MIE-ARI
(Computer Arithmetic – Homework 4)

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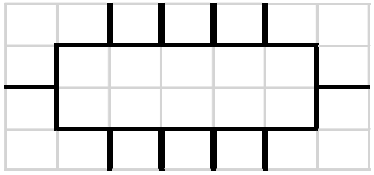
https://courses.fit.cvut.cz/MIE-ARI/

Task 1 – Shifts

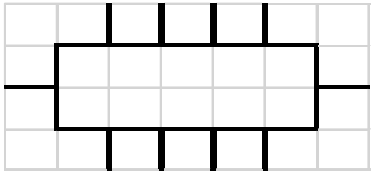
Shift a 4 bits number by 1 bit and detect overflow and precision lost.

Unsigned numbers

The logical shift to the left

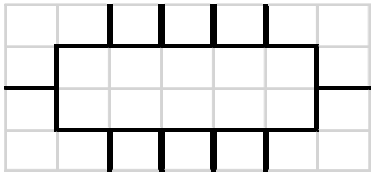


The logical shift to the right

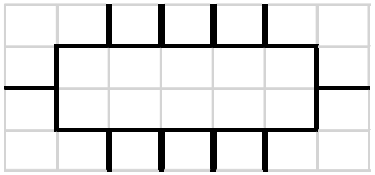


Unsigned numbers

The cyclic shift to the left

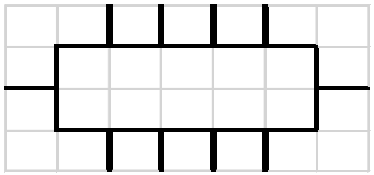


The cyclic shift to the right

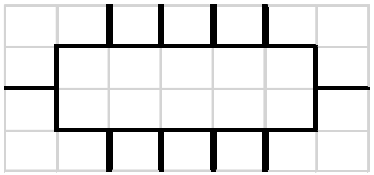


2's complement code

The arithmetic shift to the left

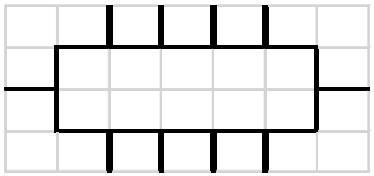


The arithmetic shift to the right

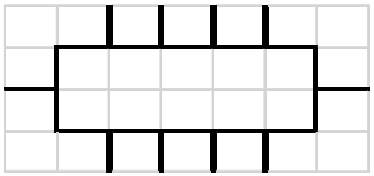


Sign and Magnitude code

The arithmetic shift to the left



The arithmetic shift to the right



Advice: Use the information in lecture 4 (Multiplication I.), in slides 1 – 5.

Task 2 – Multiplication of unsigned numbers

a) Convert two decimal numbers into a binary system.
b) Multiply these two unsigned 5bits binary numbers.
c) How many bits we need for the result.

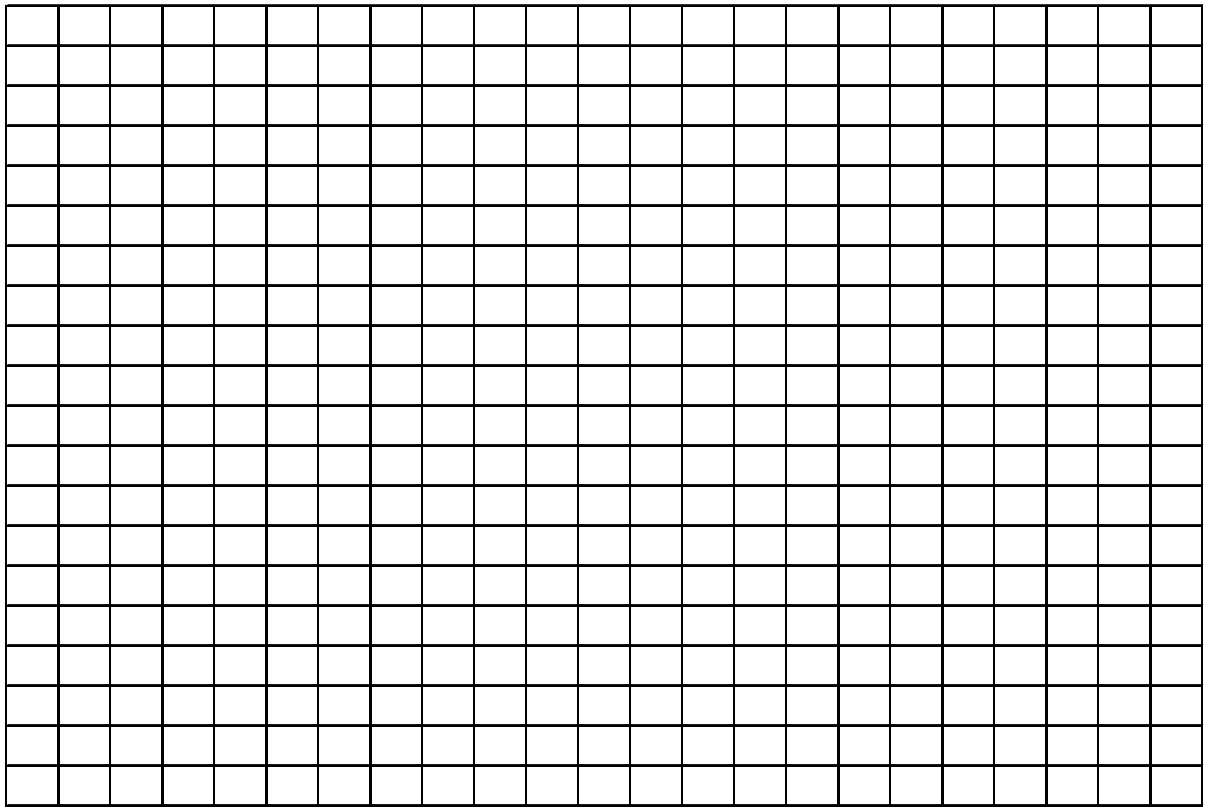
$22_{10} \cdot 11_{10} =$

Advice: Use the information in lecture 4 (Multiplication I.), in slides 9.

Task 3 – Multiplication of unsigned numbers using sign digit number system

a) Convert two decimal numbers into a binary system.
b) Multiply these two unsigned 8bits binary numbers using sign digit number system for Z=4 (Booth).
c) How many bits we need for the result.

$157_{10} \cdot 111_{10} =$

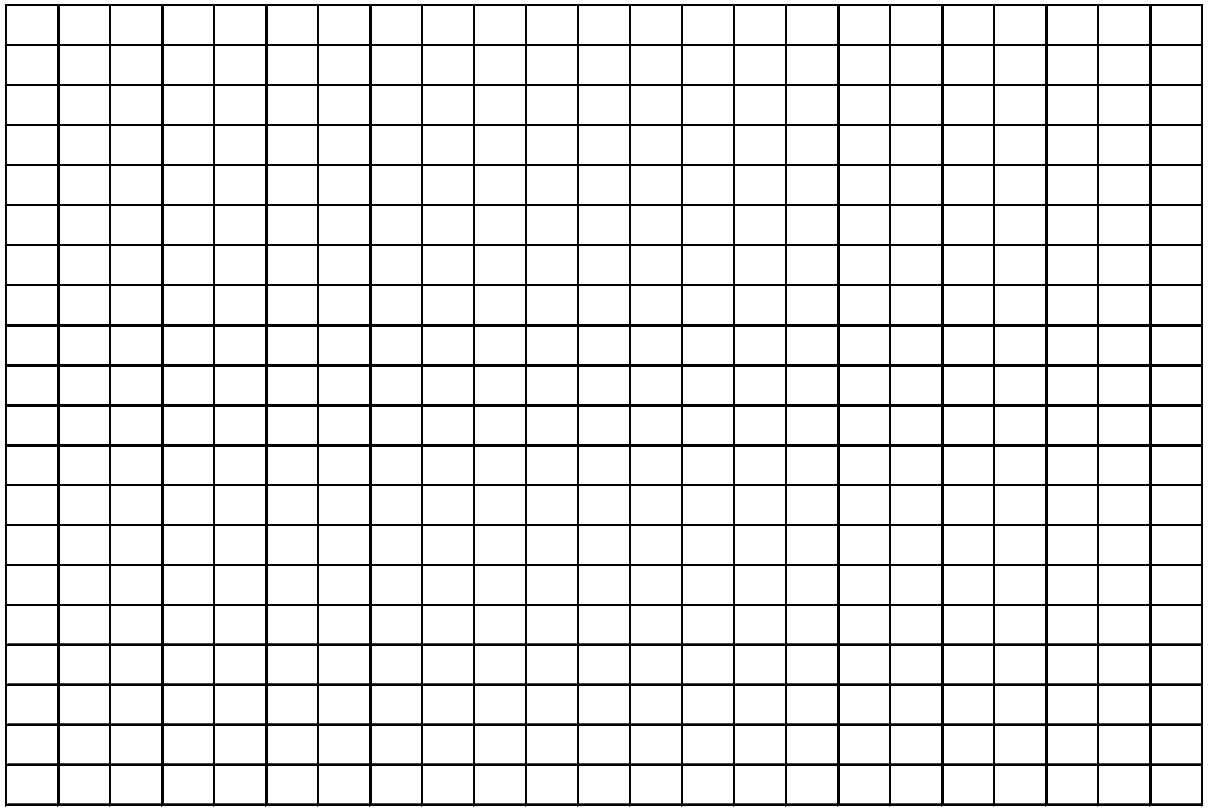


Advice: Use the information in lecture 4 (Multiplication I.), in slides 13.

Task 4 – Multiplication of signed numbers – 2's complement code

a) Convert two decimal numbers into the 2's complement code (the second operand will use a special format, where 1's bits are changed to -1's bits).
b) Multiply these two signed binary numbers using the sign digit number system for Z=2 with the Booth method.
c) How many bits we need for the result.

$(-5_{10})\cdot(-5_{10})=$

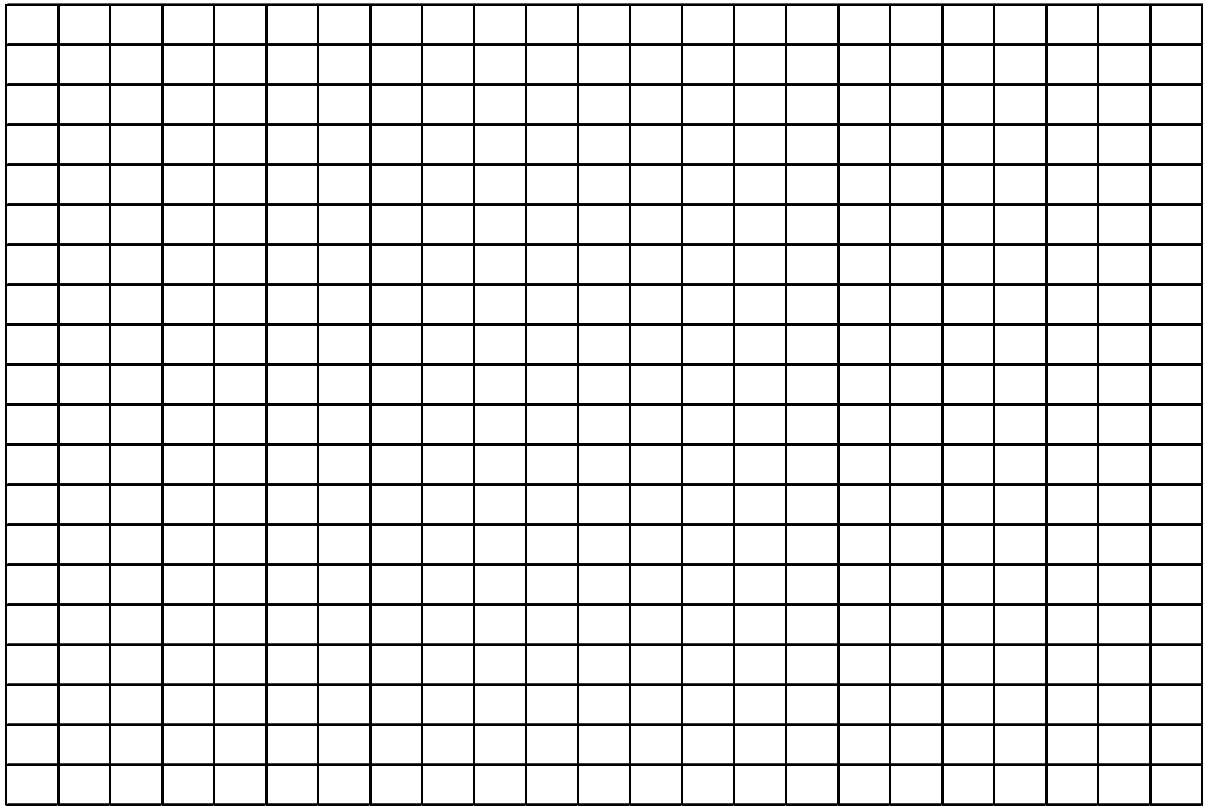


Advice: Use the information in lecture 4 (Multiplication I.), in slides 16.

Task 5 – Multiplication of signed numbers – 2's complement code – another way

a) Convert two decimal numbers into the 2's complement code.
b) Multiply these two numbers using the subtraction in the last step
if the higher bit of the second operand is equal to one.
c) How many bits we need for the result.

$(-5_{10})\cdot(-5_{10})=$

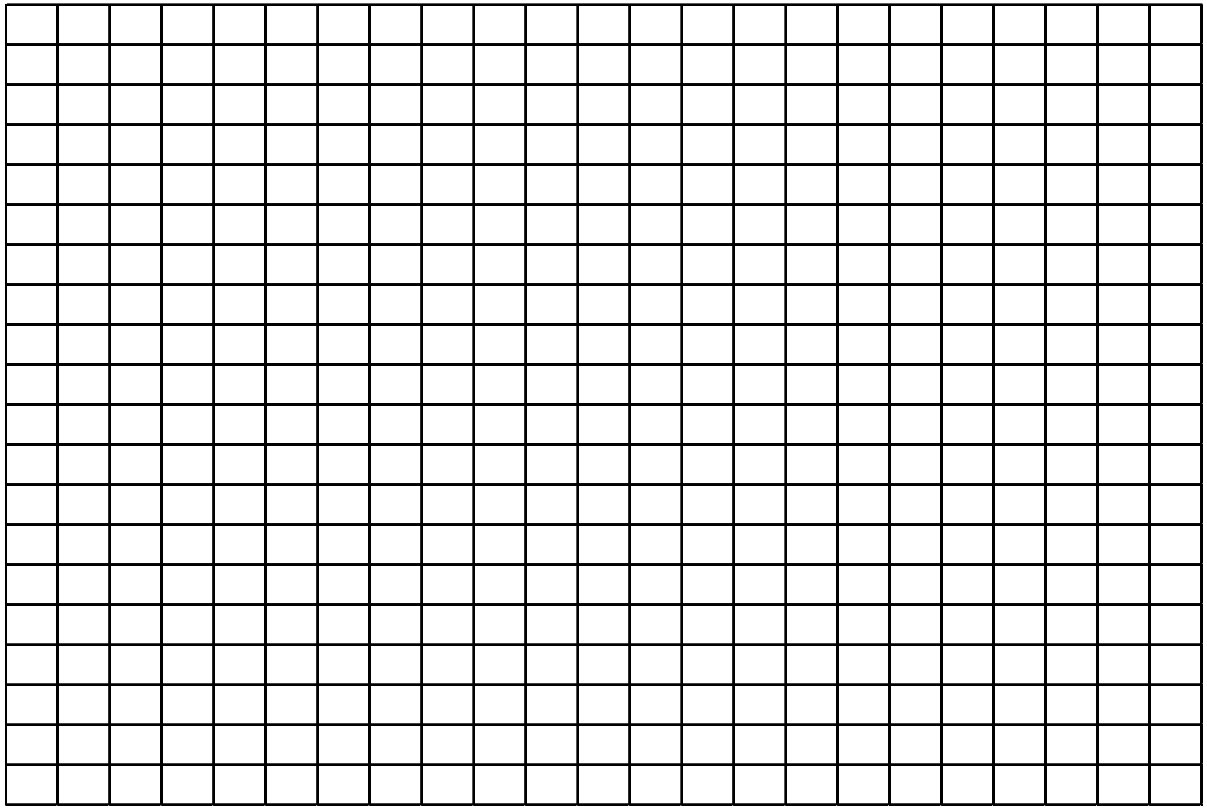


Advice: Use the information in lecture 4 (Multiplication I.), in slides 18.

Task 6 – Multiplication of signed numbers – 2's complement code

a) Convert two decimal numbers into the 2's complement code.
b) Multiply these two numbers using sign digit number system for Z=4 and modified Booth method.
c) How many bits we need for the result.

$(-46_{10})\cdot(-27_{10})=$



Advice: Use the information in lecture 4 (Multiplication I.), in slides 19.

Notes I.

Notes II.