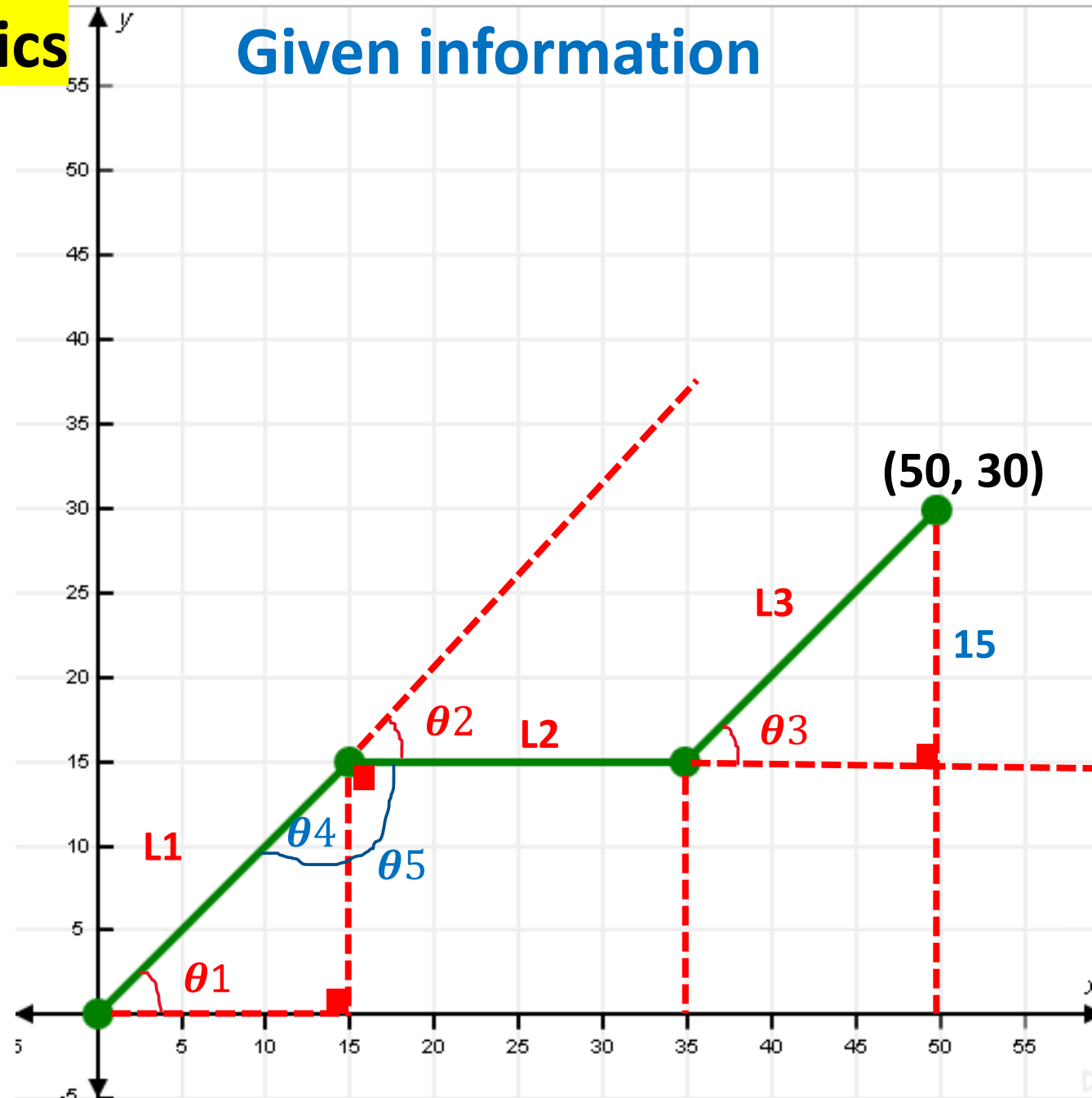


Forward kinematics & inverse kinematics

Inverse kinematics

X= 50
Y= 30

Given information



Pythagoras theorem:

$$h^2 = a^2 + b^2$$

$$h^2 = 15^2 + 15^2$$

$$h = \sqrt{15^2 + 15^2}$$

$$h = 21.21$$

L1 and L3 are equal 21.21

$$\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\sin \theta = \frac{15}{21.21}$$

$$\theta = \arcsin \frac{15}{21.21}$$

$$\theta = 45.01^\circ$$

θ_1 and θ_2 are equal 45.01

$$\theta_4 = 180 - (45.01 + 90)$$

$$\theta_4 = 44.99^\circ$$

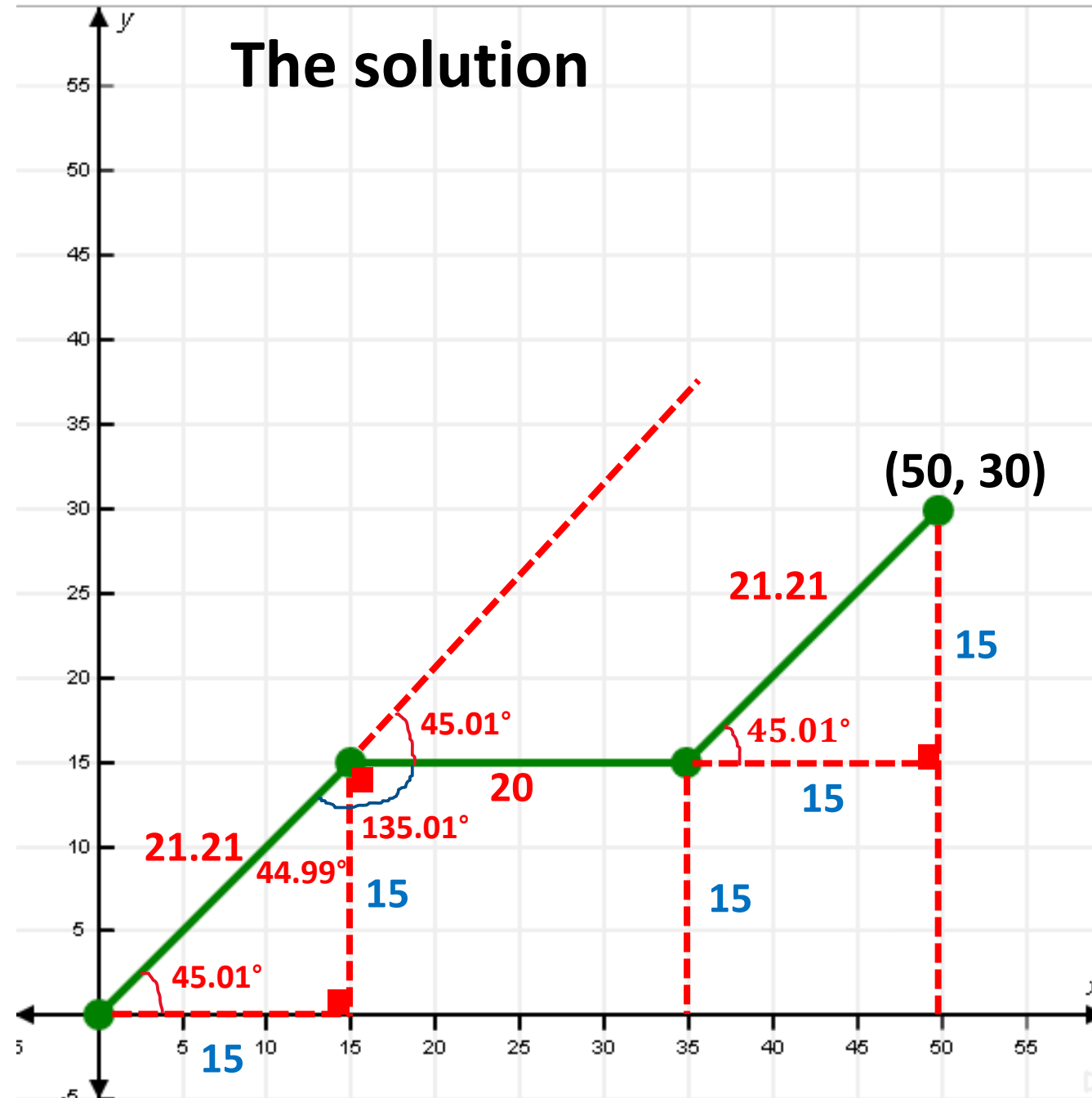
$$\theta_5 = 44.99 + 90$$

$$\theta_5 = 134.99^\circ$$

$$\theta_2 = 180 - 134.99$$

θ_2 and θ_3 are equal

The solution



$$L1 = 21.21$$

$$L2 = 20$$

$$L3 = 21.21$$

$$\theta_1 = 45.01$$

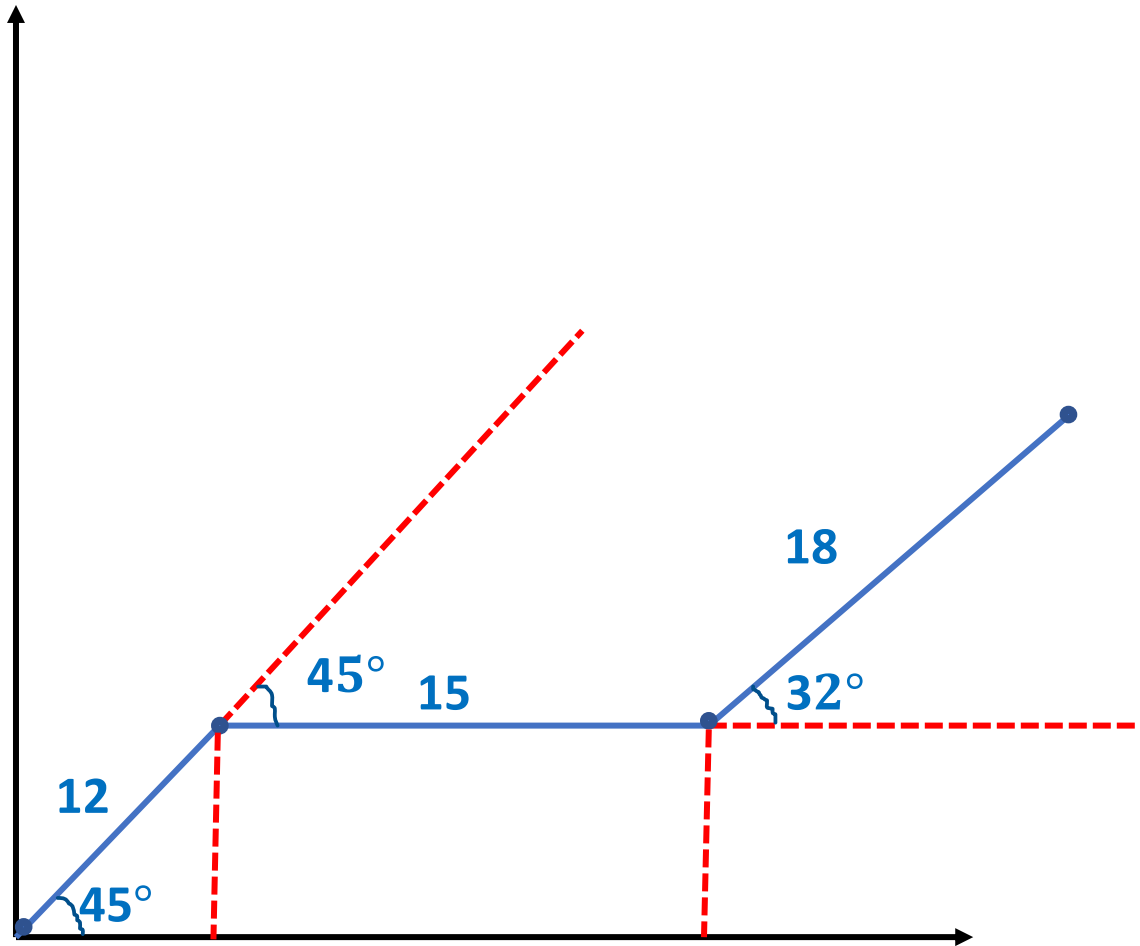
$$\theta_2 = 45.01$$

$$\theta_3 = 45.01$$

Forward kinematics:

Given information

- $L1 = 12$
- $L2 = 15$
- $L3 = 18$
- $\theta1 = 45^\circ$
- $\theta2 = 45^\circ$
- $\theta3 = 32^\circ$



The solution

$$X = (L1 \cos \theta 1) + L2 + (L3 \cos \theta 3)$$
$$Y = (L1 \sin \theta 1 + L3 \sin \theta 3)$$

$$X = (12 \cos 45) + 15 + (18 \cos 32)$$
$$X = 38.75$$
$$Y = (12 \sin 45 + 18 \sin 32)$$
$$Y = 18.02$$
$$(x,y) = (38.75, 18.02)$$

