

Heimadaemi 2 - Forritunarmál (Einstaklingsverkefni)

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Verkefni

```
function SumInts(k: int): int
  requires k >= 0
{
  if k == 0 then 0 else SumInts(k - 1) + k
}

method SumIntsLoop(k: int) returns (s: int)
  requires k >= 0
  ensures s == (k + 1) * k / 2
  ensures s == SumInts(k)
{
  var i := 0;
  s := 0;
  while i < k
    invariant 0 <= i <= k
    decreases k - i
    invariant s == i * (i + 1) / 2
    invariant s == SumInts(i)
  {
    s := s + i + 1;
    i := i + 1;
  }
}

method SumIntsRecursive(k: int) returns (s: int)
  requires k >= 0
  ensures s == (k + 1) * k / 2
  ensures s == SumInts(k)
{
  if (k == 0)
    {return 0; }
  else
  {
    var result := SumIntsRecursive(k - 1);
    return result + k;
  }
}

method SumIntsTailRecursive(i: int, r: int, k: int) returns (s: int)
  requires 0 <= i <= k
  decreases k - i
  requires r == (i+1)*i/2
```

```

requires r == SumInts(i)
ensures s == (k + 1) * k / 2
ensures s == SumInts(k)
{
  if (i == k)
  {return r;}
  else
  {
    var nexti := i + 1;
    var nextr := r + nexti;
    var result := SumIntsTailRecursive(nexti, nextr, k);
    return result;
  }
}

method Main()
{
  var s1 := SumIntsLoop(5);
  var s2 := SumIntsRecursive(5);
  var s3 := SumIntsTailRecursive(0,0,5);
  var s4 := SumIntsTailRecursive(4,10,5);
  print s1;
  print s2;
  print s3;
  print s4;
}

```

<http://tinyurl.com/MDAN1>