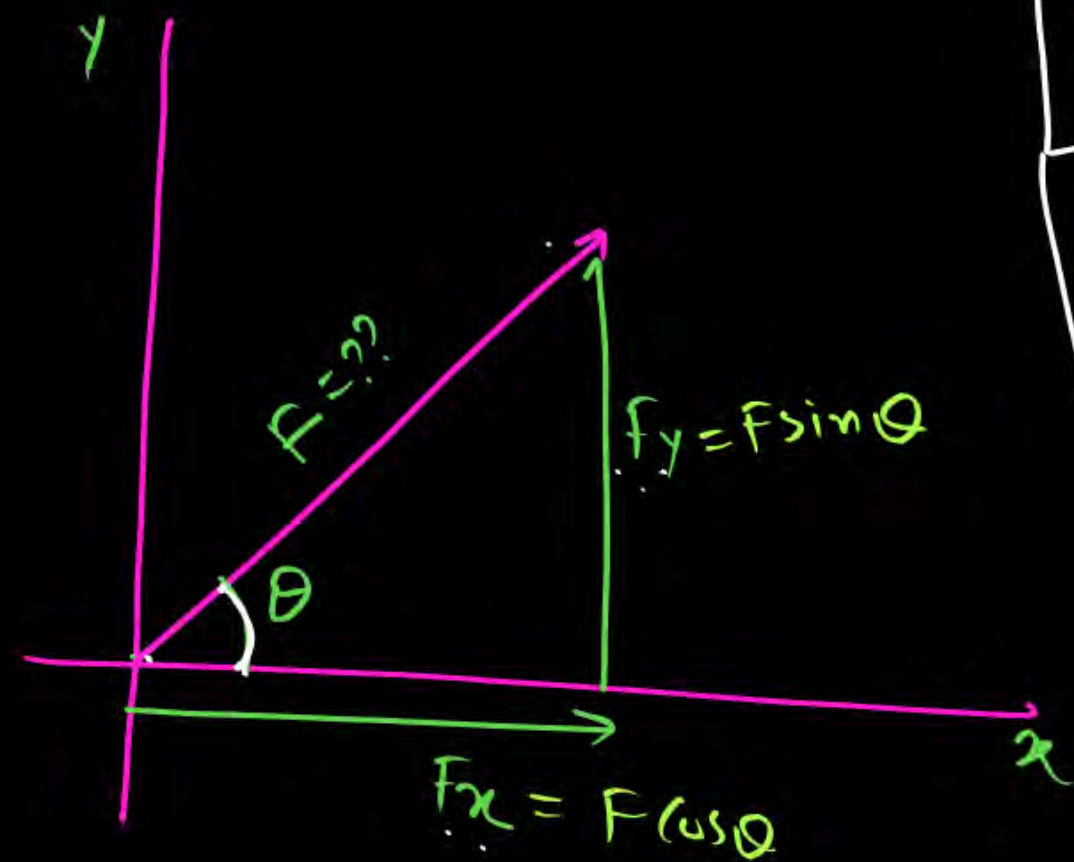
Component of force



$$\cos 53^\circ = \frac{3}{5}$$



magnitude of vector (जोड़ना)



direction of \vec{F}

$$\tan \theta = \frac{F_y}{F_x}$$
$$\theta = \tan^{-1} \left(\frac{F_y}{F_x} \right)$$

$$\vec{F} = F_x \hat{i} + F_y \hat{j}$$

$$\vec{F} = F \cos \theta \hat{i} + F \sin \theta \hat{j}$$

squaring & adding F_x & F_y

$$F_x^2 + F_y^2 = (F \cos \theta)^2 + (F \sin \theta)^2$$

$$F_x^2 + F_y^2 = F^2 (\cos^2 \theta + \sin^2 \theta)$$

$$F^2 = F_x^2 + F_y^2$$

$$F = \sqrt{F_x^2 + F_y^2}$$

Magnitude of \vec{F}

$$\# \quad \vec{F} = 30\text{N} \hat{i}$$

$$|\vec{F}| = 30\text{N}$$

$$\# \quad \vec{F} = 40\text{N} \hat{j}$$

$$|\vec{F}| = 40\text{N}$$

$$\# \quad \vec{F} = \underbrace{30\text{N} \hat{i}}_{F_x} + \underbrace{30\text{N} \hat{j}}_{F_y}$$

$$|\vec{F}| = \sqrt{F_x^2 + F_y^2}$$

$$= \sqrt{(30)^2 + (30)^2}$$

$$= \sqrt{1800}$$

$$= \sqrt{900 \times 2}$$

$$= 30\sqrt{2}$$

~~$$|\vec{F}| = 60\text{N}$$~~

$$\vec{F} = 3\hat{i} + 4\hat{j}$$

$$|\vec{F}| = \sqrt{3^2 + 4^2}$$

$$= \sqrt{9+16}$$

$$= \sqrt{25}$$

$$= 5$$

$$\# \vec{F} = 1\hat{i} + 1\hat{j}$$

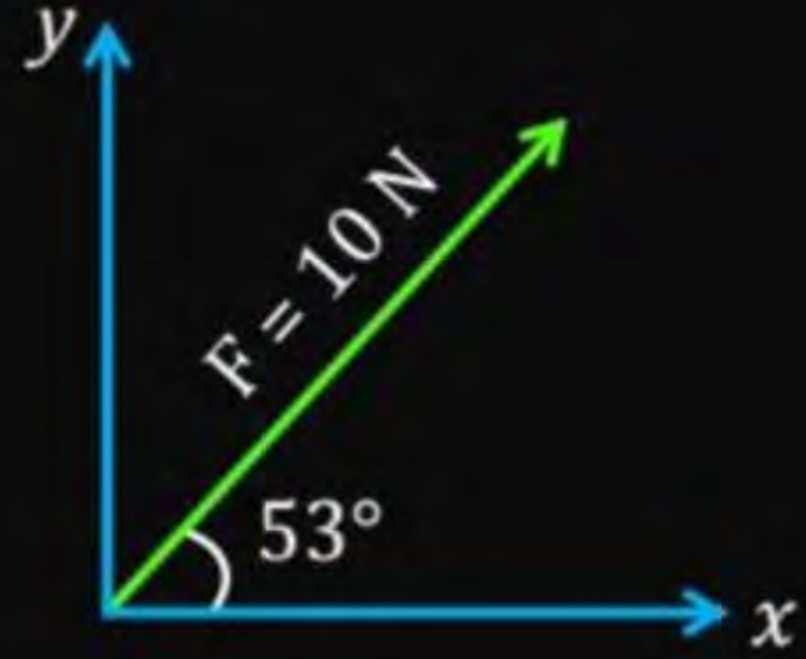
$$|\vec{F}| = \sqrt{1^2 + 1^2} = \sqrt{2}$$

$$\vec{F} = f_x \hat{i} + f_y \hat{j} + f_z \hat{k}$$

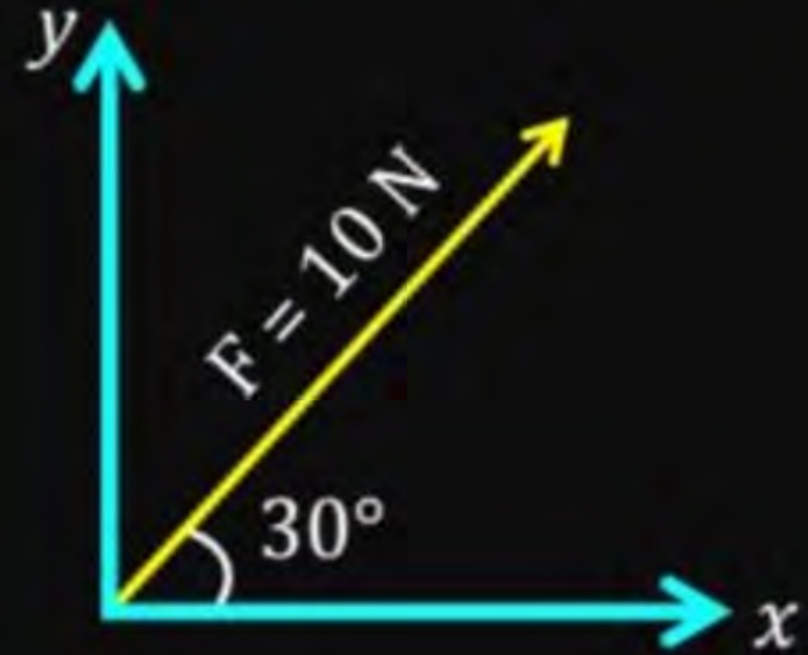
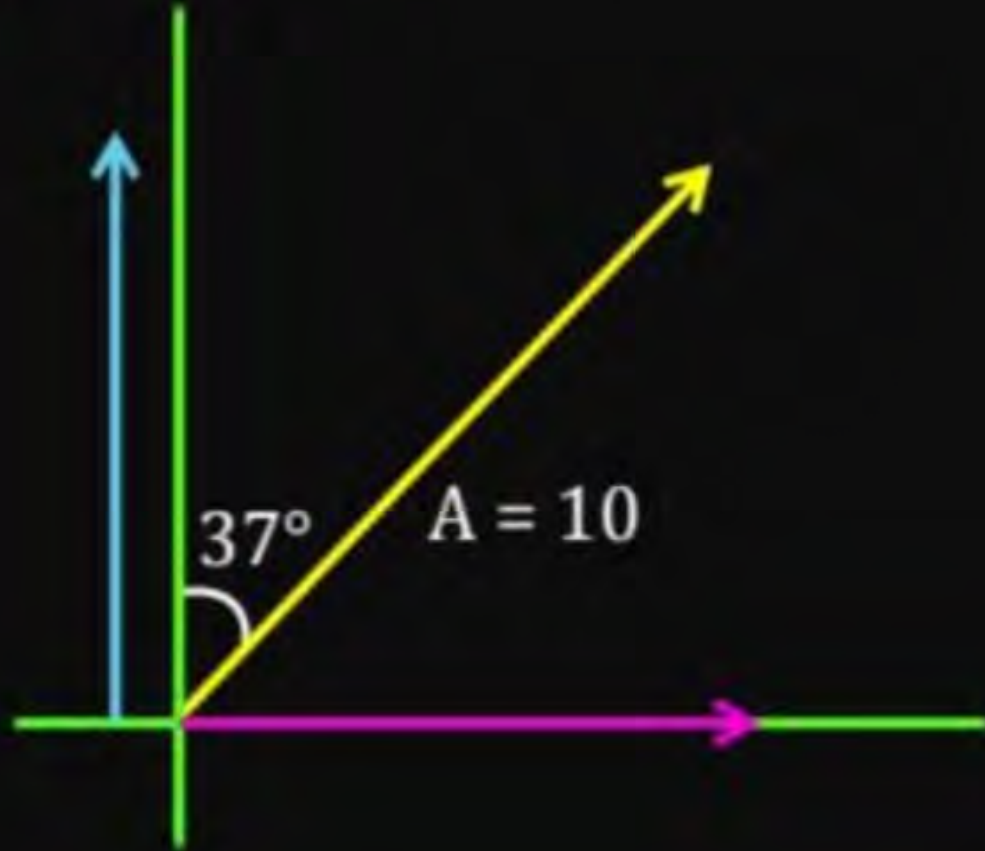
$$|\vec{F}| = \sqrt{f_x^2 + f_y^2 + f_z^2}$$

#

H/W



H/w



Find magnitude of Vector:

$$\vec{A} = 2\hat{i} + 3\hat{j} \quad \rightarrow$$

$$\vec{B} = 3\hat{i} + 4\hat{j} \quad \rightarrow$$

$$\vec{C} = 3\hat{i} + 4\hat{j} + 5\hat{k} \quad \rightarrow$$

$$\vec{D} = \hat{i} - \hat{j} + \hat{k} \quad \rightarrow$$

$$\vec{E} = 6\hat{i} - 8\hat{j} + 10\hat{k} \quad \rightarrow$$

$$\vec{F} = 10\hat{i} - 10\hat{j} - 10\hat{k} \quad \rightarrow$$

THANK
YOU