**MATHEMATICAL OPERATORS IN JAVA**

There are 5 main mathematical operators in Java. These are:

\*, / and %

+ and –

You are familiar with \* (multiply), / (divide), + (plus) and – (minus), but probably not with the % (mod) operator. The mod operator takes two operands and returns the remainder when the first operand is divided by the second operand.

E.g. 11 % 3 = 2 (11 divided by 3 is 3, with a remainder of 2)

# PRECEDENCE RULES FOR MATHEMATICAL OPERATORS

If a mathematical expression in Java consists of more than 1 operator, the compiler will evaluate the expression using in-built precedence rules. These are:

**( )** any part of the expression in brackets is evaluated first

**\* / and %** operators have the highest precedence and are evaluated left to right.

**+ and –** have the lowest precedence and are evaluated left to right

It is also important to note that an integer divided by an integer, results in an integer (not a float) **Examples**

(6+2\*3) % (2/3+4) 6+2\*3 % 2/3 +4

= (6+6) % (0+4) 6+6 % 2/3+4

=12%4 6 +0/3 +4

6+0 +4

= 0 =10

# EXERCISE: EVALUATE THE FOLLOWING EXPRESSIONS

|  |  |  |
| --- | --- | --- |
| **1** | 6 + 4\*3-7 | 11 |
| **2** | 5\*6+2\*8 | 46 |
| **3** | 6\*3\*(2-5)-14+7%2 | -67 |
| **4** | 4 + (3\*7-2\*4) – 8/5 | 16 |
| **5** | 3/4\*8-4%3-7\*2 | -15 |
| **6** | 3+3\*4/5+(7-8\*12%2) | 12 |

# WORKED EXAMPLE

Write a program that will ask for the length and breadth of a room and will calculate and output the area of the room.

**Algorithm**

OUTPUT “Enter the length of the room: “

INPUT length [decimal point number]

OUTPUT “Enter the breadth of the room: “

INPUT breadth [decimal point number]

SET area = length x breadth [decimal point number] OUTPUT “The area of the room is “ + area + “ square units” Now, take each line of pseudocode and translate it to Java.

|  |
| --- |
| import java.util.Scanner;    public class Area { public static void main(String[] args) {  float length, breadth;  // Read in the dimensions of the room.  Scanner sc = new Scanner(System.in);    System.out.print ("Enter the length of the room:\t"); length = sc.nextFloat ();  System.out.print ("Enter the breadth of the room:\t"); breadth = sc.nextFloat ();  // Calculate and output the area of the room.    float area = length \* breadth;  System.out.println ("The area of the room is " + area + " square units"); }  } |

**EXERCISES**

In each case, fill out the test data so that you can test your program when it compiles.

1. Write a program that will read in 3 numbers and will output their average.

|  |  |  |  |
| --- | --- | --- | --- |
| **Number 1** | **Number 2** | **Number 3** | **Average** |
| 8.2 | 50.4 | -8.6 | 16.666666 |
| 65.3 | -87.256 | 3.24 | -6.2386646 |
| 3.57 | 2.45 | 8.56 | 4.86 |

1. Write a program that read in an amount in euros and will calculate and output the equivalent amount in American dollars and Sterling.

Use the conversion rates: €1 = $1.3469 and €1 = £0.851713671

|  |  |  |
| --- | --- | --- |
| € **(Euro)** | **$ (American dollars)** | **£ (Sterling)** |
| €32.56 | $43.855064 | £ 27.731798 |
| €657.14 | $885.10187 | £ 559.6951 |
| €214.91 | $289.46228 | £ 183.04178 |

1. Write a program that will read in a measurement in miles and will convert it to kilometres. Output the number of kilometres calculated. 1 mile = 1.609 km

|  |  |
| --- | --- |
| **Miles** | **Kilometres** |
| 18.659 | 30.022331 |
| 256.14 | 412.12927 |
| 7.36 | 11.84224 |

1. Write a program that will read in the length and width (in metres) of a garden lawn. Calculate and output the area of the lawn and the cost of reseeding the lawn (€3.75 per square metre).

|  |  |  |
| --- | --- | --- |
| **Length** | **Breadth** | **Cost of reseeding** |
| 3.2 | 5.6 | 67.2 |
| 8.9 | 7.1 | 236.96 |
| 11.7 | 8.5 | 372.94 |

1. The cost per **yard** of a particular fabric is €12.99. Write a program that will read in the length of a piece of this fabric in **metres** and will output the cost of buying it. 1 yard = 1.196 metres.

|  |  |
| --- | --- |
| **Length (metres)** | **Cost** |
| 3.6 | 55.93 |
| 4.8 | 74.57 |
| 20.69 | 321.44 |

1. Write a program to input a name (first name only), height in feet and inches and weight in stones and pounds. Convert the height to centimetres and the weight to kilograms. Output the name followed by “You are “ and the calculated centimetres “centimetres and you weigh” followed by the weight in kilograms.

Conversions are: 1 inch = 2.54 cm 1 stone = 6.364 kg (and there are 14 lbs in a stone)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Stones** | **Pounds** | **Feet** | **Inches** | **Output** |
| John | 13 | 8 | 5 | 11 | Your name is John and you are 180.34 tall and weight 86.37 kgs |
| Susan | 10 | 5 | 5 | 7 | Your name is Susan and you are 170.18 tall and weight 65.91 kgs |
| Frank | 15 | 8 | 6 | 2 | Your name is Frank and you are 187.96 tall and weight 99.10 kgs |

Have the output as ***name*** **is *x*** **centimetres and *y*** **kilograms**, where name is the name input, x is the number of calculated centimetres and y is the calculated kilograms.

1. Write a program that will read in a person’s gross wage. It should then calculate their tax @ 29% of the gross, prsi @ 7% of the gross and net pay as the gross pay – prsi – tax. Make the output meaningful.

|  |  |  |  |
| --- | --- | --- | --- |
| **Gross** | **Tax** | **Prsi** | **Net** |
| 12345.67 | 3580.24 | 864.20 | 7901.23 |
| 63523.76 | 18421.89 | 4446.66 | 40655.21 |
| 452783.88 | 131307.31 | 31694.87 | 289781.69 |