

# Bittiooperaatiot Javalla

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# Kehysrakenne

D	M	Y
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Syntymäaika

D = päivä (5 bittiä)

M = kuukausi (4 bittiä)

Y = vuosi (7 bittiä)

Yhteensä 16 bittiä, 2 tavua

Kuinka asetetaan?

# Päivämäärän asetus 16 bittiin



```
int D=31; int M=12; int Y=99; // byte, short
```

```
short DMY=0; // 16 bittiä, 2 tavua
```

```
DMY = (short)(DMY ^ (D << 11));
```

```
DMY = (short)(DMY ^ (M << 7));
```

```
DMY = (short)(DMY ^ Y);
```

# Päivän asetus kenttään



```
int D=31; int M=12; int Y=99;
```

```
DMY = (short)(DMY ^ (D << 11));
```

$D = 31_{10} = 0000000000011111_2$

$D \ll 11_{10} = 1111100000000000_2$

	0000000000000000	DMY
XOR	1111100000000000	$D \ll 11$
	1111100000000000	uusi DMY

# Kuukauden asetus kenttään



```
int D=31; int M=12; int Y=99;
```

```
DMY = (short)(DMY ^ (M << 7));
```

$M = 12_{10} = 0000000000001100_2$

$M \ll 7_{10} = 0000011000000000_2$

	1111100000000000	DMY
XOR	0000011000000000	$M \ll 7$
	1111111000000000	uusi DMY

# Vuoden asetus kenttään

D	M	Y
---	---	---

```
int D=31; int M=12; int Y=99;
```

```
DMY = (short)(DMY ^ Y);
```

$Y = 99_{10} = 0000000001100011_2$

	1111111000000000	DMY
XOR	0000000001100011	Y
	1111111001100011	uusi DMY

# Sokettiin kirjoittaminen

```
int D=31; int M=12; int Y=99;
```

DMY on short tyyppinen, sokettiin pitää kirjoittaa tavuja  
`byte[] data = new byte[2];`

```
data[0] = (byte)(DMY >>> 8);
```

```
1111111001100011 >>> 8  
= 0000000011111110  
(byte) 0000000011111110  
= 11111110
```

```
data[1] = (byte)(DMY & 0xff);
```

```
1111111001100011  
AND 0000000011111111  
0000000001100011
```

```
// Lähetetään data sokerin kautta maailmalle
```

# Vastaanotto ja yhdistäminen

D	M	Y
---	---	---

```
byte[] receiveData = new byte[2];
```

```
Short Rec_dmy;
```

```
// Saadaan soketista 2 tavua receiveData taulukkoon
```

```
Rec_dmy = (short)(receiveData[0] & 0xff);
```

```
Rec_dmy = Rec_dmy << 8;
```

```
Rec_dmy = (short)(Rec_dmy ^ (receiveData[1] & 0xff));
```



# Vastaanotto binäärisenä

```
//receiveData[0] = 11111110; receiveData[1] = 01100011
Rec_dmy = (short)(receiveData[0] & 0xff);
```

	11111110	receiveData[0]
AND	11111111	0xFF (maski)
	11111110	(tulos Javassa int)
	0000000011111110	(typecast to short)

```
Rec_dmy = Rec_dmy << 8;
```

0000000011111110	Rec_dmy
1111111000000000	<< 8

```
Rec_dmy = (short)(Rec_dmy ^ (receiveData[1] & 0xff));
```

	1111111000000000	Rec_dmy
XOR	01100011	receiveData[1] & 0xff
	1111111001100011	XOR:n int tyyppimuunnettu short:iksi

# Vastaanotto ja dekoodaus



```
byte[] rec_data = new byte[2];  
Short Rec_dmy;
```

```
Rec_dmy = (short)(receiveData[0] & 0xff);  
Rec_dmy = Rec_dmy << 8;  
Rec_dmy = (short)(Rec_dmy ^ (receiveData[1] & 0xff));  
byte day = (byte) ((Rec_dmy >>> 11) & 0x1F);  
byte month = (byte) ((Rec_dmy >>> 7) & 0xF);  
byte year = (byte) (Rec_dmy & 0x7F);
```

# Kenttien arvot purettuna

```
//Rec_dmy = 1111111001100011
```

```
byte day = (byte) ((Rec_dmy >>> 11) & 0x1F);
```

	0000000000011111	Rec_dmy >>> 11	(shifting)
AND	0000000000011111	0x1F	(maski)
	0000000000011111	== 31	(tulos)

```
byte month = (byte) ((Rec_dmy >>> 7) & 0xF);
```

	0000000111111100	Rec_dmy >>> 7
AND	0000000000001111	0xF
	0000000000001100	== 12

```
byte year = (byte) (Rec_dmy & 0x7F);
```

	1111111001100011	Rec_dmy
AND	0000000001111111	0x7F
	0000000001100011	== 99