

Worksheet 2

Expression Trees

An expression tree shows the *structure* of an expression—how the expression's parts fit together.

An expression tree is made by following these steps:

1. Put an operation sign at the top. This will be “+” if the expression is a sum, “*” if it is a product, “-” if it is a difference, and so on.
2. Draw two line segments that drop to the left and to the right of the operation sign. These will connect the operation sign with the things that are being operated upon (called *operands*).
3. Put the operands below the operation sign at the ends of the line segments.

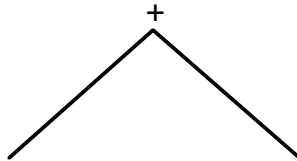
The "trick" to constructing complicated expression trees is to understand that, in step 3, if an operand is an expression, you will have to construct another expression tree.

*Example: Draw an expression tree for $3*5+2$*

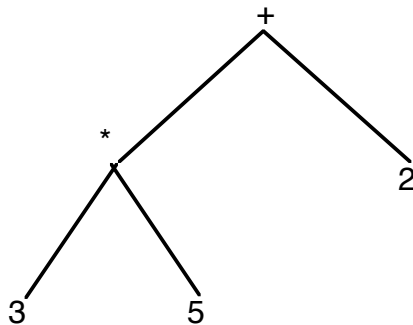
First, rewrite the expression with parentheses.

$$3*5+2 \text{ --- } \rightarrow (3*5)+2$$

Second, write the top operation sign with two branches.



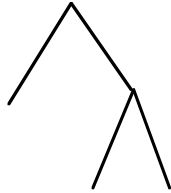
Third, put the things being operated upon at the ends of the branches. If an expression is one of the things being operated upon, then repeat these steps to write it as an expression tree.



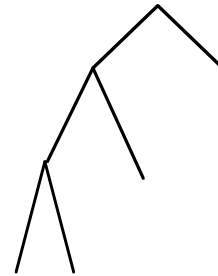
Part I (Partial trees)

Put parentheses where they belong in the expressions. Then complete the expression tree for each expression. Check yourself by comparing your answer with another student.

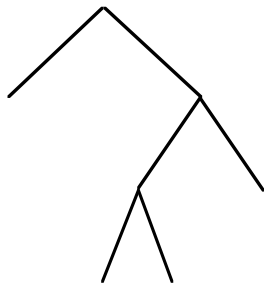
1. $5 - 10 * 2$



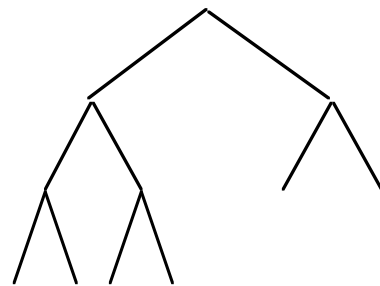
2. $4 / 2 + 3 - 4$



3. $4 / (2 + 3 - 4)$



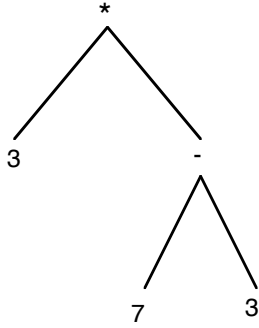
4. $5 * 4 + 6 / 3 - 7 * 2$



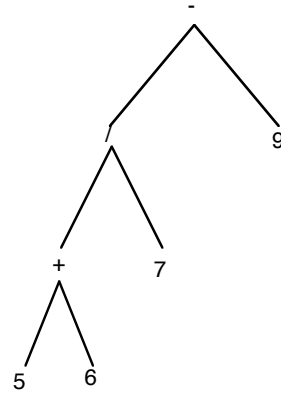
Part II

1. For each tree, write an expression that will make the tree.

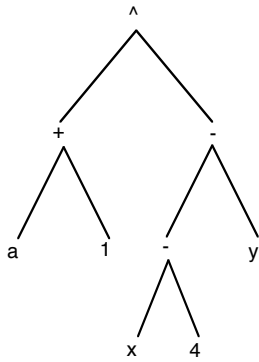
a.



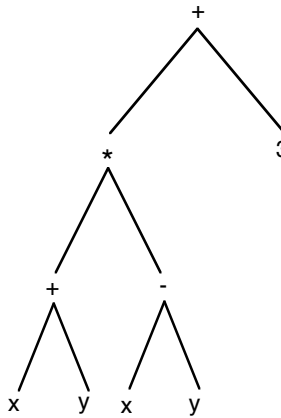
b.



c.



d.



Part III

Draw an expression tree for each expression. Check yourself by comparing your answer with another student.

1. $11 - 2^9 / 3$

2. $6 * (x - 8) + 2 * y$

3. $u * 12 - v * 8$

4. $2 * (z - 4) * 8$

5. $c - d + d / 4 - f * 5$

6. $c - (d + d / 4 - f) * 5$