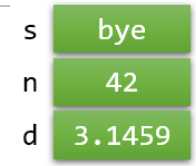
References



In C++, both library types, like `string`, and the built-in primitive types, like `int` and `double`, are called **value types**. In C++ such variables are "boxes" that **contain** data.

C++ also has several **derived types**:

- **pointers**, which contain the address of a variable,
- **arrays**, which contain a sequence of variables
- **references**, which provide an **alias** or alternate name for an existing variable

A reference name is an alternate name or **alias** for an existing object. Here's an example of a variable `n` and its alias `r`. You create a reference by putting an ampersand (`&`) after the type name. The type of `r` is usually pronounced *"int-ref"*.

```
int n = 3;
int& r = n;      // r is now an alias for n
r = 42;          // n is also now 42
```

Here, `r` is simply an alternate name for `n`. It **is not** a new variable. Under the hood, the compiler often uses pointers to implement references (although that's not required). Even if you understand how pointers work, however, you should try not to get the two concepts confused.