

# Integer Division & Remainders

Most of you are familiar with expressions involving addition, subtraction, multiplication and division from Java or Python. However, when it comes to C++ you'll find a few surprises. We want to start this lesson by discussing the differences between **integer division** and normal or **true division**.

Integer division works like grade-school **long division**. You draw a little "house" on the board and put the "maximum occupancy" (called the **dividend**) inside the house. That is the number you want to divide.



Next, you draw the number you want to divide by (the **divisor**), standing at the front door of the house like a group of visitors. In the picture, you can see we have a dividend of **253** and a divisor of **5**.

Then you ask, "how many groups" (of 5 in this case), could fit inside the house and place that number on the roof. This is the **quotient**.

You multiply the quotient by the divisor, place the result beneath the dividend, and subtract. The **remainder** is anything left over (down in the "basement"), **8** in the example the student is solving on the board (on the left), and **3** in the example on the callout.

In C++ **integer division**, the quotient is calculated, and then **truncated** (not rounded). The remainder is **discarded**. With **true division**, **15/4** would be **3.75** but with integer division, it's just **3**, not **4** as it would be if the **3.75** were rounded.

## The Remainder Operator

The **%** or **remainder operator** (sometimes called the **modulus** operator) does exactly the same thing, except, instead of returning the quotient portion from the roof, it **returns the remainder** from the basement.

Here are some examples:

```
cout << 1 / 3 << endl;    // 0 int division
cout << 1.0 / 3 << endl;  // .3333 true division
cout << 12 % 5 << endl;   // 2 left over after 12 / 5
```



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