**ДЗ 6 Храбров Артём Алексеевич Р3115. Вариант 82**

**A = 66,23  
B = 74,71**

#### 1.1 Формат Ф1

A = (66,23)10 = (42,3AE148)16 = (0,423AE148)16 · 162

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |

B = (74,71)10 = (4A,B5C28F)16 = (0,4AB5C28F)16 · 162

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| XA | = | – | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| XB | = | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| (XA-XB)пр. | = |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(XA-XB) = 0; XC = XA = XB = 2

#### а) A>0, B>0:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | + |  | . | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| MB | = |  | . | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| MC | = |  |  | . | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |

Результат сложения нормализован.  
  
MC = . 1 0 0 0 1 1 0 0 1 1 1 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |

С\* = МС · 16Рс = (0,8CF)16 · 162 = 140,9375.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 140,94 – 140,9375 = 0,0025

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,0025 |  | · 100% = 0,00177% |
| 140,94 |

Результат получился представленным с избытком. Этот факт можно объяснить неточным представлением операндов.

#### б) A>0, B<0:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | – |  | . | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| MB | = |  | . | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| MC | = |  |  | . | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |

Результат вычитания денормализован вправо и представлен в дополнительном коде.  
  
MC = . 0 1 1 1 1 0 0 1 0 0 0 0  
  
Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 1 (ХC = ХC - 1 = 1).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

С\* = МС · 16Рс = (-0,870)16 · 161 = -8,4375.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -8,48 – (-8,4375) = -0,0425

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,0425 |  | · 100% = 0,50118% |
| -8,48 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.

#### с) A<0, B>0:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MB | = | – |  | . | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| MA | = |  | . | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| MC | = |  |  | . | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |

Результат вычитания денормализован вправо.  
  
MC = . 1 0 0 0 0 1 1 1 0 0 0 0  
  
Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 1 (ХC = ХC - 1 = 1).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

С\* = МС · 16Рс = (0,870)16 · 161 = 8,4375.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 8,48 – 8,4375 = 0,0425

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,0425 |  | · 100% = 0,50118% |
| 8,48 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.

#### 2.1 Формат Ф2

A = (66,23)10 = (42,3AE148)16 = (0,10000100011101011100001)2 · 27

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |

B = (74,71)10 = (4A,B5C28F)16 = (0,10010101011010111000011)2 · 27

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| XA | = | – | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| XB | = | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| (XA-XB)пр. | = |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(XA-XB) = 0; XC = XA = XB = 7

#### а) A>0, B>0:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | + |  | . | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| MB | = |  | . | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| MC | = |  | 1 | . | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |

Результат сложения денормализован влево.  
  
MC = . 1 0 0 0 1 1 0 0 1 1 1 1  
  
Т.к. выполнен сдвиг мантиссы вправо, характеристику результата нужно увеличить на 1 (ХC = ХC + 1 = 8).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |

С\* = МС · 2Рс = (0,100011001111)2 · 28 = 140,9375.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 140,94 – 140,9375 = 0,0025

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,0025 |  | · 100% = 0,00177% |
| 140,94 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.

#### б) A>0, B<0:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MA | = | – |  | . | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| MB | = |  | . | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| MC | = |  |  | . | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

Результат вычитания денормализован вправо и представлен в дополнительном коде.  
  
MC = . 0 1 1 1 1 0 0 0 0 0 0 0  
  
Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 3 (ХC = ХC - 3 = 4).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

С\* = МС · 2Рс = (-0,10001)2 · 24 = -8,5.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -8,48 – (-8,5) = 0,02

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,02 |  | · 100% = 0,23585% |
| -8,48 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.

#### с) A<0, B>0:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| MB | = | – |  | . | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| MA | = |  | . | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| MC | = |  |  | . | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

Результат вычитания денормализован вправо.  
  
MC = . 1 0 0 0 1 0 0 0 0 0 0 0  
  
Т.к. выполнен сдвиг мантиссы влево, характеристику результата нужно уменьшить на 3 (ХC = ХC - 3 = 4).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

С\* = МС · 2Рс = (0,10001)2 · 24 = 8,5.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 8,48 – 8,5 = -0,02

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,02 |  | · 100% = 0,23585% |
| 8,48 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих разрядов мантиссы результата при его нормализации.  
  
  
В формате Ф2 результаты получились точнее из-за того, что операнды представлены точнее и при нормализации результата сдвиг производился на один двоичный разряд, а не на четыре.