A+ Computer Science

Math

OPERATIONS

Expressions

average = total / 5

sum = one + two

Expressions usually consist of operators, variables, and/or literal values.

Operators

+	**addition**
-	**subtraction**
*	**multiplication**
/	**division**
%	**modulus**

Integer Math

```
out.println("6 + 5 == " + (6+5));
out.println("6 - 5 == " + (6-5));
out.println("6 * 5 == " + (6*5));
out.println("6 / 5 == " + (6/5));
```
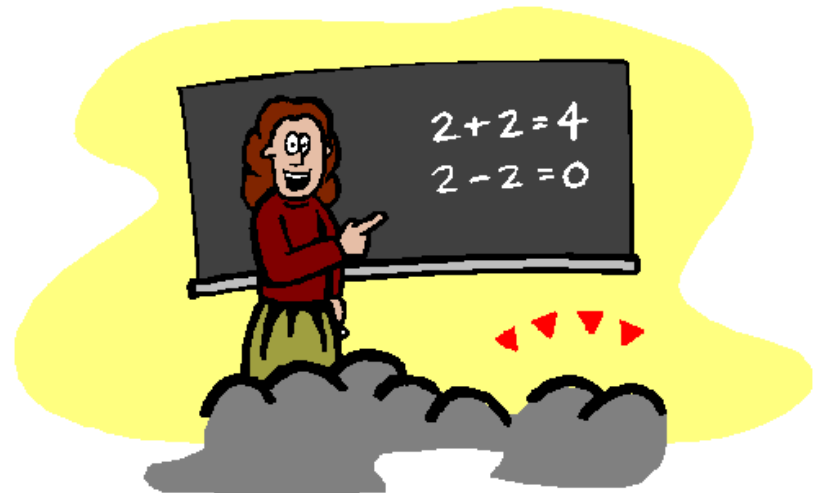
OUTPUT

6 + 5 == 11
6 - 5 == 1
6 * 5 == 30
6 / 5 == 1

Real Math

```
out.println("6.1 + 5.2 == " + (6.1+5.2));
out.println("6.1 - 5.2 == " + (6.1-5.2));
out.println("6.1 * 5.2 == " + (6.1*5.2));
out.println("6.1 / 5.2 == " + (6.1/5.2));
```

OUTPUT
6.1 + 5.2 == 11.3
6.1 - 5.2 == 0.8999
6.1 * 5.2 == 31.72
6.1 / 5.2 == 1.17307

Division

$$1/2 = ??$$
$$1.0 / 2.0 = ??$$

$$1/2 = 0$$
1 and 2 are integer constants.

$$1.0/2.0 = 0.5$$
1.0 and 2.0 are decimal constants.

Division

$$1 / 2.0 \ = \ ??$$
$$1.0 / 2 \ = \ ??$$

$$1/2.0 = 0.5$$

$$1.0/2 = 0.5$$

As long as one value is a decimal, the result is a decimal.

Division

1 / 0 = ??
0 / 1 = ??

Dividing by 0 causes a runtime exception to be thrown.
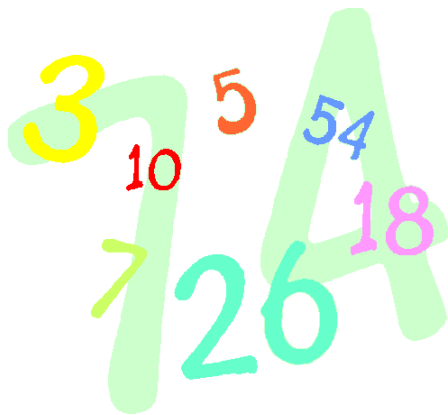
Dividing 0 by 1 results in 0.

Remainder

mod(%) gives you the integer remainder of integer division.

out.println(2 % 3);
out.println(3 % 2);

OUTPUT

2

1

Remainder

mod(%) gives you the integer remainder of integer division.

num = 45;
out.println(num%10);
out.println(num/10);

OUTPUT

5

4

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Remainder

mod(%) gives you the real number remainder of real number division.

out.println(9 % 3);

out.println(9.2 % 3);

OUTPUT
0
0.2

divide.java
modulus.java

Precedence

	HIGH
()	
! ++ --	
*** / %**	
+ -	
= += -= *= /= %=	
,	LOW

Assignment

```
int num = 10;
out.println(num);

num = num + 5;
out.println(num);

num = 10 * 2 + 7;
out.println(num);
```

OUTPUT

10
15
27

Assignment

```
num *= 2;
out.println(num);

num /= 5;
out.println(num);

num = num + 4 / 2 - 8;
out.println(num);

num = (4 + 5)/2+7;
out.println(num);
```

OUTPUT

54
10
4
11

Shortcuts

```
num = 11;
out.println(num);

num++;
out.println(num);

num--;
out.println(num);

num++;
out.println(num);
```

OUTPUT

11
12
11
12

Compound Assignment

```
num = 11;
num += 3;
out.println(num);

num %= 3;
out.println(num);

num *= 5;
out.println(num);
```

OUTPUT
14
2
10

assignment.java
shortcuts.java

Casting

Casting is used to temporarily change the type of a value.

(int)3.14159
(double)3

Casting is often used to create compatibility among data types.

Casting

```
int one = 0;              //32 bit int
long big = 453;           //64 bit int
double dec = 7.56;        //64 bit real

one = dec;                //illegal
one = big;                //illegal
one = (int)dec;           //legal
one = (int)big;           //legal
```

Casting is often used to create compatibility among data types.

cast.java

Casting

```
int one = 11;
int two = 5;
double dec = (double)one/two;
```

As long as one part of the division is a decimal value, the result will be a decimal.

one is temporarily converted to a double before the division.

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Casting

```
out.println("1/2 = " + (1/2));
out.println("(double)1/2 = " + (double)1/2);
out.println("5/2 = " + (5/2));
out.println("5/(double)2 = " + 5/(double)2);
```

OUTPUT
1/2 = 0
(double)1/2 = 0.5
5/2 = 2
5/(double)2 = 2.5

intcast.java

Work on Programs!

Crank Some Code!

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Math

OPERATIONS