

How to calculate arrow velocity

Using the distance of the sight from the archer's eye and the distance between the 20m and 60 m sight marks.

First let's take a look at the parabolic trajectory:

s = distance to target. V_0 = Arrow velocity.

α = Arrow elevation. $g_0 = 9,82 \text{ m/s}^2$ (at latitude 60-65)

$$s = \frac{2 \cdot V_0^2}{g_0} \cdot \sin \alpha \cdot \cos \alpha$$

For small angles ($< 8^\circ$) cosine is very close to 1

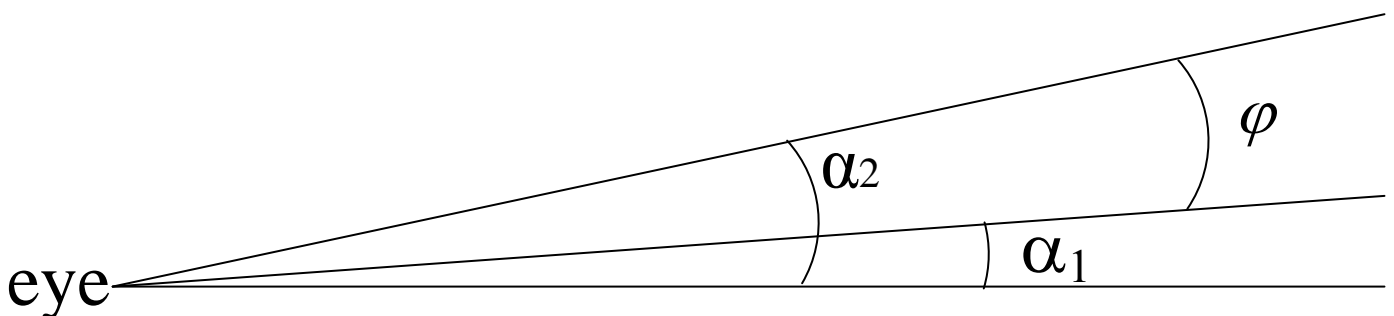
Thus the arrow velocity for small elevation angles is:

$$v = \sqrt{\frac{g_0 \cdot s}{2 \cdot \sin \alpha}}$$

Now we define two elevation angles:

α_1 = elevation angle for hitting the target at 20 meters

α_2 = elevation angle for hitting the target at 60 meters



φ = the angle between 20m and 60m sight marks and the sighting eye.

$$\alpha_2 = \alpha_1 + \varphi$$

The arrow velocity (v) is of course the same whether we shoot at 20m or 60m:

$$v = \sqrt{\frac{g_0 \cdot 20}{2 \cdot \sin \alpha_1}} = \sqrt{\frac{g_0 \cdot 60}{2 \cdot \sin \alpha_2}}$$

Squaring both sides and dividing by $g_0/2$ we get

$$\frac{20}{\sin \alpha_1} = \frac{60}{\sin \alpha_2}$$

$$\sin \alpha_1 \cdot 60 = \sin \alpha_2 \cdot 20$$

$$\sin \alpha_2 = 3 \cdot \sin \alpha_1$$

$$\alpha_2 = \alpha_1 + \varphi$$

And then

$$\sin(\alpha_1 + \varphi) = 3 \sin \alpha_1$$

For small angles, $\sin(\alpha_1 + \varphi) = \sin \alpha_1 + \sin \varphi$

giving us

$$\sin \alpha_1 + \sin \varphi = 3 \sin \alpha_1$$

thus $\sin \alpha_1 = 0,5 \cdot \sin \varphi$

$$v = \sqrt{\frac{g_0 \cdot 20}{2 \cdot \sin \alpha_1}} = \sqrt{\frac{g_0 \cdot 20}{2 \cdot 0.5 \cdot \sin \varphi}} = \sqrt{\frac{196.4}{\sin \varphi}}$$

a =distance from your eye the sight pin

d =distance from 20m mark to 60m mark on sight scale

$$v = \sqrt{\frac{196.4 \cdot a}{d}}$$

about 1%

[illegible]

The estimated **arrow velocity** may control as measured by

ArrowSpeedometer see www.ide-teknik.com/eanalys-velocity.htm

Reference:

<http://margo.student.utwente.nl/sagi/artikel/speed/arrow.html>

<http://www.bio.vu.nl/thb/users/kooi/tuko92.pdf>

Arrow velocity calculate:

You can use this link: <http://www.ide-teknik.com/arrowspeed.htm> or use the diagram below

