Floating point: number range 4

Challenge 2

C C

A floating point number is represented by a mantissa and an exponent. Both parts are always stored as two's complement numbers.

The number of bits allocated to the **exponent** affects the **range** of the numbers that can be represented.

If 5 bits are allocated to the mantissa and 3 bits are allocated to the exponent, what is the **smallest negative number** (the negative number that is closest to zero) that can be represented? Give you answer as a denary (base-10) number.

Floating point: number range 3

Challenge 2

C C

A floating point number is represented by a mantissa and an exponent. Both parts are always stored as two's complement numbers.

The number of bits allocated to the **exponent** affects the **range** of the numbers that can be represented.

If 5 bits are allocated to the mantissa and 3 bits are allocated to the exponent, what is the **largest negative number** that can be represented? Give you answer as a denary (base-10) number.

Quiz:
STEM SMART Computer Science Week 33

Floating point: binary to denary 1

Challenge 2

C C

The binary number shown below is represented as a floating point number with a 10-bit mantissa and a 4-bit exponent. The mantissa and exponent are both stored using two's complement.

mantissa											exponent			
1	.	0	0	0	0	1	0	1	0	0	0	1	0	1

Convert the floating point number into denary.

Quiz:
STEM SMART Computer Science Week 33

Floating point: normalisation

Challenge 2

Floating point numbers are normalised so that they can be stored with optimum precision. Which of the following values is **not** properly normalised?

mantissa	exponent
0.111010001	0100

mantissa	exponent
0.011101101	0110

mantissa	exponent
1.010011110	1111

mantissa	exponent
1.000000001	0110

Quiz:
STEM SMART Computer Science Week 33

Floating point: binary to denary 2

Challenge 2

The binary number shown below is represented as a **normalised floating point number** with an 8-bit mantissa and a 4-bit exponent. The mantissa and exponent are both stored using two's complement.

mantissa										exponent			
0	.	1	1	0	0	1	1	0		0	1	0	0

Convert the floating point number into denary.

Type your answer as a **signed decimal number** (e.g. $+3.75$) - do not leave any spaces in your answer.

Quiz:
STEM SMART Computer Science Week 33

Floating point: binary to denary 3

Challenge 2

The binary number shown below is represented as a **normalised floating point number** with an 8-bit mantissa and a 4-bit exponent. The mantissa and exponent are both stored using two's complement.

mantissa										exponent			
1	.	0	0	1	0	1	0	0		1	1	1	1

Which of the following options shows the correct denary representation of the number?

- -0.421875
- -1.6875
- -27648
- $+0.578125$

Quiz:
STEM SMART Computer Science Week 33

Floating point: binary to denary 4

Challenge 2

The binary number shown below is represented as a **normalised floating point number** with an 8-bit mantissa and a 4-bit exponent. The mantissa and exponent are both stored using two's complement.

mantissa										exponent			
0	.	1	0	1	0	0	0	0		1	0	1	1

Convert the floating point number into denary.

Type your answer as a **signed decimal number**, e.g. $+3.75$ - do not leave any spaces in your answer.

Quiz:
STEM SMART Computer Science Week 33

Floating point: denary to binary 1

Challenge 2

Convert the denary number $+\frac{5}{16}$ (or $+0.3125$ as a decimal) to binary, encoding the number as a **normalised floating point number** with an 8-bit mantissa and a 4-bit exponent. The mantissa and exponent use two's complement.

Type your answer as a 12-bit binary number with the binary point (e.g. 0.11100011101) - do not leave any spaces in your answer.

Quiz:
STEM SMART Computer Science Week 33

Floating point: denary to binary 2

Challenge 2

The denary number $-\frac{9}{64}$ (or -0.140625 as a decimal) has been converted to binary, and is held as a **normalised floating point number** with an 8-bit mantissa and a 4-bit exponent. The mantissa and exponent use two's complement.

Which of the following options shows the correct binary representation of the number?

mantissa	exponent
1.0111000	0010

mantissa	exponent
1.1101110	0000

mantissa	exponent
1.0111000	1110

mantissa	exponent
0.1001000	1110

Quiz:
STEM SMART Computer Science Week 33

Floating point: addition

Challenge 2

Select the correct result for the addition of binary numbers shown below. The representation used is **normalised** two's complement **floating point**, with **8 bits** for the mantissa and **4 bits** for the exponent.

	mantissa	exponent
	01110110	0011
+	01001011	0100

mantissa	exponent
10000110	0100

mantissa	exponent
01000011	0101

mantissa	exponent
11000001	0111

mantissa	exponent
010000110	0100