1.1 Number systems

Adding two positive
8-bit binary integers

The rules of binary addition

	0
	0
	0

$0 + 0 = 0$

The rules of binary addition

	0
	1
	1

$0 + 0 = 0$

$0 + 1 = 1$

The rules of binary addition

	1
	1
1	**0**

$0 + 0 = 0$

$0 + 1 = 1$

$1 + 1 = 0$ carry 1

The rules of binary addition

	1
	1
	1
1	**1**

$0 + 0 = 0$

$0 + 1 = 1$

$1 + 1 = 0$ carry 1

$1 + 1 + 1 = 1$ carry 1

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	85								85
Number									170
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer								1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer							1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer						1	1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer					1	1	1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer				1	1	1	1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer			1	1	1	1	1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer		1	1	1	1	1	1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	0	1	0	1	85
Number	1	0	1	0	1	0	1	0	170
Answer	1	1	1	1	1	1	1	1	255
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	43								43
Number	74								74
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer								1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer							0	1	
Carries						1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer						1	0	1	
Carries						1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer					0	1	0	1	
Carries				1		1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer				1	0	1	0	1	
Carries				1		1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer			1	1	0	1	0	1	
Carries				1		1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer		1	1	1	0	1	0	1	
Carries				1		1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	0	1	0	1	1	43
Number	0	1	0	0	1	0	1	0	74
Answer	0	1	1	1	0	1	0	1	117
Carries				1		1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	59								59
Number									124
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer								1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer							1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer						1	1	1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer					0	1	1	1	
Carries				1					

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer				1	0	1	1	1	
Carries			1	1					

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer			1	1	0	1	1	1	
Carries		1	1	1					

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer		0	1	1	0	1	1	1	
Carries	1	1	1	1					

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	0	1	1	1	0	1	1	59
Number	0	1	1	1	1	1	0	0	124
Answer	1	0	1	1	0	1	1	1	183
Carries	1	1	1	1					

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	95								95
Number									222
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer									
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer								1	
Carries									

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer							0	1	
Carries						1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer						1	0	1	
Carries					1	1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer					1	1	0	1	
Carries				1	1	1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer				1	1	1	0	1	
Carries			1	1	1	1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer			1	1	1	1	0	1	
Carries			1	1	1	1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer		0	1	1	1	1	0	1	
Carries	1		1	1	1	1			

Adding two 8-bit binary integers

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer	0	0	1	1	1	1	0	1	317
Carries	1		1	1	1	1			

1 ← Overflow