

# Floating Point Guidelines

# Guidelines

## Guideline 1:

«Do **not** test two floating point numbers for **equality**, if at least one of them was rounded before.»

# Guideline 1 – Example

Guideline 1:

«Do **not** test two floating point numbers for **equality**, if at least one of them was rounded before.»



This is *false*

Example:

```
double a = 0.1;
if (10*a == 1.0)
    std::cout << "no output\n";
```

# Guideline 1 – Example

Guideline 1:

«Do **not** test two floating point numbers for **equality**, if at least one of them was rounded before.»

This is false

Example:

```
double a = 0.1;  
if (10*a == 1.0)  
    std::cout << "no output\n";
```

**Problem:**

0.1 not  
representable

# Guidelines

## Guideline 1:

«Do **not** test two floating point numbers for **equality**, if at least one of them was rounded before.»

## Guideline 2:

«**Avoid** the **addition** of numbers of extremely **different sizes!**»

# Guideline 2 – Example

Guideline 2:

«**Avoid** the **addition** of numbers of extremely **different sizes!**»

Example:

```
float a = 16777216 + 1;  
  
if (a == 16777216)  
    std::cout << "This is output ... \n";
```

# Guideline 2 – Example

Guideline 2:

«**Avoid** the **addition** of numbers of extremely **different sizes!**»

Example:

```
float a = 16777216 + 1;  
  
if (a == 16777216)  
    std::cout << "This is output ... \n";
```

**Problem:**

Significand too  
short

# Guidelines

Guideline 1:

«Do **not** test two floating point numbers for **equality**, if at least one of them was rounded before.»

Guideline 2:

«**Avoid** the **addition** of numbers of extremely **different sizes!**»

Guideline 3:

«**Avoid** the **subtraction** of numbers of **similar sizes!**»



# Guideline 3 – Example

Guideline 3:

«**Avoid** the **subtraction** of numbers of **similar sizes!**»

Example:

```
float volume_exact = 35.828125;  
float volume_approx = 35.328125;  
  
float diff = volume_exact  
            - volume_approx;
```

Due to  
rounding errors

# Guideline 3 – Example

Guideline 3:

«**Avoid** the **subtraction** of numbers of **similar sizes!**»

Example:

```
float volume_exact = 35.828125;  
float volume_approx = 35.328125;  
  
float diff = volume_exact  
            - volume_approx;
```

Due to  
rounding errors

**Danger:**

`diff` **absolutely not** 0