

# C++ Programming Test

A programmer was asked to implement the rule-set below, but he was sloppy and not thorough, so the code you are seeing presents a number of bugs, or missing features from the ruleset.

## Steps

1. **Go through the provided source code, fix all issues (according to the rules), make it run properly and refactor code where you think it is necessary.**
2. **Optimize overall performance (Hint: not only game logic-update performance is important)**
3. **Implement all features listed under “Extensions”.**
4. **Feel free to go ahead and implement additional features to impress us (but make sure to keep the core-ruleset working as outlined!)**

While going through the steps, make sure to explain any decisions you made with code comments or inside a separate document.

Include all files that are necessary to build your project and verify that your application runs properly before zipping up the project and sending it to us. Try to keep the file size as small as possible by including only necessary files. If your file is larger than 5mb, please send us a download link.

## Rules

### Outline:

The game should run inside the windows console.

On start, the application spawns a fixed number of alien ships and exactly one player ship. Player ship and alien ship behave as described below. Every relevant game object has a unique visual representation

If an alien ship gets destroyed the score count will go up by 10 for normal aliens and 20 for better aliens. The game should run deterministically when using the given test seed and end after the fixed time frame.

If the player dies, the game should freeze in its current state and display a game over message including the reached score.

### Alien Ship:

Moves with a constant speed in a given direction (mainly horizontal, slightly vertical). If it reaches the edge of the screen, it will change its direction.

If an alien ship reaches the bottom of the screen the player dies (game over).

An alien ship randomly shoots laser shots depending on a fire rate and can transform into a “Better Alien Ship” after reaching a certain amount of energy. The amount of energy increases randomly per frame. After reaching a certain energy level the alien ship can transform. When the actual transformation happens it is again random.

Collisions between alien ships and the player will result in both objects being destroyed.

### Better Alien Ship:

Alien ship with a higher fire rate and faster movement speed. It also takes two laser shots to destroy a better alien ship.

### Player Ship:

The player ship is like an alien ship though it will not automatically move. The player has movement methods to move left and right and will randomly shoot laser shots.

**Laser Shot:**

Laser shots are spawned by the player ship or the alien ship.

The laser shots from the player move upwards in direction of the alien ships. The laser shots of aliens in the opposite direction.

They are spawned in front of the spaceships.

On collision, they will destroy any spaceship or other laser shot with which they collide. This will result in the destruction of all colliding parties. An explosion will be spawned at the hit point.

**Explosion:**

Visualization of a collision. Will automatically destroy itself after a short amount of time.

## Extensions

1. Add a second mode that allows controlling the player ship via input keys.
2. Spawn alien ships in waves (never-ending continuous waves, number of aliens can increase by wave)
3. Blocking Walls (procedurally spawned blocking walls per wave, can be destroyed by multiple laser shot hits).
4. Power-ups (destroyed enemies have a 10% chance to drop a power-up that moves towards the bottom of the screen). If the player collects it (collides with the power-up) he will gain one of the following enhancements:
  - a. Speed boost (Player gets faster for a certain amount of time)
  - b. Fire rate boost (Player can shoot laser shots faster)
  - c. Triple fire (player can shoot 3 laser shots at once, moving in different directions: straight, 45° left and right)