# Floating Point Binary Practice questions

Typical exam question:

1. What is the decimal value for the following binary patterns if the first 8 bits is the mantissa and the last 4 bits are the exponent: 1000 1100 0100

How to do these questions!

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| 1000 1100 0100  mantissa exponent | Separate out the exponent from the mantissa  *Originally this number is given in two’s complement* ***Normalised Form***  *(most accurate representation possible for a given size of mantissa)* |
| 1000 1100 **0100**  +4 | Work out the exponent and write it down (you may get a mark for this part!). NB: first bit of exponent (like mantissa) is the sign bit.  *In normalise form the binary point always goes after the first significant digit of the mantissa. This number represents 1.00011 x 24* |
| 1000 1100 0100  0111 0011 (complement)  1+ (add 1)  0111 0100 | If the mantissa is negative then work out the complement (swap 1’s and 0’s) and add 1 |
| 0**.**1110100  becomes  01110**.**100  +4 | Move the binary point to its new position.  Right for positive exponent, left for negative exponent.  *Normalised form always starts with 2 bits that are different*  *e.g. 01 or 10.* |
| 1110.1 = **-14.5** | Work out the number in decimal.  Remember add the minus sign back in at the end! |

Now you try!

|  |  |
| --- | --- |
| 1. 0101 1001 0110 | 4. 0100 0000 1111 |
| 2. 1000 1100 0100 | 5. 1011 0110 0101 |
| 3. 0110 1110 0100 | 6. 0110 1101 0101 |

*Answers explained on next page (but do try to have a go on your own first!!)*

# Answers!

|  |  |
| --- | --- |
| 1. 0101 1001 0110  0101 1001 0110 exponent = +6  0**.**101 1001 0110 mantissa is +ve  0101100**.**1 = **+44.5**  +6 | 4. 0100 0000 1111  0100 0000 1111 exponent = -1  0**.**100 0000 1111 mantissa is +ve  0 **.**0100 0000 = **+ 0.25**  sign -1 |
| 2. 1000 1100 0100  1000 1100 0100 exponent = +4  1000 1100 0100 mantissa is –ve  0111 0011 find complement  1 + add 1  0**.**111 0100  0111 0**.**100 = 14.5  +4  Answer = **-14.5** (remember to put the minus sign back in at end!) | 5. 1011 0110 0101  1011 0110 0101 exponent = +5  1011 0110 0101 mantissa is –ve  0100 1001 find complement  1 + add 1  0**.**100 1010  0100 10**.**10 = 18.5  +5  Answer = **-18.5** (remember to put the minus sign back in at end!) |
| 3. 0110 1110 0100  0110 1110 0100 exponent = +4  0**.**110 1110 0100 mantissa is +ve  0110 1**.**110 = **+13.75**  +4 | 6. 0110 1101 0101  0110 1101 0101 exponent = +5  0**.**110 1101 0101 mantissa is +ve  0110 11**.**01 = **+27.25**  +5 |