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Quiz yourself: Mikalai and Simon divide by zero

Does it matter if the division uses integers, floats, or doubles? Yes, it does.

by Mikalai Zaikin and Simon Roberts

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If you have worked on our quiz questions in the past, you know none of them is easy. They model the difficult questions from certification examinations. We write questions for the certification exams, and we intend that the same rules apply: Take words at their face value and trust that the questions are not intended to deceive you but to straightforwardly test your knowledge of the ins and outs of the language.

Given the `DivisionTest` class

```java
public class DivisionTest {
    static int res = 0;
    static int div(int a, int b) {
        var r = 0;
        try {
            r = a/b;
            res = res + 1;
        } catch (ArithmeticException e) {
            res = res + 2;
        } finally {
            res  = res + 3;
        }
        return r;
    }
    static double div(double a, double b) {
        var r = 0.0;
        try {
            r = a/b;
            res = res + 4;
        } catch (ArithmeticException e) {
            res = res + 5;
        } finally {
            res  = res + 6;
        }
        return r;
    }
    public static void main(String[] args) {
        div(0,0);
```

```
            div(0.0,0.0);
            System.out.println(res);
        }
    }
```

What is the result? Choose one.

A. A runtime exception and no output

The answer is A.

B. 9

The answer is B.

C. 14

The answer is C.

D. 15

The answer is D.

E. 16

The answer is E.

Answer. This question investigates Java's handling of division by zero using integer and floating-point arithmetic and the `try-catch-finally` mechanism.

Key to answering this question are two facts. First, integer division by zero throws an `ArithmeticException`. Second, floating-point division by zero produces a *sentinel value* that indicates the computation was impossible but does not throw any exceptions. This sentinel value might be an infinity (such as `Double.POSITIVE_INFINITY`) if the dividend is nonzero, or it might be "not a number" (`Double.NaN`) if you attempt to divide zero by zero.

This example makes calls to `div(0, 0)` and `div(0.0, 0.0)`. The first of those calls will resolve to the method `div(int, int)`, while the second will resolve to the `div(double, double)` overload.

The call `div(0, 0)` will produce an `ArithmeticException`. This will be caught and the code in the `catch` block increases the value of `res` to 2. Following that, the `finally` block executes and further increments `res` to 5.

Because the exception was caught, it is handled, and the code continues.

Next, the call to `div(0.0, 0.0)` will invoke the `div(double,double)` method. The floating-point division produces the `Double.NaN` value but does not throw an exception. Consequently, the value of `res` is incremented by 4, while still in the `try` block, right after the division. This brings `res` up to 9. Then, the `finally` block is executed, which increments by 6, giving the final result of 15.

Remember that if a `try` block starts to execute, any associated `finally` block will run (it might not finish if another exception arises or the machine is shut down). This is the case regardless of whether the `try` block finishes without any exception, there's an exception that's handled in a `catch`, or there's an exception that goes unhandled.

Based on this, the value 15 will be printed and option D is correct, while options A, B, C, and E are all incorrect.

Conclusion. The correct answer is option D.

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