

# Introduktion til Programmering og Problemløsning (PoP)

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# Decimal til Binær

## Program (.fsx)

```
/// Convert a non-negative integer into its
/// binary form. E.g., dec2bin 3 = "0b11"
let dec2bin n =
    if n < 0 then
        "Illegal value"
    elif n = 0 then
        "0b0"
    else
        let mutable v = n
        let mutable str = ""
        while v > 0 do
            str <- (string (v % 2)) + str
            v <- v / 2
        "0b" + str
let N = 116
printfn "%d_10 = %s_2" N (dec2bin N)
```

## Implementation (.fs)

```
module convert

let dec2bin n =
    if n < 0 then
        "Illegal value"
    elif n = 0 then
        "0b0"
    else
        let mutable v = n
        let mutable str = ""
        while v > 0 do
            str <- (string (v % 2)) + str
            v <- v / 2
        "0b" + str
```

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## Application (.fsx)

```
open convert

let N = 116
printfn "%d_10 = %s_2" N (dec2bin N)
```

# White-box testing

1. Beslut hvilke units, der skal afprøves
2. Identificer forgreningspunkter
3. Lav inputeksempler for alle units, som afprøver hver forgreningsvej, og notér det forventede output
4. Skriv et program, som kører koden med alle inputeksempler, og sammenlign resultatet med det forventede output

module convert

let dec2bin n =

if n < 0 (\* WB: 1 \*)

"Illegal value"

elif n = 0 then (\* WB: 2 \*)

"0b0"

else

let mutable v = n

let mutable str = ""

while v > 0 do (\* WB: 3 \*)

str <- (string (v % 2)) + str

v <- v / 2

"0b" + str

Unit	Branch	Condition	Input	Expected output	Comment
dec2bin	1	n < 0			
	1a	true	-1	"Illegal value"	
	1b	false			-> Branch 2
	2	n = 0			n >= 0
	2a	true	0	"0b0"	
	2b	false			-> Branch 3
	3	v > 0			n > 0
	3a	true	1	"0b1"	1 or more
	3b	false			0 times, impossible.

# White-box testing

Unit	Branch	Condition	Input	Expected output	Comment
dec2bin	1	$n < 0$			
	1a	true	-1	"Illegal value"	
	1b	false			-> Branch 2
	2	$n = 0$			$n \geq 0$
	2a	true	0	"0b0"	
	2b	false			-> Branch 3
	3	$v > 0$			$n > 0$
	3a	true	1	"0b1"	1 or more
	3b	false			0 times, impossible.

open convert

```
printfn "White-box testing of dec2bin n"
printfn " %5b: Branch 1a" (dec2bin -1 = "Illegal value")
printfn " %5b: Branch 2a" (dec2bin 0 = "0b0")
printfn " %5b: Branch 3a" (dec2bin 1 = "0b1")
```

```
$ fsharp -a dec2bin.fsi dec2binWhite.fs
$ fsharp -r dec2binWhite.dll dec2binWhiteTest.fsx
$ mono dec2binWhiteTest.exe
White-box testing of dec2bin n
  true: Branch 1a
  true: Branch 2a
  true: Branch 3a
```

# Resumé

I denne video hørte du om:

- Whitebox testing