Math Prof. Pennance – Summary of Lecture 9 - Algorithms

1. Roughly speaking, an *algorithm* is a finite sequence of steps which solves a problem or class of problems.

2. An algorithm for addition

   (a) Addition without rebundling

   $$\begin{array}{r} 5 \\ +2 \\ \hline 7 \end{array} \qquad \begin{array}{r} 50 \\ +20 \\ \hline 70 \end{array} \qquad \begin{array}{r} 500 \\ +200 \\ \hline 700 \end{array}$$

   Explanation:

   $$\begin{aligned} 500 + 200 &= 5 \times 10^2 + 2 \times 10^2 \\ &= (5+2) \times 10^2 \\ &= 7 \times 10^2 \\ &= 700 \end{aligned}$$

10^3	10^2	10^1	10^0
			

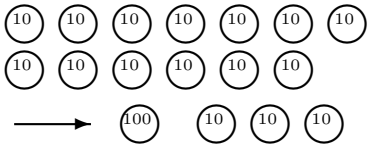
   +

10^3	10^2	10^1	10^0
			

   =

10^3	10^2	10^1	10^0
			

   (b) Rebundling

   (c) Single instances of rebundling

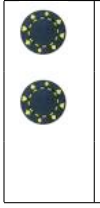
   $$\begin{array}{r} 15 \\ +27 \\ \hline 42 \end{array}$$

   (d) Multiple rebundling

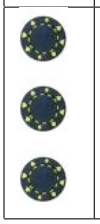
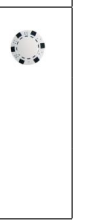
   $$\begin{array}{r} 1266 \\ +2355 \\ \hline 3621 \end{array}$$

10^3	10^2	10^1	10^0
			

   +

10^3	10^2	10^1	10^0
			

   =

10^3	10^2	10^1	10^0
			

3. An algorithm for subtraction

   (a) Subtraction without unbundling

   (b) Subtraction with unbundling

4. Multiplication by a 1-digit number.

   (a) Without rebundling

   (b) With rebundling

5. Multiplication by multidigit numbers.