

fractionprelim.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # fractionprelim.py
5: # Author: Bob Dondero
6: #-----
7: import euclid
8: #-----
9:
10: class Fraction:
11:     def __init__(self, num=0, den=1):
12:         if den == 0:
13:             raise ZeroDivisionError('Denominator cannot be 0')
14:         self._num = num
15:         self._den = den
16:         self._normalize()
17:
18:     def _normalize(self):
19:         if self._den < 0:
20:             self._num *= -1
21:             self._den *= -1
22:         if self._num == 0:
23:             self._den = 1
24:         else:
25:             gcden = euclid.gcd(self._num, self._den)
26:             self._num //= gcden
27:             self._den //= gcden
28:
29:     def to_string(self):
30:         if self._den == 1:
31:             return str(self._num)
32:         return '%d/%d' % (self._num, self._den)
33:
34:     def equals(self, other):
35:         return (self._num == other._num) and (self._den == other._den)
36:
37:     def compare_to(self, other):
38:         if (self._num * other._den) < (other._num * self._den):
39:             return -1
40:         if (self._num * other._den) > (other._num * self._den):
41:             return 1
42:         return 0
43:
44:     def negate(self):
45:         return Fraction(-self._num, self._den)
46:
47:     def add(self, other):
48:         new_num = (self._num * other._den) + (other._num * self._den)
49:         new_den = self._den * other._den
50:         return Fraction(new_num, new_den)
51:
52:     def subtract(self, other):
53:         new_num = (self._num * other._den) - (other._num * self._den)
54:         new_den = self._den * other._den
55:         return Fraction(new_num, new_den)
56:
57:     def multiply(self, other):
58:         new_num = self._num * other._num
59:         new_den = self._den * other._den
60:         return Fraction(new_num, new_den)
61:
62:     def divide(self, other):
63:         new_num = self._num * other._den
64:         new_den = self._den * other._num
65:         return Fraction(new_num, new_den)

```

fractionprelimclient.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # fraction1client.py
5: # Author: Bob Dondero
6: #-----
7:
8: import sys
9: import fractionprelim as fraction
10:
11: def main():
12:
13:     try:
14:         line = input('Numerator 1: ')
15:         num1 = int(line)
16:         line = input('Denominator 1: ')
17:         den1 = int(line)
18:         line = input('Numerator 2: ')
19:         num2 = int(line)
20:         line = input('Denominator 2: ')
21:         den2 = int(line)
22:
23:         frac1 = fraction.Fraction(num1, den1)
24:         print('frac1:', frac1.to_string())
25:
26:         frac2 = fraction.Fraction(num2, den2)
27:         print('frac2:', frac2.to_string())
28:
29:         if frac1.equals(frac2):
30:             print('frac1 equals frac2')
31:         if not frac1.equals(frac2):
32:             print('frac1 does not equal frac2')
33:
34:         comparison = frac1.compare_to(frac2)
35:         if comparison < 0:
36:             print('frac1 is less than frac2')
37:         if comparison > 0:
38:             print('frac1 is greater than frac2')
39:         if comparison <= 0:
40:             print('frac1 is less than or equal to frac2')
41:         if comparison >= 0:
42:             print('frac1 is greater than or equal to frac2')
43:
44:         frac3 = frac1.negate()
45:         print('-frac1:', frac3.to_string())
46:
47:         frac3 = frac1.add(frac2)
48:         print('frac1 + frac2:', frac3.to_string())
49:
50:         frac3 = frac1.subtract(frac2)
51:         print('frac1 - frac2:', frac3.to_string())
52:
53:         frac3 = frac1.multiply(frac2)
54:         print('frac1 * frac2:', frac3.to_string())
55:
56:         frac3 = frac1.divide(frac2)
57:         print('frac1 / frac2:', frac3.to_string())
58:
59:     except Exception as ex:
60:         print(str(ex), file=sys.stderr)
61:         sys.exit(1)
62:
63: #-----
64: if __name__ == '__main__':
65:     main()

```

fraction.py (Page 1 of 2)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # fraction.py
5: # Author: Bob Dondero
6: #-----
7:
8: import euclid
9:
10: #-----
11:
12: class Fraction:
13:
14:     def __init__(self, num=0, den=1):
15:         if den == 0:
16:             raise ZeroDivisionError('Denominator cannot be 0')
17:         self._num = num
18:         self._den = den
19:         self._normalize()
20:
21:     def _normalize(self):
22:         if self._den < 0:
23:             self._num *= -1
24:             self._den *= -1
25:         if self._num == 0:
26:             self._den = 1
27:         else:
28:             gcden = euclid.gcd(self._num, self._den)
29:             self._num //= gcden
30:             self._den //= gcden
31:
32:     def __str__(self):
33:         if self._den == 1:
34:             return str(self._num)
35:         return '%d/%d' % (self._num, self._den)
36:
37:     def __eq__(self, other):
38:         return (self._num == other._num) and (self._den == other._den)
39:
40:     def __ne__(self, other):
41:         return not self == other
42:
43:     def __lt__(self, other):
44:         return (self._num * other._den) < (other._num * self._den)
45:
46:     def __gt__(self, other):
47:         return (self._num * other._den) > (other._num * self._den)
48:
49:     def __le__(self, other):
50:         return not self > other
51:
52:     def __ge__(self, other):
53:         return not self < other
54:
55:     def __neg__(self):
56:         return Fraction(-self._num, self._den)
57:
58:     def __add__(self, other):
59:         new_num = (self._num * other._den) + (other._num * self._den)
60:         new_den = self._den * other._den
61:         return Fraction(new_num, new_den)
62:
63:     def __sub__(self, other):
64:         new_num = (self._num * other._den) - (other._num * self._den)
65:         new_den = self._den * other._den

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fraction.py (Page 2 of 2)

```

66:         return Fraction(new_num, new_den)
67:
68:     def __mul__(self, other):
69:         new_num = self._num * other._num
70:         new_den = self._den * other._den
71:         return Fraction(new_num, new_den)
72:
73:     def __truediv__(self, other):
74:         new_num = self._num * other._den
75:         new_den = self._den * other._num
76:         return Fraction(new_num, new_den)

```

fractionclient.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # fractionclient.py
5: # Author: Bob Dondero
6: #-----
7:
8: import sys
9: import fraction
10:
11: def main():
12:
13:     try:
14:
15:         line = input('Numerator 1: ')
16:         num1 = int(line)
17:         line = input('Denominator 1: ')
18:         den1 = int(line)
19:         line = input('Numerator 2: ')
20:         num2 = int(line)
21:         line = input('Denominator 2: ')
22:         den2 = int(line)
23:
24:         frac1 = fraction.Fraction(num1, den1)
25:         print('frac1:', str(frac1)) # Same as frac1.__str__()
26:
27:         frac2 = fraction.Fraction(num2, den2)
28:         print('frac2:', frac2) # print() calls str(frac2)
29:                               # Same as frac2.__str__()
30:
31:         if frac1 == frac2: # Same as frac1.__eq__(frac2)
32:             print('frac1 equals frac2')
33:         if frac1 != frac2: # Same as frac1.__ne__(frac2)
34:             print('frac1 does not equal frac2')
35:         if frac1 < frac2: # Same as frac1.__lt__(frac2)
36:             print('frac1 is less than frac2')
37:         if frac1 > frac2: # Same as frac1.__gt__(frac2)
38:             print('frac1 is greater than frac2')
39:         if frac1 <= frac2: # Same as frac1.__le__(frac2)
40:             print('frac1 is less than or equal to frac2')
41:         if frac1 >= frac2: # Same as frac1.__ge__(frac2)
42:             print('frac1 is greater than or equal to frac2')
43:
44:         frac3 = -frac1 # Same as frac1.__neg__()
45:         print('-frac1:', frac3)
46:
47:         frac3 = frac1 + frac2 # Same as frac1.__add__(frac2)
48:         print('frac1 + frac2:', frac3)
49:
50:         frac3 = frac1 - frac2 # Same as frac1.__sub__(frac2)
51:         print('frac1 - frac2:', frac3)
52:
53:         frac3 = frac1 * frac2 # Same as frac1.__mul__(frac2)
54:         print('frac1 * frac2:', frac3)
55:
56:         frac3 = frac1 / frac2 # Same as frac1.__truediv__(frac2)
57:         print('frac1 / frac2:', frac3)
58:
59:     except Exception as ex:
60:         print(str(ex), file=sys.stderr)
61:         sys.exit(1)
62:
63: #-----
64: if __name__ == '__main__':
65:     main()

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EqualityStr.java (Page 1 of 1)

```

1: import java.util.Scanner;
2:
3: public class EqualityStr
4: {
5:     public static void main(String[] args)
6:     {
7:         Scanner scanner = new Scanner(System.in);
8:
9:         System.out.println("Enter the first string:");
10:        String s1 = scanner.nextLine();
11:
12:        System.out.println("Enter the second string:");
13:        String s2 = scanner.nextLine();
14:
15:        System.out.println(s1 == s2);
16:        System.out.println(s1.equals(s2));
17:    }
18: }

```

equalitystr.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # equalitystr.py
5: # Author: Bob Dondero
6: #-----
7:
8: def main():
9:
10:     s1 = input('Enter the first string:\n')
11:     s2 = input('Enter the second string:\n')
12:
13:     print(s1 is s2)
14:     print(s1 == s2)
15:
16: if __name__ == '__main__':
17:     main()

```

EqualityInt.java (Page 1 of 1)

```

1: import java.util.Scanner;
2:
3: public class EqualityInt
4: {
5:     public static void main(String[] args)
6:     {
7:         Scanner scanner = new Scanner(System.in);
8:
9:         System.out.println("Enter the first int:");
10:        int i1 = scanner.nextInt();
11:
12:        System.out.println("Enter the second int:");
13:        int i2 = scanner.nextInt();
14:
15:        System.out.println(i1 == i2);
16:        // System.out.println(i1.equals(i2));
17:    }
18: }

```

equalityint.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # equalityint.py
5: # Author: Bob Dondero
6: #-----
7:
8: def main():
9:
10:     i1 = int(input('Enter the first int:\n'))
11:     i2 = int(input('Enter the second int:\n'))
12:
13:     print(i1 is i2)
14:     print(i1 == i2)
15:
16: if __name__ == '__main__':
17:     main()

```

queue.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # queue.py
5: # Author: Bob Dondero
6: #-----
7:
8: class _Node:
9:
10:     def __init__(self, item):
11:         self._item = item
12:         self._next = None
13:     def get_item(self):
14:         return self._item
15:     def get_next(self):
16:         return self._next
17:     def set_next(self, next):
18:         self._next = next
19:
20: class Queue:
21:
22:     def __init__(self):
23:         self._head_node = None
24:         self._tail_node = None
25:
26:     def put(self, item):
27:         new_node = _Node(item)
28:         if self._tail_node is None:
29:             self._head_node = new_node
30:         else:
31:             self._tail_node.set_next(new_node)
32:             self._tail_node = new_node
33:
34:     def get(self):
35:         if self._head_node is None:
36:             raise Exception('Empty queue')
37:         item = self._head_node.get_item()
38:         self._head_node = self._head_node.get_next()
39:         if self._head_node is None:
40:             self._tail_node = None
41:         return item
42:
43:     def is_empty(self):
44:         return self._head_node is None

```

priorityqueue.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # priorityqueue.py
5: # Author: Bob Dondero
6: #-----
7:
8: import queue
9:
10: class PriorityQueue (queue.Queue):
11:
12:     def put(self, item):
13:         new_node = queue._Node(item)
14:
15:         if self._head_node is None:
16:             self._head_node = new_node
17:             self._tail_node = new_node
18:             return
19:
20:         prev_node = None
21:         curr_node = self._head_node
22:         while curr_node is not None:
23:             if curr_node.get_item() < item:
24:                 if prev_node is None:
25:                     self._head_node = new_node
26:                 else:
27:                     prev_node.set_next(new_node)
28:                     new_node.set_next(curr_node)
29:                 return
30:             prev_node = curr_node
31:             curr_node = curr_node.get_next()
32:
33:         self._tail_node.set_next(new_node)
34:         self._tail_node = new_node

```

priorityqueueclient.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # priorityqueueclient.py
5: # Author: Bob Dondero
6: #-----
7:
8: import sys
9: import priorityqueue
10:
11: def main():
12:
13:     pqueue = priorityqueue.PriorityQueue()
14:
15:     print('Enter non-negative ints, one per line.')
16:     print('Enter a negative int to stop.')
17:
18:     try:
19:         line = input()
20:         item = int(line)
21:         while item >= 0:
22:             pqueue.put(item)
23:             line = input()
24:             item = int(line)
25:
26:         while not pqueue.is_empty():
27:             item = pqueue.get()
28:             print(item)
29:
30:     except Exception as ex:
31:         print(ex, file=sys.stderr)
32:         sys.exit(1)
33:
34: if __name__ == '__main__':
35:     main()

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objectparam1.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # objectparam1.py
5: # Author: Bob Dondero
6: #-----
7:
8: class IntWrapper:
9:     def __init__(self, i):
10:         self._i = i
11:     def get(self):
12:         return self._i
13:     def set(self, i):
14:         self._i = i
15:
16: #-----
17:
18: def my_func(iw2):
19:     iw2 = IntWrapper(6)
20:
21: #-----
22:
23: def main():
24:     iw1 = IntWrapper(5)
25:     my_func(iw1)
26:     print(iw1.get())
27:
28: #-----
29:
30: if __name__ == '__main__':
31:     main()

```

objectparam2.py (Page 1 of 1)

```

1: #!/usr/bin/env python
2:
3: #-----
4: # objectparam2.py
5: # Author: Bob Dondero
6: #-----
7:
8: class IntWrapper:
9:     def __init__(self, i):
10:         self._i = i
11:     def get(self):
12:         return self._i
13:     def set(self, i):
14:         self._i = i
15:
16: #-----
17:
18: def my_func(iw2):
19:     iw2.set(6)
20:
21: #-----
22:
23: def main():
24:     iw1 = IntWrapper(5)
25:     my_func(iw1)
26:     print(iw1.get())
27:
28: #-----
29:
30: if __name__ == '__main__':
31:     main()
32:

```