**Ray tracing in a weekend**

\r returns the cursor to the beginning of a line. So you can overwrite a line in console. Useful for progress updates.

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Class members can be initialised in a member initialiser list rather than in the constructor body (more efficient). For example

Class myClass

{

Public:

myClass() : m\_int(1)

{}

Public:

Int m\_int

}

<https://stackoverflow.com/questions/751681/meaning-of-const-last-in-a-function-declaration-of-a-class>

https://stackoverflow.com/questions/455518/how-many-and-which-are-the-uses-of-const-in-c

const in a method declaration means you can implement two similar methods, one which is called when the object is const and one that isn’t.

**Rules and idioms for operator overloading**

<https://stackoverflow.com/questions/4421706/what-are-the-basic-rules-and-idioms-for-operator-overloading>

**Abstract classes**

https://www.ibm.com/docs/en/zos/2.4.0?topic=only-abstract-classes-c

Designed specifically to be used as a base class.

Contains one pure virtual function by using a pure specifier ( = 0 )

**Virtual functions**

Allow for dynamic function binding

<https://www.ibm.com/docs/en/zos/2.4.0?topic=only-virtual-functions-c>

**Shared\_ptr**

https://docs.microsoft.com/en-us/cpp/cpp/how-to-create-and-use-shared-ptr-instances?view=msvc-170

Smart points. Used when more than one owner might have to manage the lifetime of an object in memory. All instances of a shared ptr point to the same object with access to one “control block” that increments and decrements a reference count. When the reference count reaches zero the control block deletes the memory resource.

Use the **make\_shared** function to create a shared\_ptr.

Eg: auto eg1 = make\_shared<\*data\_type\*>(constructor)

Shared\_ptr is useful with C++ stl containers. If we wrap elements in a shared\_ptr then we can copy into other containers with the understanding that the memory is valid as long as you need it and no longer.

Shared pointers are used in the ray tracing series to allow multiple geometries to share a common instance (for example a bunch of spheres all use the same texture map material) which saves memory. It also makes memory management automatic.

**Iterators**