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Домашнее задание №6

Вариант 40

A = 1,567  
B = 63,76

#### Формат Ф1

A = (1,567)10 = (1,9126E9)16 = (0,19126E9)16 · 161

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

B = (63,76)10 = (3F,C28F5C)16 = (0,3FC28F5C)16 · 162

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

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

(XA-XB) = -1; XC = XB = 2

#### а) A > 0, B > 0:

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

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

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

С\* = МС · 16Рс = (0,415)16 · 162 = 65,3125.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 65,327 – 65,3125 = 0,0145

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,0145 |  | · 100% = 0,0222% |
| 65,327 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих младших у первого операнда при выравнивании порядков.

#### б) A > 0, B < 0:

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

Результат вычитания нормализован и представлен в дополнительном коде.  
  
MC = . 1 1 0 0 0 0 0 1 1 1 0 1

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

С\* = МС · 16Рс = (-0,3E3)16 · 162 = -62,1875.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -62,193 – (-62,1875) = -0,0055

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,0055 |  | · 100% = 0,00884% |
| -62,193 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих младших у первого операнда при выравнивании порядков.

#### с) A < 0, B > 0:

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

Результат вычитания нормализован.  
  
MC = . 0 0 1 1 1 1 1 0 0 0 1 1

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

С\* = МС · 16Рс = (0,3E3)16 · 162 = 62,1875.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 62,193 – 62,1875 = 0,0055

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,0055 |  | · 100% = 0,00884% |
| 62,193 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих младших у первого операнда при выравнивании порядков.

1. Формат Ф2

A = (1,567)10 = (1,9126E9)16 = (0,11001000100100111)2 · 21

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

B = (63,76)10 = (3F,C28F5C)16 = (0,1111111100001010001111)2 · 26

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

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

(XA-XB) = -5; XC = XB = 6

#### а) A > 0, B > 0:

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

Результат сложения денормализован влево.  
  
MC = . 1 0 0 0 0 0 1 0 1 0 1 0  
  
Т.к. выполнен сдвиг мантиссы вправо, характеристику результата нужно увеличить на 1 (ХC = ХC + 1 = 7).

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

С\* = МС · 2Рс = (0,10000010101)2 · 27 = 65,3125.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 65,327 – 65,3125 = 0,0145

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,0145 |  | · 100% = 0,0222% |
| 65,327 |

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

#### б) A > 0, B < 0:

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

Результат вычитания нормализован и представлен в дополнительном коде.  
  
MC = . 0 0 0 0 0 1 1 1 0 0 1 1

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

С\* = МС · 2Рс = (-0,111110001101)2 · 26 = -62,20313.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = -62,193 – (-62,20313) = 0,01013

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | 0,01013 |  | · 100% = 0,01628% |
| -62,193 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих младших у первого операнда при выравнивании порядков.

#### с) A < 0, B > 0:

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

Результат вычитания нормализован.  
  
MC = . 1 1 1 1 1 0 0 0 1 1 0 1

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

С\* = МС · 2Рс = (0,111110001101)2 · 26 = 62,20313.  
  
Определим абсолютную и относительную погрешности результата:  
ΔС = 62,193 – 62,20313 = -0,01013

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| δС = |  | -0,01013 |  | · 100% = 0,01628% |
| 62,193 |

Результат получился представленным с избытком. Этот факт можно объяснить потерей значащих младших у первого операнда при выравнивании порядков.

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.