Task

The task is to take a common game programming problem, research the formula required to solve the problem, and convert that solution into UnityScript? code.

Problem statement

To calculate the angle of elevation required to hit a target at a known distance with a projectile fired at a fixed velocity. The projectile will fall under gravity.

Formula

The formula for calculating the angle of elevation required to hit a given range and projectile velocity is:

$$\theta = \frac{1}{2}\sin^{-1}\left(\frac{gR}{v^2}\right)$$

where the theta symbol is the angle, g is gravity, R is the range, and v is the velocity.

Solution

Here is the UnityScript? to find the angle of elevation in degrees or return -1 if the target is out of range.

```
function ElevationAngle (target: Transform, velocity: float): float {

    var range: float = target.position.x - transform.position.x;
    var gravity: float = Physics2D.gravity.magnitude;
    var sine: float = (gravity * range) / (velocity * velocity);
    var angle: float = -1.0;
    if (sine >= -1 && sine <= 1) {
        angle = 0.5 * Mathf.Asin(sine);
    }

    return angle * Mathf.Rad2Deg;
}
```

Notes

This function assumes that you and your target are aligned with the world axes in 2D and that you are at the same height (y value).

Submission

Submitted as a PDF file to source control.

Task Log

Task	Date	Start	End	Interruptions	Hours
Write out problem statement	04/03/2014	09:00	09:10		0.17
Research formula	04/03/2014	09:10	09:20		0.17

Program the solution	04/03/2014	09:20	09:40		0.33
Test the solution	04/03/2014	09:40	09:50		0.17
Write up the solution	04/03/2014	09:50	09:55		0.08
Submit work to source control	04/03/2014	09:55	10:00		0.08