Science behind Neeraj's success

Time = 3 sec
Distance =17.85m
Angle of throw = 37.7
Wind Direction = anticlockwise
Wind speed = Anticlockwise
Air velocity = 2.58m/s

How did we measure the horizontal distance:

We measured the distance using the measuring tape by considering the person standing as the starting point, and the point where the rod touched the ground as the ending point.

How did we measure the time:

We measured the time using the video taken when throwing the rod. We calculated the time taken from the time to release till the time the rod touched the ground using the video we took.

How did we measure the angle:

We first used an app called ' Angular'. To get an accurate angle, we made the baseline 180 degrees to get an accurate value of the angle. We used the app, to mark accurately the angle at which the rod leaves the hand of the player. We calculated the hand movement when calculating the angle of the throw.

Which angle is more preferred 36 degrees or 45 degrees?

The most appropriate javelin throwing angle normally lies between 32 and 36 degrees. Numerous benefits come with this reduced angle, including enhanced aerodynamics, increased control, effective energy transfer, and general consistency in the throw. Although some throwers can get away with a 45-degree slant, it's less common because of its probable steeper trajectory and shorter range. To increase throwing distance while retaining control, finding the perfect release angle requires some experimentation, frequently with coaching and technique improvement as a guide.

How does having an initial velocity help?

Additionally, having an initial velocity helps in throwing the rod further. By giving it an initial push or momentum, an object, like a rod, can go further thanks to its starting velocity. The object can continue moving thanks to its initial momentum, which aids in overcoming sources of resistance like friction. The starting velocity affects how far an object goes before coming to a stop, whether it's via reducing friction on a surface, maintaining momentum, following a curved trajectory in projectile motion, or assisting acceleration.

a:37.7°

Calculation:

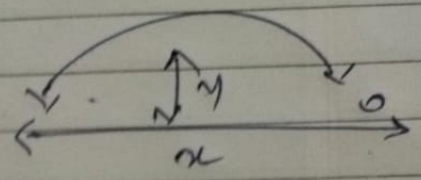
Given :-

Time = 1.5 sec

Distance = 17.85 m

Angle of throw = 37.7°

Air velocity = 2.58 m/s



$S_y = V_0 \sin(37.7) \times 1.5 - 1/2 \times 9.8 \times (1.5)^2$

$0 = V_0 (0.61) \times 1.5 - 11.025$

$= V_0 (0.915) - 11.025$

$11.025 = V_0 (0.915)$

$V_0 = \frac{11.025}{0.915}$

$\boxed{V_0 = 12.04}$

$S_x = V_0 \cos(37.7) + V_{tail} \times 1.5$

$= 12.04 (0.79) + 2.58 \times 1.5$

$= 12.09 \times 1.5$

$= 18.135$

Horizontal range for 45°

$$R_{45^\circ} = \left(V_0 \cos(45) + V_{tail}\right) \times 1.5$$

$$= \left[\left(12.04\right)\left(0.70\right) + \left(2.58\right)\right] \times 1.5$$

$$= 11.008 \times 1.5$$

$$\boxed{R_{45^\circ} = 12.298}$$

Horizontal range for 36°

$$R_{36^\circ} = \left(V_0 \cos(36) + V_{tail}\right) 1.5$$

$$= \left[\left(12.04\right)\left(0.80\right) + 2.58\right] 1.5$$

$$= 12.212 \times 1.5$$

$$\boxed{R_{36^\circ} = 18.318}$$

$$\boxed{R_{36^\circ} > R_{45^\circ}}$$

Hence Proved!

The range for angle 36 degree is more than the range for angle 45 degree which proves why 36 degrees is more preferrable.