An important question

What is a monad?

Ask your mother.

No one can be told what a monad is. You have to see it for yourself.

No one knows. Everyone is pretending.

First unit test a function that prints output, then you will know.

```
void estimate()
{
    printf("3");
    printf(".");
    printf("1");
}
```

```
void test_estimate()
{
    estimate();
    assert(???);
}
```

```
void test_estimate()
{
    FakeWorld w;
    estimate(w);
    assert(w.stdout() == “3.1”);
}
```

```
void test_estimate2()
{
    FakeWorld w;
    FakeWorld w2 = estimate2(w);
    assert(w2.stdout() == “3.1”);
}
```

```
int main()
{
    RealWorld w;
    estimate2(w);
}
```

```
template<typename W>
W estimate2(W world)
{
    world = world.print("3");
    world = world.print(".");
    world = world.print("1");
    return world;
}
```

A monad transforms estimate into estimate2.

```
void estimate()
{
    printf("3");
    printf(".");
    printf("1");
}
```

```
template<typename W>
W estimate2(W world)
{
    world = world.print("3");
    world = world.print(".");
    world = world.print("1");
    return world;
}
```

A monad transforms estimate into estimate2.

```
estimate :: IO ()
estimate =
    do
        putStr "3"
        putStr "."
        putStr "1"
```

(magic)

A monad transforms a function so it returns the thing it does stuff to.