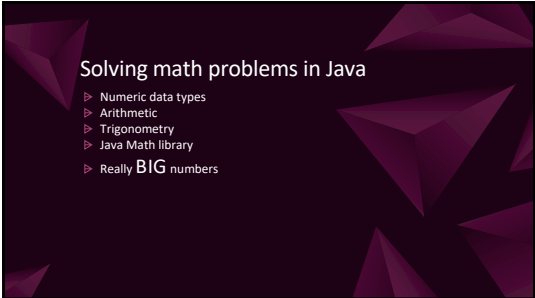
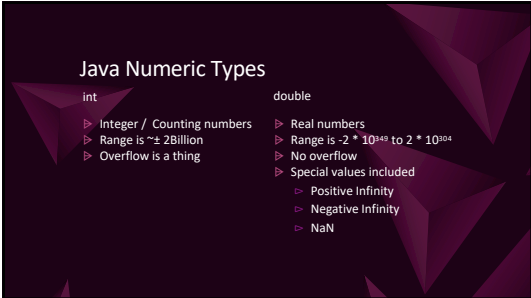




1



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Special Cases

Integer divide by 0

- Throws an `ArithmeticException`

Double divide by 0

- Returns Infinity if it is any number other than zero
- Returns NaN if the numerator is zero

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PEMDAS

- Prens are first and group statements only – no multiplication!
- Exponents are handled with `Math.pow`, no special operator
- Multiplication is done with the `*` operator
- Modulo with the `%` operator
 - You do long division, ignore the answer and keep the remainder
- Division is done with the `/` operator
 - Data type matters!!!!
- Addition is with the `+` operator
- Subtraction is with the `-` operator

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Comparing numeric values

int

- Compare equality with `==`
- Inequality with `!=`

double

- Do **NOT** use `==`
- Subtract two doubles and compare the difference against some predetermined close enough amount
 - Use `Math.abs` to make it easy

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Casting

- ▶ Changing values from double to int requires an explicit cast as the extra information contained in a double has no where to go in an int.
- ▶ Casting up to a double should be done BEFORE the mathematical operation(s) so information is not lost
 - ▶ `double demo = (double) 7 / 4;`
- ▶ Casting down to an int should be done AFTER the operation(s) for the same reason
 - ▶ `int otherDemo = (int) (Math.random() * 100);`

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Random

- ▶ `Math.random()` is the default way to get random numbers in Java
- ▶ It returns a double value in the range [0,1)
 - ▶ AKA it can include 0 but NOT 1
- ▶ I use it most often by multiplying by some scalar and then casting as an int.
- ▶ You can also shift the range up/down the number line by adding or subtracting after multiplying
- ▶ Use `.size()` or `.length` as the scalar for a valid random index
- ▶ `int randomValue = (int) (Math.random() * scalar) + shift;`

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Must know Math methods

- ▶ `Math.abs`
 - ▶ Absolute value
 - ▶ Absolutely helpful
- ▶ `Math.max / Math.min`
 - ▶ Overloaded for int and double
 - ▶ Returns the bigger/smaller of the two parameters
 - ▶ Very nestable!

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More in Math

- Math.pow
 - How to do exponents
 - Handles positive/negative and fractional (root) values!
- Math.sqrt
 - Square roots minus the vowels

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Trigonometric functions

- These all use radians by default so remember your unit circle!
- Take and return double values
- One of the few useful constants in Math.PI

Standard	Inverse
sin(angle)	asin(angle)
cos(angle)	acos(angle)
tan(angle)	atan(angle)
	atan2(y, x)

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Rounding / Bounds

- The methods round, floor, and ceil return values based only on the fractional part of the double value.
- They return long as the data type so will need to be downcast in to an int
- Math.round behaves the way you learned about rounding fractions in elementary
- Math.floor ALWAYS drops all fractional value, regardless of how large the fractional portion is.
- Math.ceil ALWAYS goes to the next whole value regardless of how small the fractional portion is.

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Logarithms

- ▶ If you plan on writing any code to help with calculus you will be using Math.log and Math.log10
- ▶ Math.log is the natural logarithm of the supplied parameter
- ▶ Math.log10 is the base 10 logarithm (quelle surprise)

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Big Numbers

- ▶ What if you want to do math on arbitrarily LARGE values and your want precise answers?
 - Integers: java.math.BigInteger
 - Decimal values: java.math.BigDecimal
- ▶ Slower than int/double but does not have the overflow problem of int or the lack of precision of a double.

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Other methods

- ▶ There are other methods in Math I just did not cover everything. Check out the Java Math API for even more information

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