

Binary Arithmetic Challenge

Core unsigned arithmetic

Show your work. Unless stated otherwise, treat every value as unsigned binary.

Name _____

Date _____

1 Binary addition

CARRY CHAINS

Calculate: $(10101101)_2 + (01110111)_2$

2 Fixed-width unsigned addition

8-BIT

Using exactly 8 result bits, calculate $(11101011)_2 + (10110110)_2$. State the 8-bit sum and the final carry-out.

3 Binary subtraction

BORROWING

Using ordinary binary borrowing, calculate: $(10010000)_2 - (00101111)_2$

4 Complements

8-BIT

Find both the 1's complement and the 2's complement of the 8-bit pattern $(01101001)_2$.

Binary Arithmetic Challenge

Complement arithmetic

For Questions 5 and 6, use 8-bit two's-complement addition.

5

Two's-complement subtraction

POSITIVE RESULT

Calculate $(01100101)_2 - (00111011)_2$. Give the 8-bit result.

6

Signed two's-complement subtraction

NEGATIVE RESULT

Calculate $(00110110)_2 - (01011101)_2$. Give the 8-bit result and its signed decimal value.

7

Binary multiplication

SHIFT AND ADD

Calculate the full product: $(101011)_2 \times (1101)_2$

Binary Arithmetic Challenge

Long division and mixed mastery

Complete each problem in binary and show every major step.

8

Binary division

LONG DIVISION

Calculate the quotient and remainder: $(11010110)_2 / (1001)_2$

9

Mixed mastery

CHALLENGE

Evaluate from left to right: $[(101101)_2 + (11011)_2] - (10010)_2$

Binary Arithmetic Challenge

Final answers only

Use this page to check results after completing the worksheet.

1

ADDITION

$$(100100100)_2$$

2

8-BIT ADDITION

$$\text{Sum: } (10100001)_2$$

$$\text{Carry-out: } 1$$

3

SUBTRACTION

$$(01100001)_2$$

4

COMPLEMENTS

$$1\text{'s: } (10010110)_2$$

$$2\text{'s: } (10010111)_2$$

5

2'S SUBTRACTION

$$(00101010)_2$$

6

SIGNED SUBTRACTION

$$(11011001)_2 = -39_{10}$$

7

MULTIPLICATION

$$(1000101111)_2$$

8

DIVISION

$$Q = (10111)_2$$

$$R = (111)_2$$

9

MIXED MASTERY

$$(110110)_2$$

Score

____ / 9