大数据训练营 — 模块三
附录：RDD 操作

极客时间

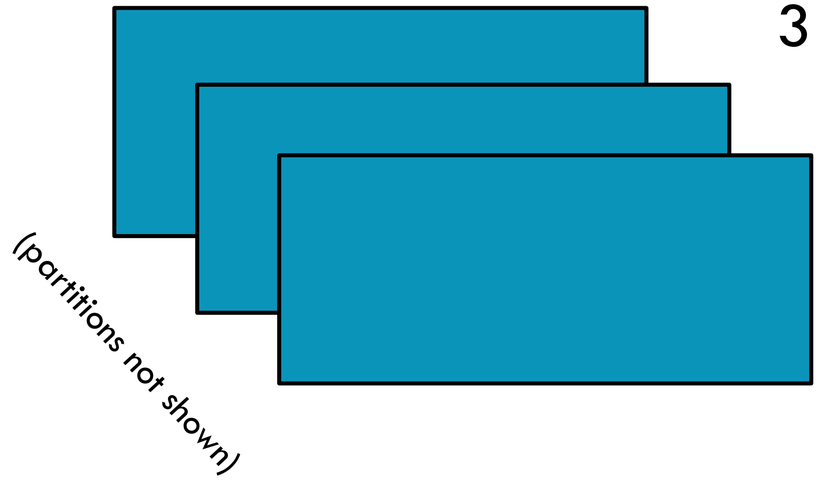
金澜涛

目录

TRANSFORMATIONS

MAP

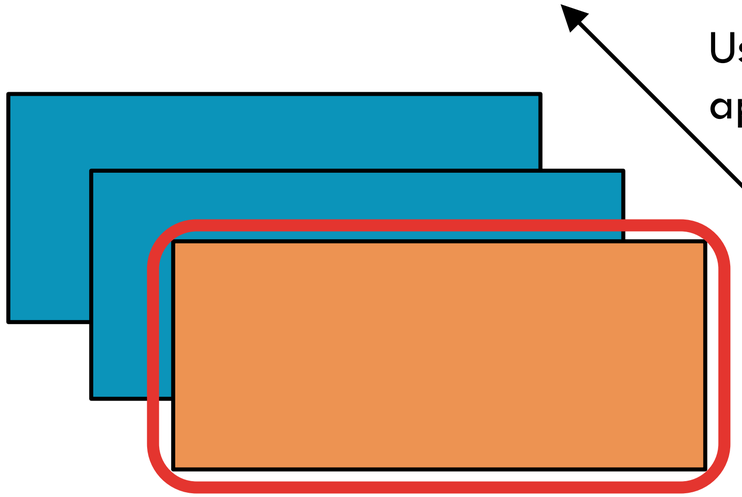
RDD: **x**



3 items in RDD

MAP

RDD: x

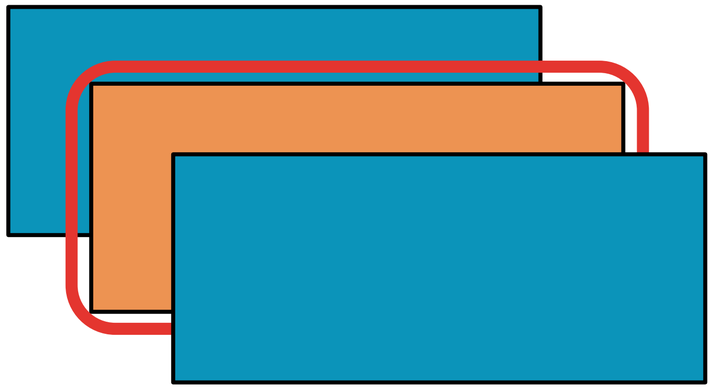


User function
applied item by item

RDD: y

MAP

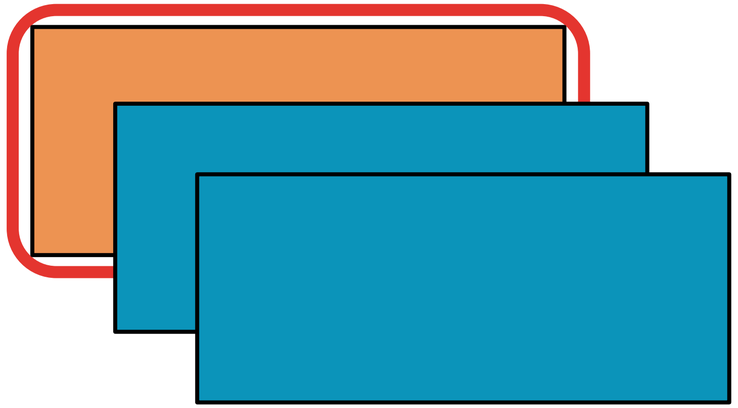
RDD: **x**



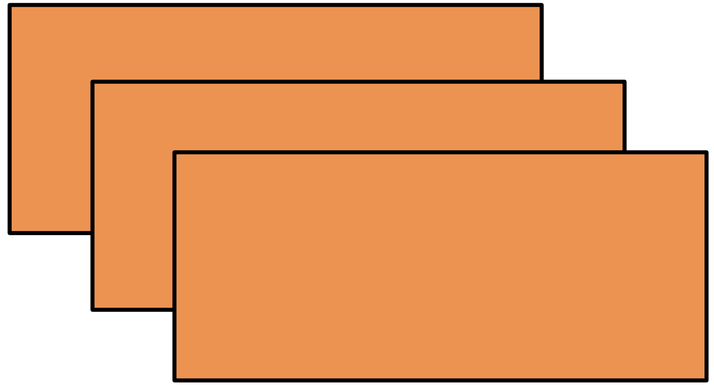
RDD: **y**

MAP

RDD: **x**



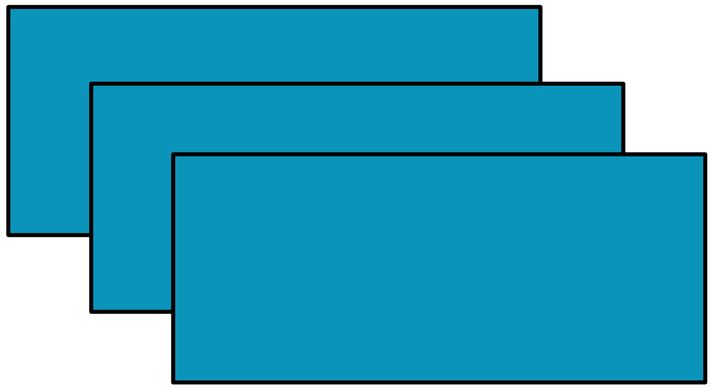
RDD: **y**



MAP

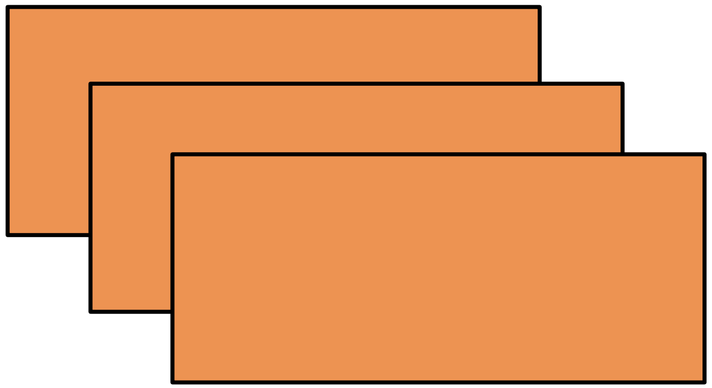
After `map()` has been applied…

RDD: **x**

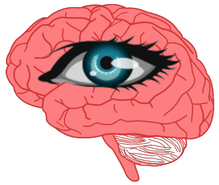


before

RDD: **y**

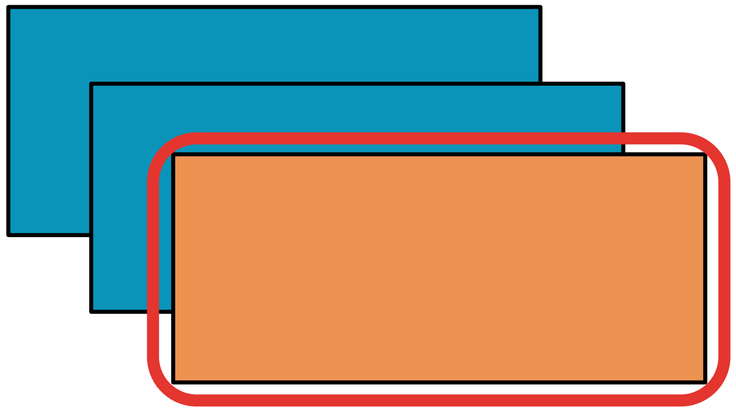


after

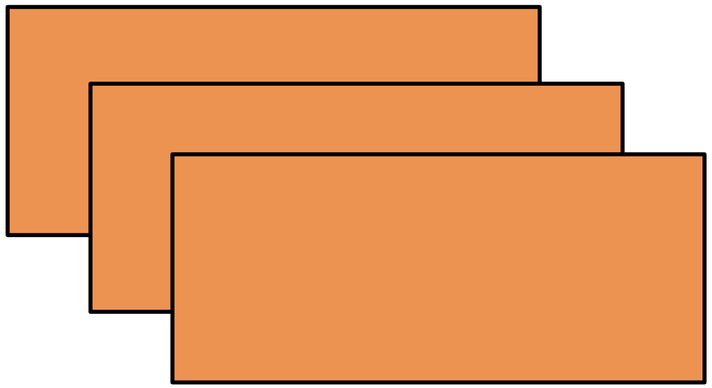


MAP

RDD: **x**

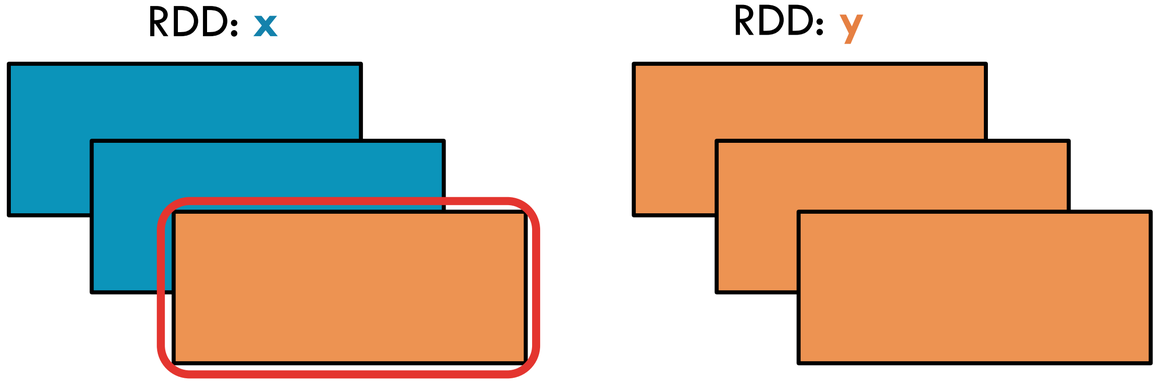


RDD: **y**



Return a new RDD by applying a function to each element of this RDD.

MAP




```
map(f, preservesPartitioning=False)
```

Return a new RDD by applying a function to each element of this RDD

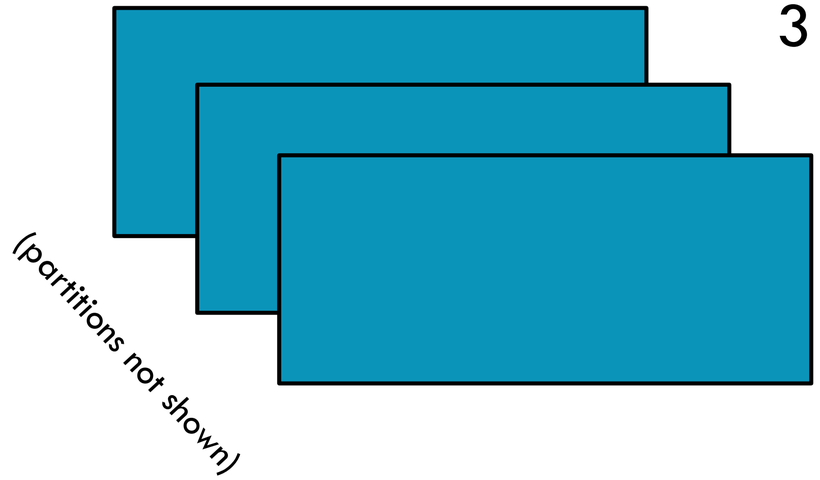
```
x = sc.parallelize(["b", "a", "c"])
y = x.map(lambda z: (z, 1))
print(x.collect())
print(y.collect())
```

```
x: ['b', 'a', 'c']

y: [('b', 1), ('a', 1), ('c', 1)]
```

```
val x = sc.parallelize(Array("b", "a", "c"))
val y = x.map(z => (z,1))
println(x.collect().mkString(", "))
println(y.collect().mkString(", "))
```

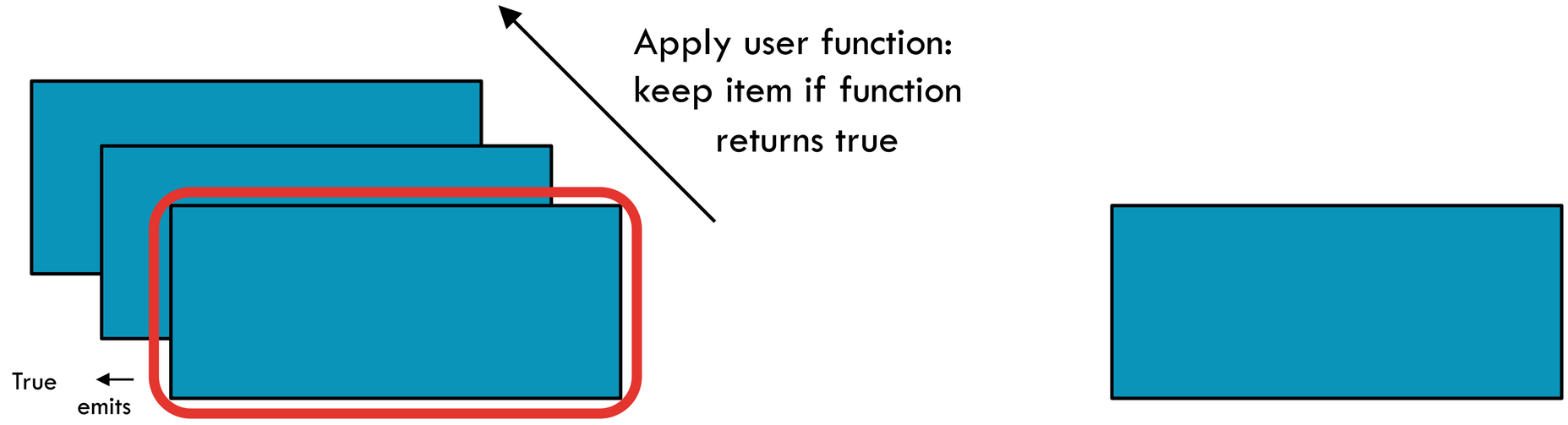
FILTER

RDD: **x**



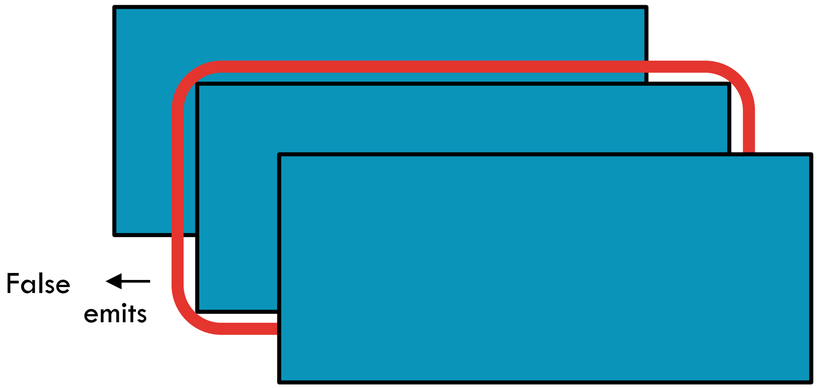
3 items in RDD

FILTER


RDD: x
RDD: y
Apply user function:
keep item if function
returns true
True
emits

FILTER

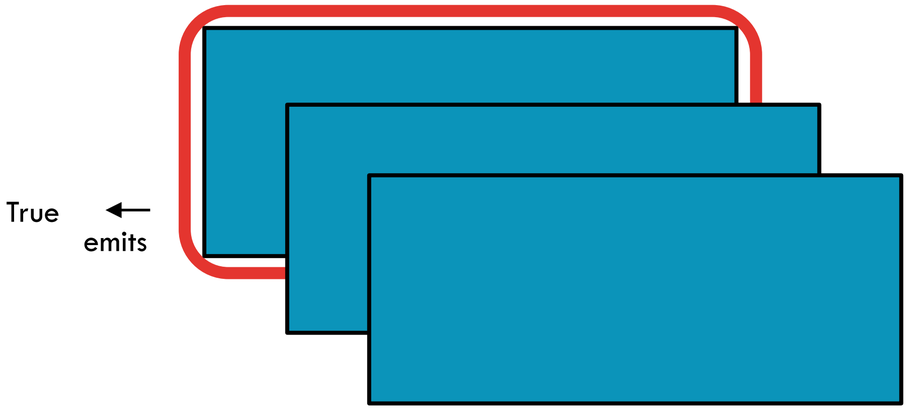
RDD: **x**



RDD: **y**

FILTER

RDD: **x**

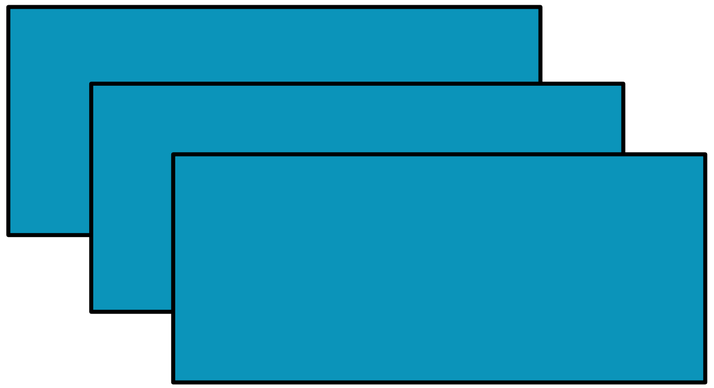


RDD: **y**

FILTER

After `filter()` has been applied...

RDD: **x**

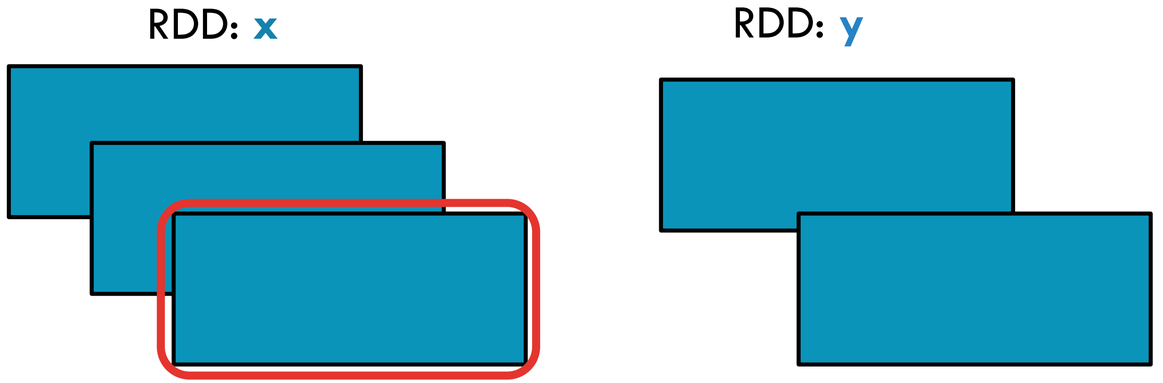


before

RDD: **y**

after

FILTER



Return a new RDD containing only the elements that satisfy a predicate

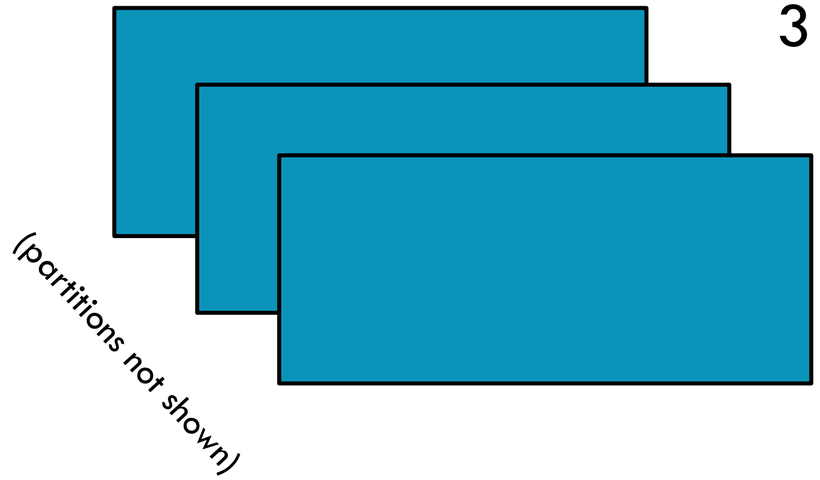
```python
x = sc.parallelize([1,2,3])
y = x.filter(lambda x: x%2 == 1) #keep odd values
print(x.collect())
print(y.collect())
```

```scala
val x = sc.parallelize(Array(1,2,3))
val y = x.filter(n => n%2 == 1)
println(x.collect().mkString(", "))
println(y.collect().mkString(", "))
```

```
x: [1, 2, 3]

y: [1, 3]
```

FLATMAP

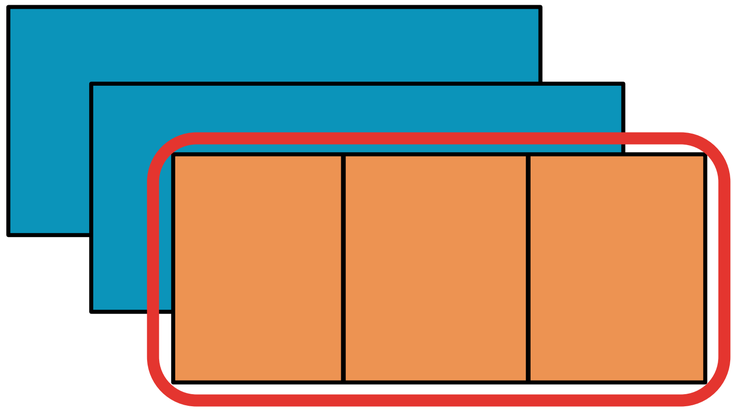
RDD: **x**



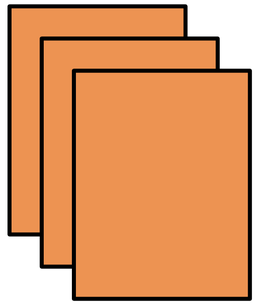
3 items in RDD

FLATMAP

RDD: **x**

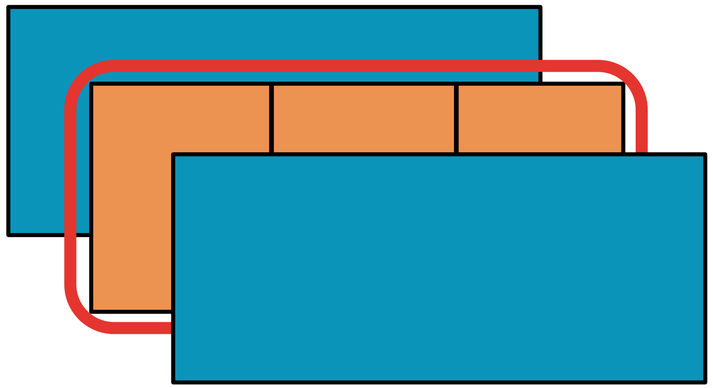


RDD: **y**

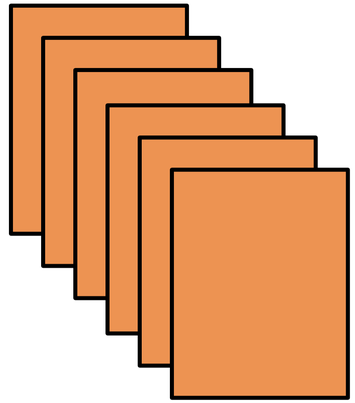


FLATMAP

RDD: **x**

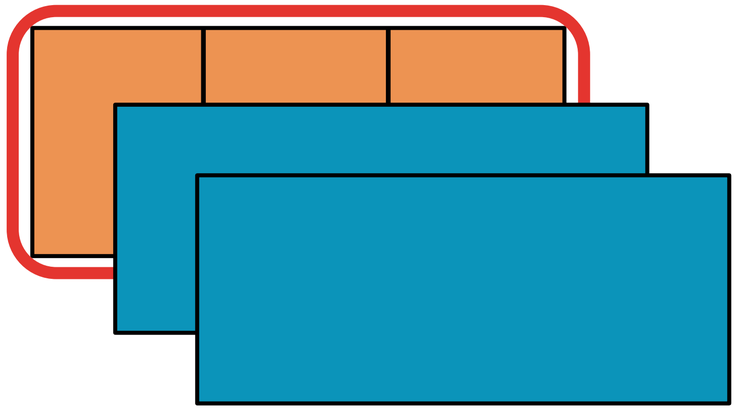


RDD: **y**

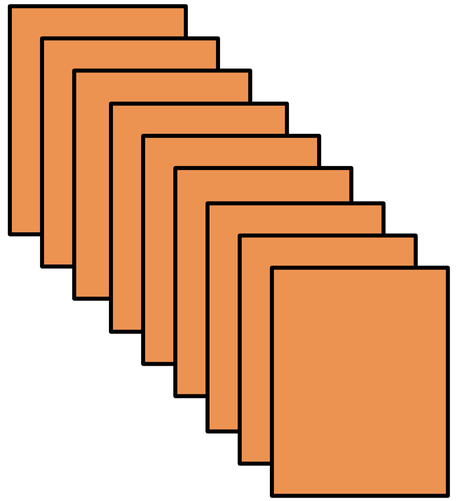


FLATMAP

RDD: **x**



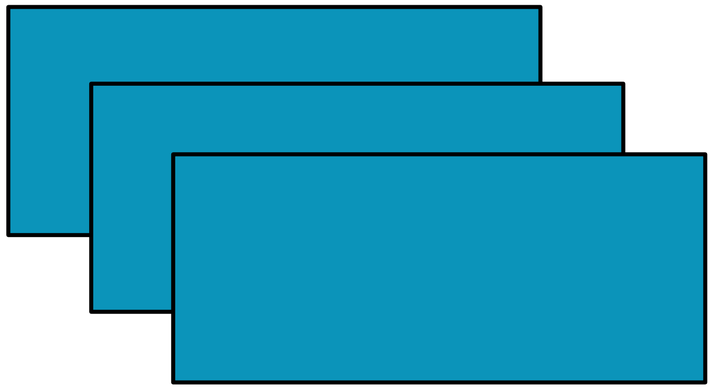
RDD: **y**



FLATMAP

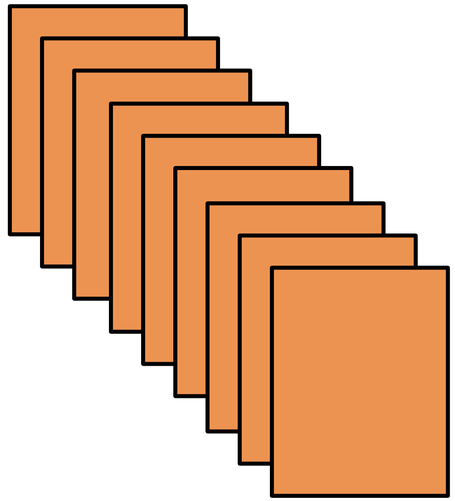
After `flatmap()` has been applied...

RDD: **x**



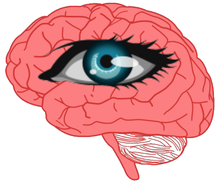
before

RDD: **y**

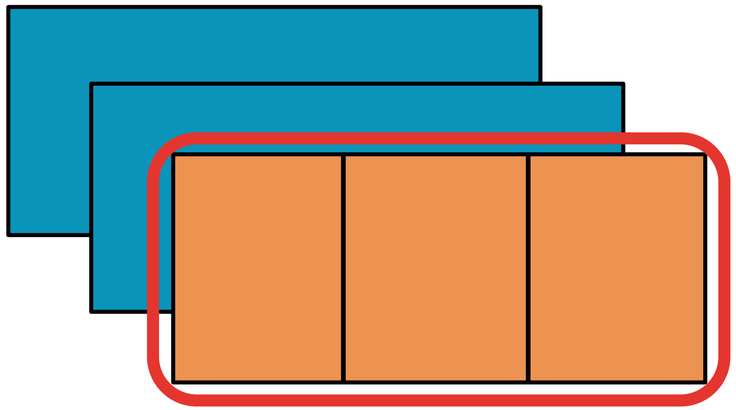


after

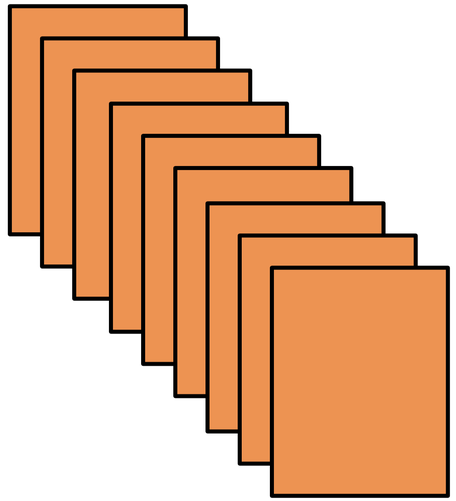
FLATMAP



RDD: x

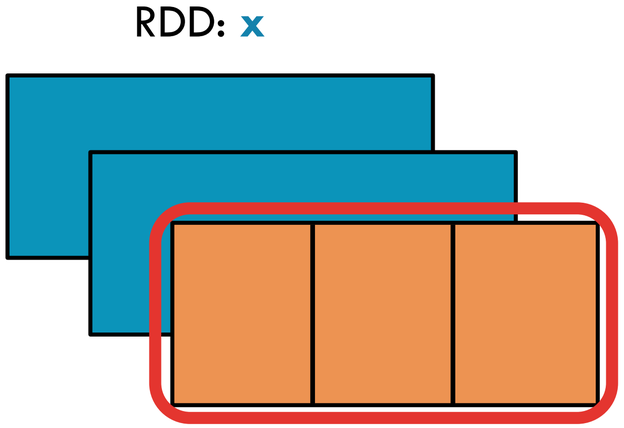


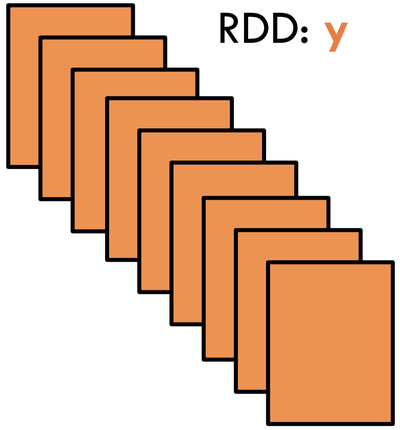
RDD: y



Return a new RDD by first applying a function to all elements of this RDD, and then flattening the results

FLATMAP





```
flatMap(f, preservesPartitioning=False)
```

Return a new RDD by first applying a function to all elements of this RDD, and then flattening the results

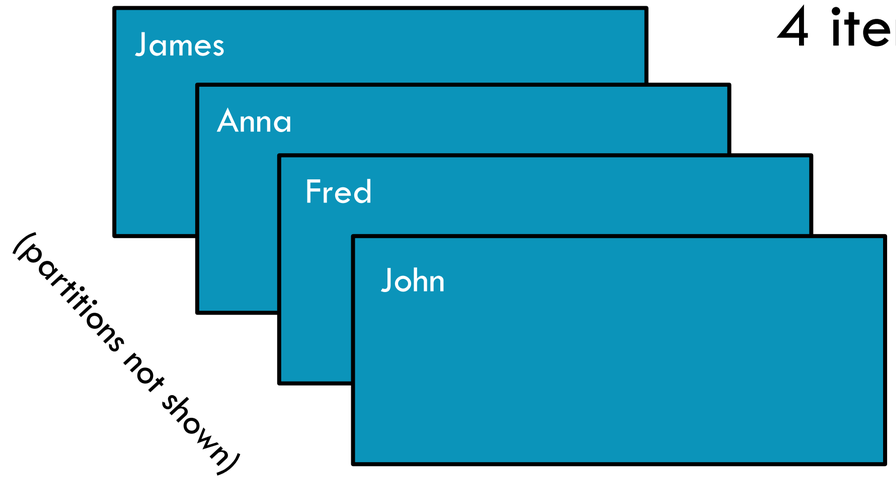
```python
x = sc.parallelize([1,2,3])
y = x.flatMap(lambda x: (x, x*100, 42))
print(x.collect())
print(y.collect())
```

```
x: [1, 2, 3]

y: [1, 100, 42, 2, 200, 42, 3, 300, 42]
```

```scala
val x = sc.parallelize(Array(1,2,3))
val y = x.flatMap(n => Array(n, n*100, 42))
println(x.collect().mkString(", "))
println(y.collect().mkString(", "))
```

GROUPBY

RDD: **x**

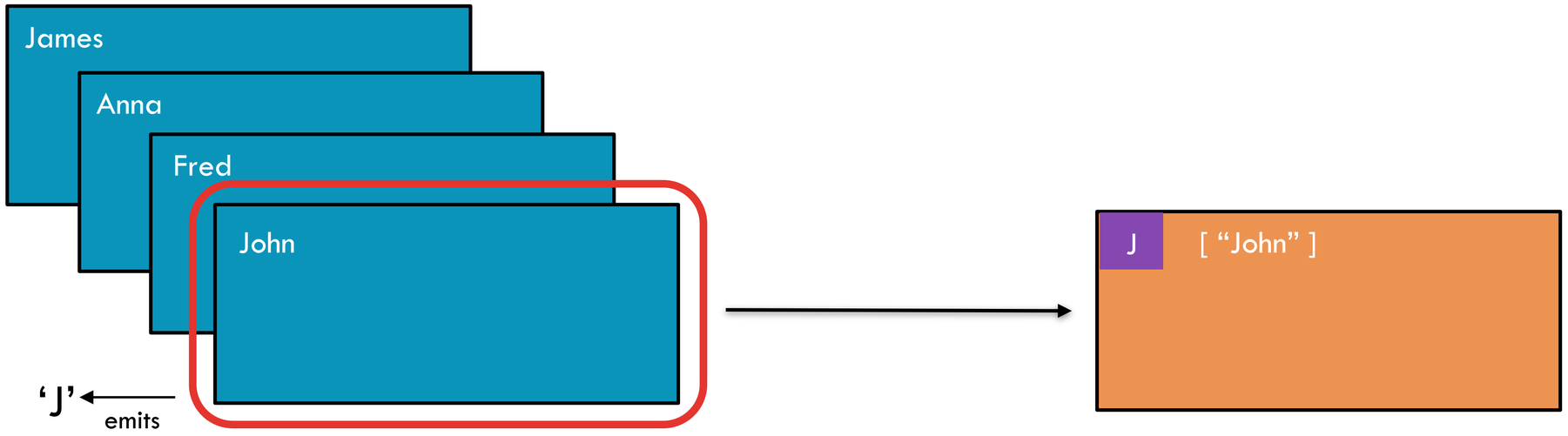


4 items in RDD

GROUPBY

RDD: x

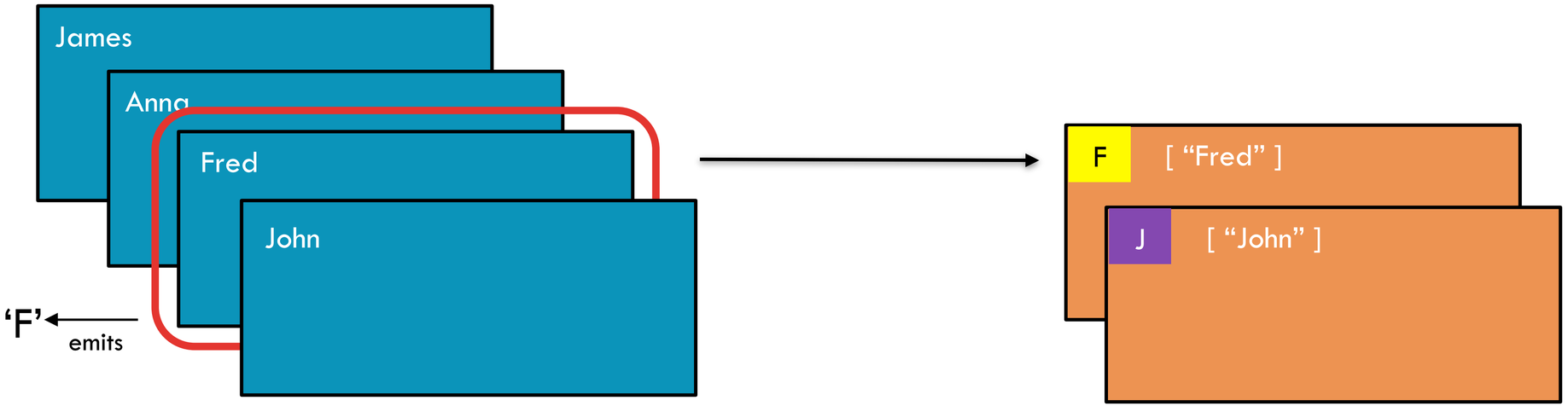
RDD: y



GROUPBY

RDD: x

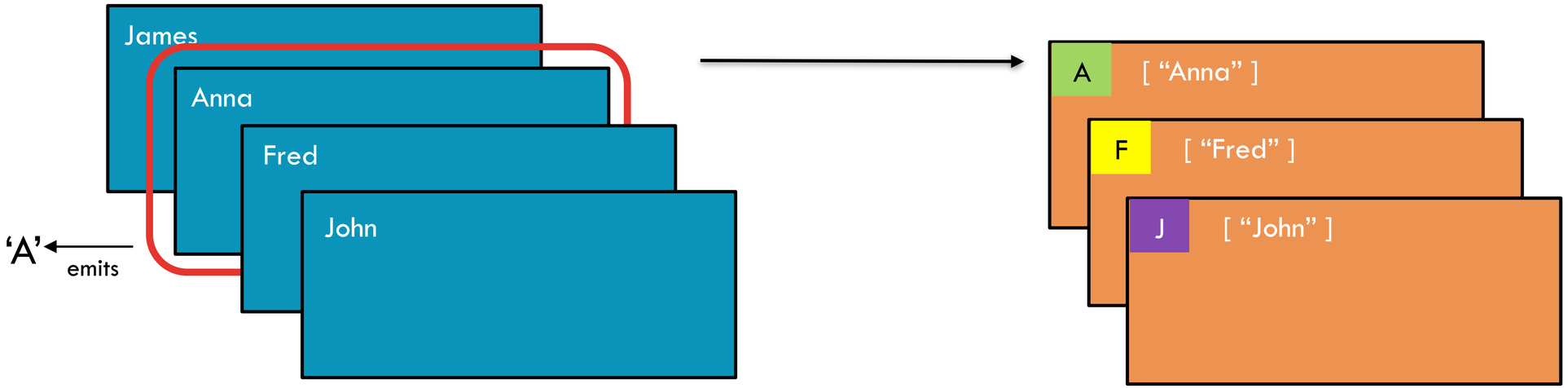
RDD: y



GROUPBY

RDD: x

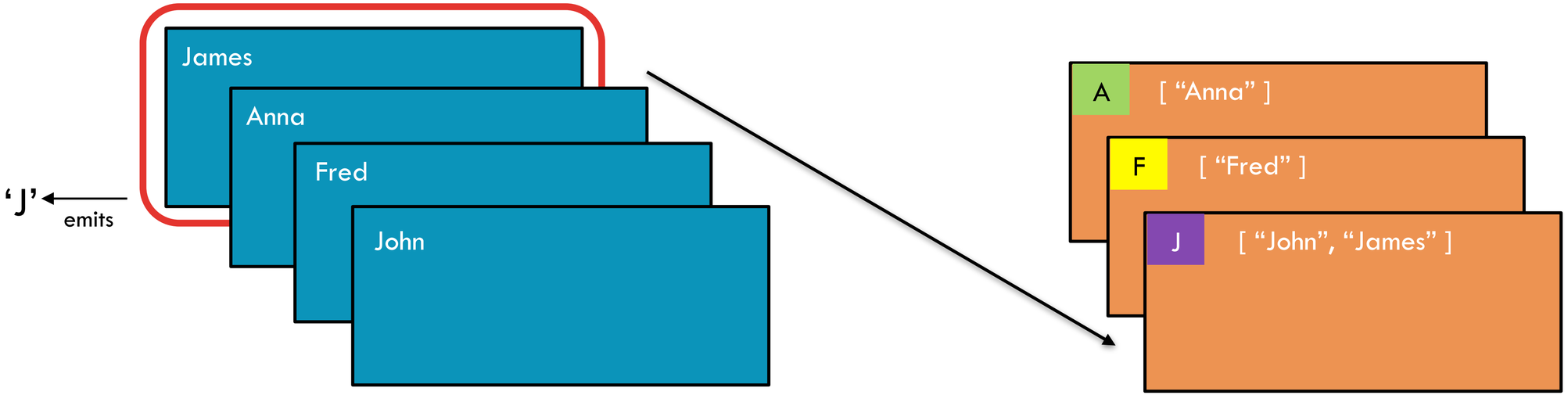
RDD: y



GROUPBY

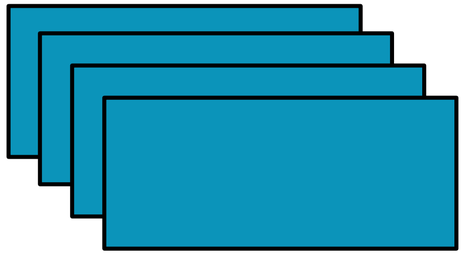
RDD: x

RDD: y



GROUPBY

RDD: x



RDD: y

groupBy(*f*, *numPartitions=None*)

Group the data in the original RDD. Create pairs where the key is the output of a user function, and the value is all items for which the function yields this key.

```
x = sc.parallelize(['John', 'Fred', 'Anna', 'James'])
y = x.groupBy(lambda w: w[0])
print [(k, list(v)) for (k, v) in y.collect()]
```

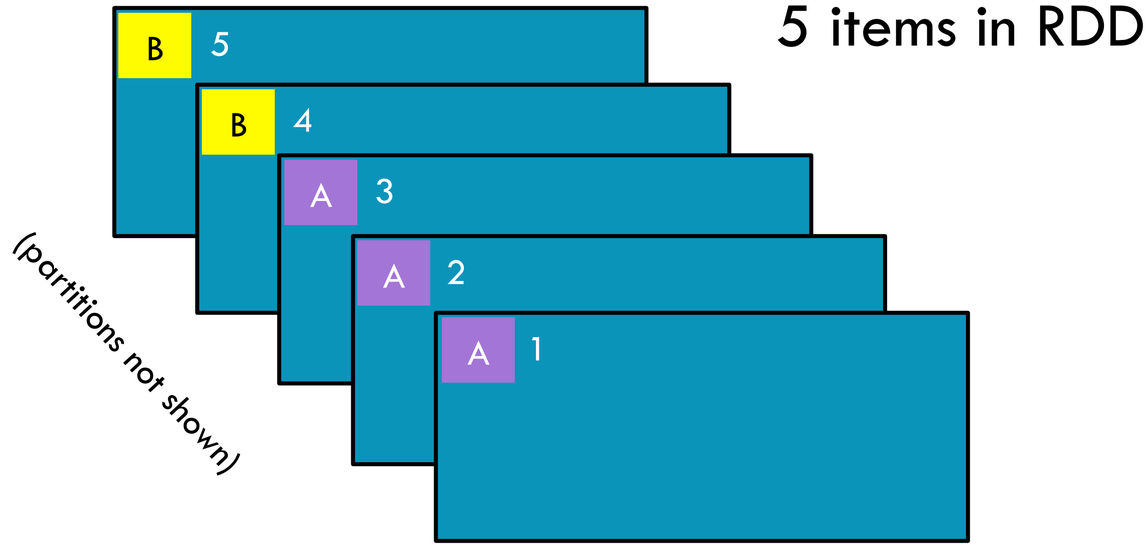
```
val x = sc.parallelize(
     Array("John", "Fred", "Anna", "James"))
val y = x.groupBy(w => w.charAt(0))
println(y.collect().mkString(", "))
```

x: ['John', 'Fred', 'Anna', 'James']

y: [('A',['Anna']),('J',['John','James']),('F',['Fred'])]

GROUPBYKEY

Pair RDD: **x**

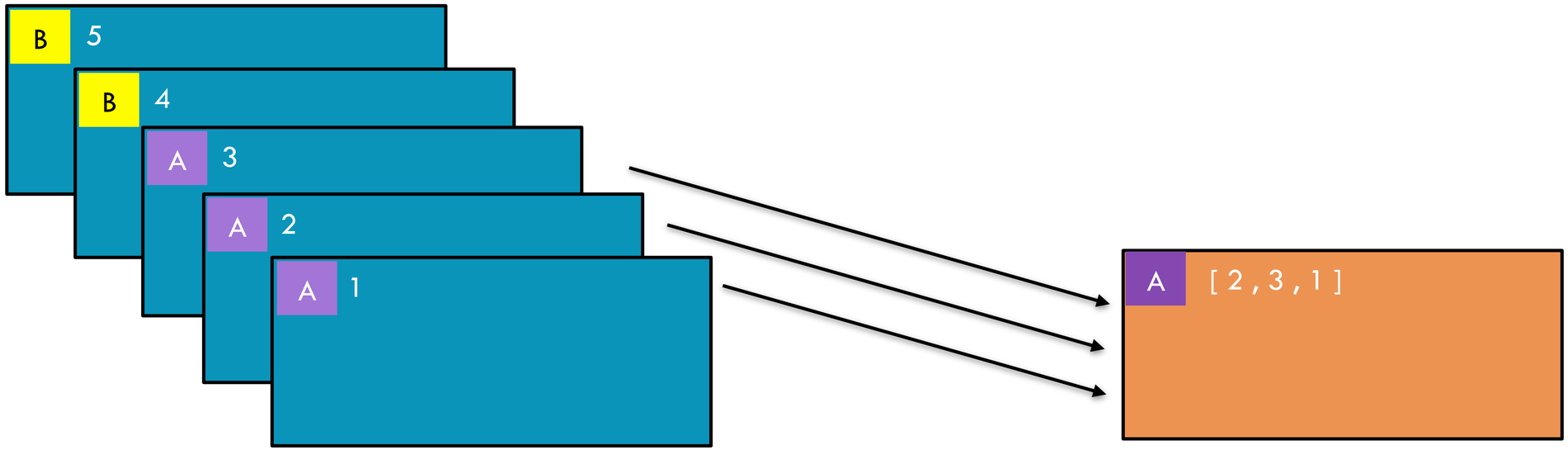


5 items in RDD

GROUPBYKEY

Pair RDD: **x**

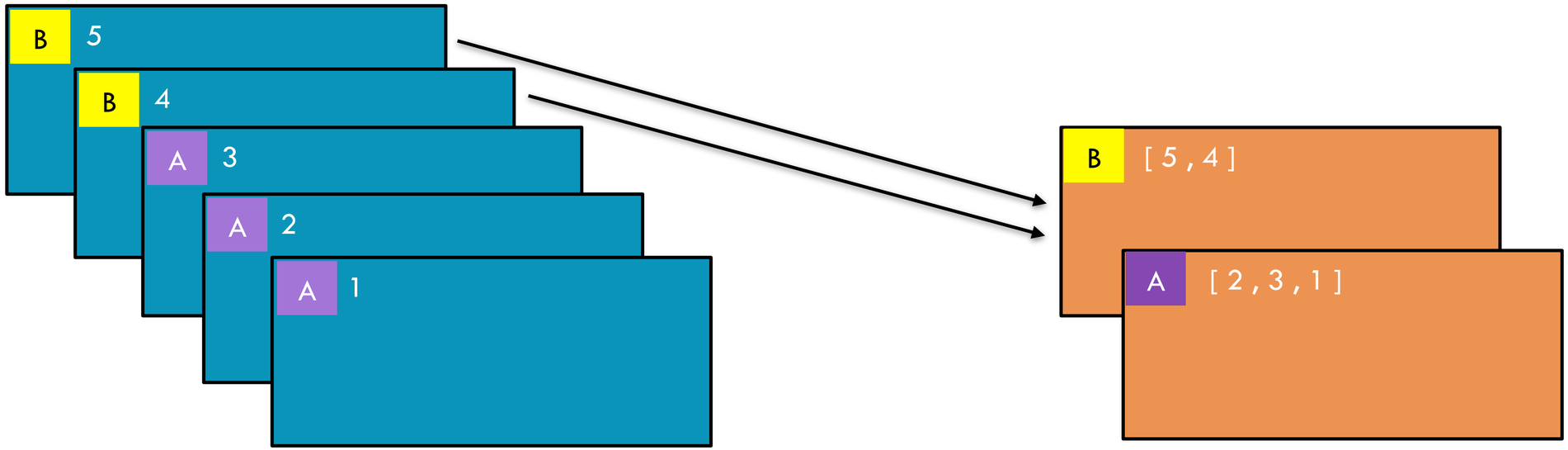
RDD: **y**



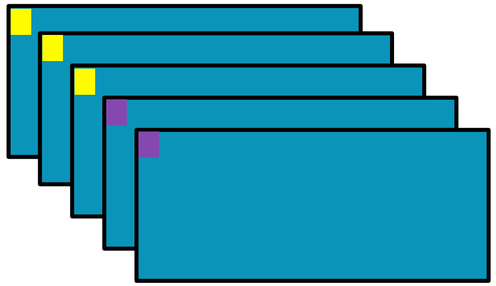
GROUPBYKEY

Pair RDD: **x**

RDD: **y**



GROUPBYKEY



groupByKey(*numPartitions=None*)

Group the values for each key in the original RDD. Create a new pair where the original key corresponds to this collected group of values.

```python
x = sc.parallelize([('B',5),('B',4),('A',3),('A',2),('A',1)])
y = x.groupByKey()
print(x.collect())
print(list((j[0], list(j[1])) for j in y.collect()))
```

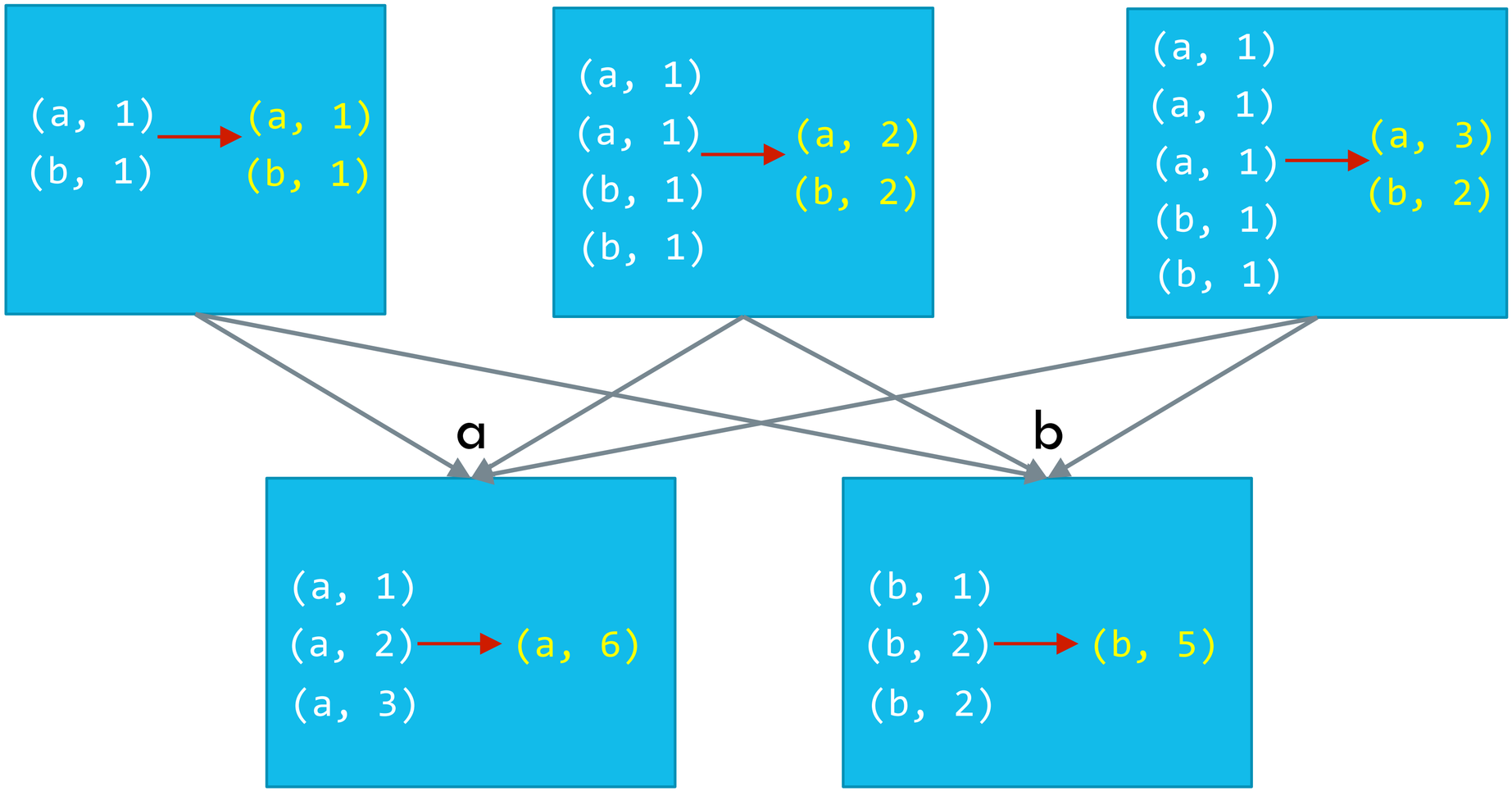
```
x: [('B', 5),('B', 4),('A', 3),('A', 2),('A', 1)]

y: [('A', [2, 3, 1]),('B',[5, 4])]
```

```scala
val x = sc.parallelize(
        Array(('B',5),('B',4),('A',3),('A',2),('A',1)))
val y = x.groupByKey()
println(x.collect().mkString(", "))
println(y.collect().mkString(", "))
```

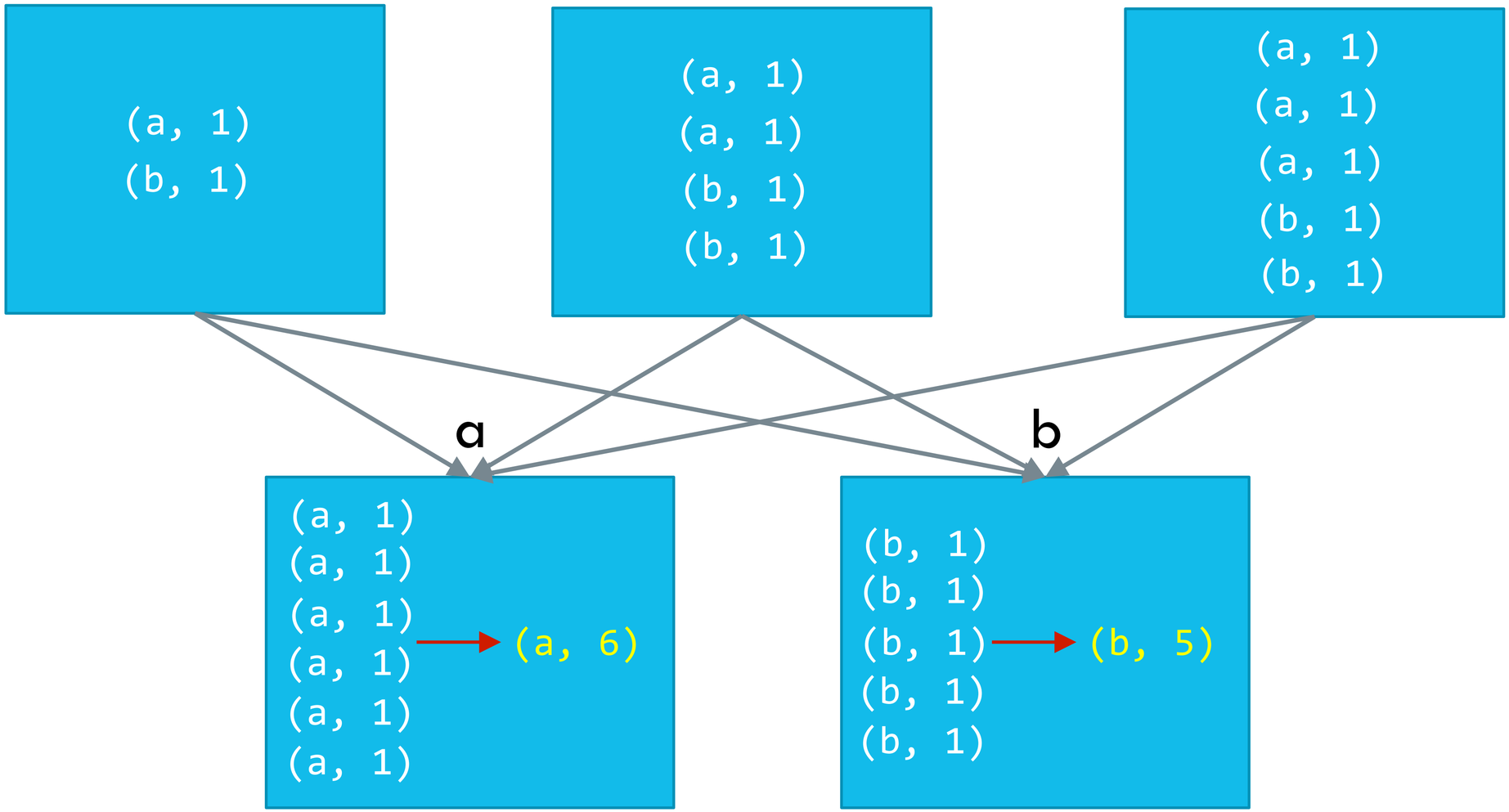
REDUCEBYKEY VS GROUPBYKEY

```
val words = Array("one", "two", "two", "three", "three", "three")
val wordPairsRDD = sc.parallelize(words).map(word => (word, 1))

val wordCountsWithReduce = wordPairsRDD
  .reduceByKey(_ + _)
  .collect()

val wordCountsWithGroup = wordPairsRDD
  .groupByKey()
  .map(t => (t._1, t._2.sum))
  .collect()
```

REDUCEBYKEY

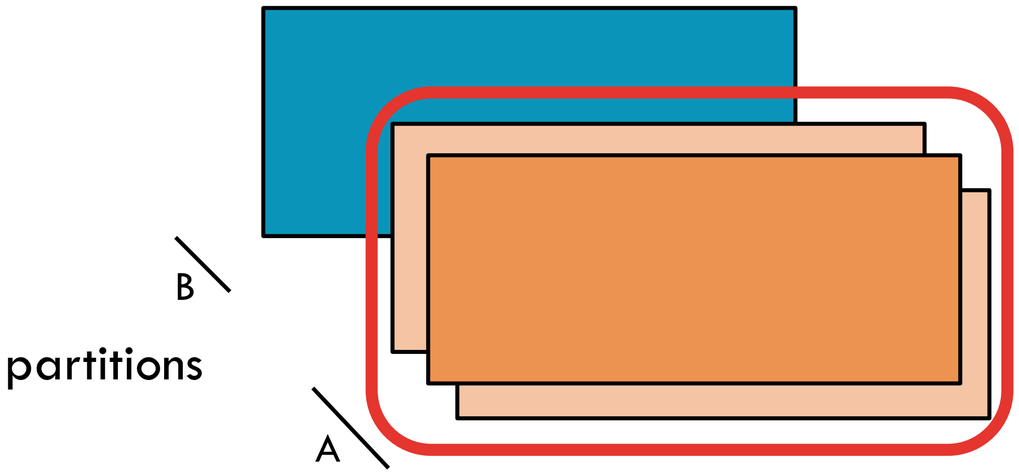


GROUPBYKEY


(a, 1)
(b, 1)
(a, 1)
(a, 1)
(b, 1)
(b, 1)
(a, 1)
(a, 1)
(a, 1)
(b, 1)
(b, 1)
a
b
(a, 1)
(a, 1)
(a, 1)
(a, 1)
(a, 1)
(a, 1)
(a, 6)
(b, 1)
(b, 1)
(b, 1)
(b, 1)
(b, 1)
(b, 1)
(b, 5)

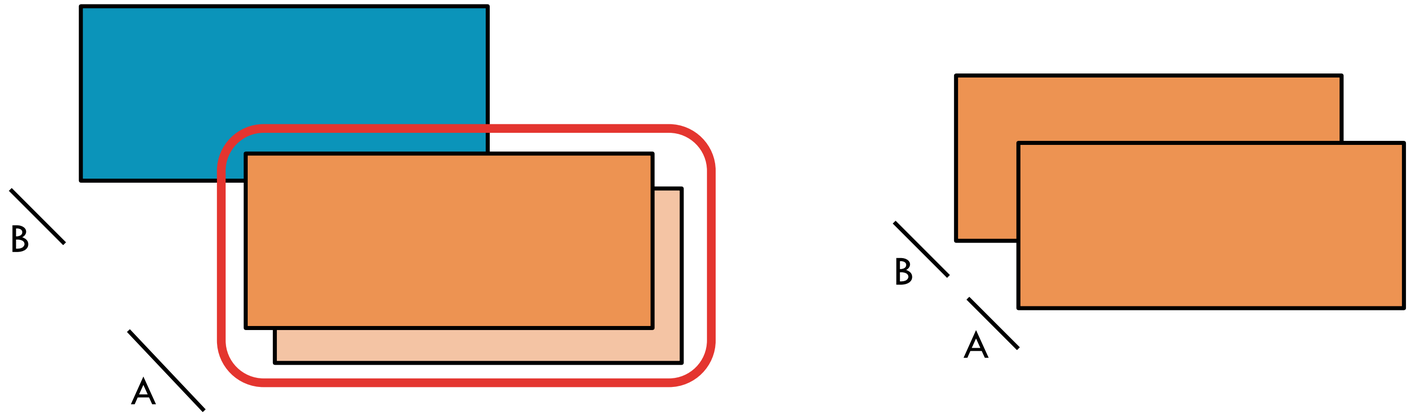
MAPPARTITIONS

RDD: **x**



RDD: **y**

MAPPARTITIONS



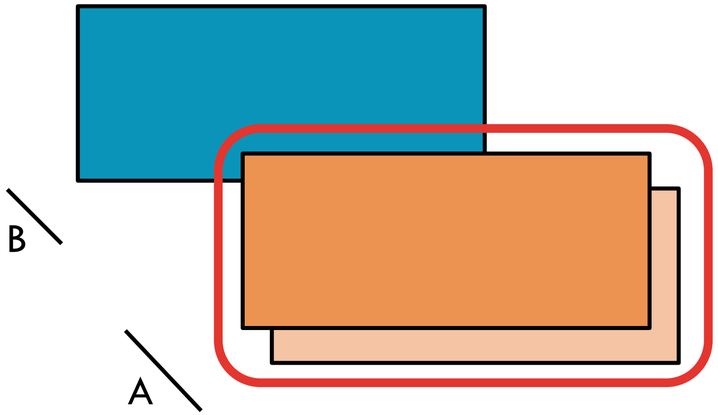
`mapPartitions(f, preservesPartitioning=False)`

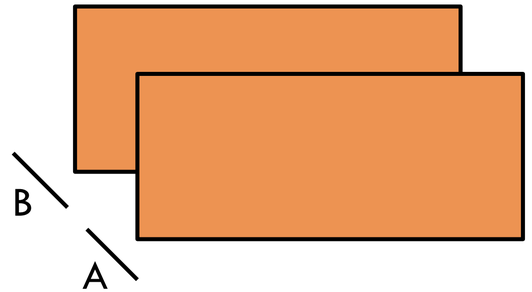
Return a new RDD by applying a function to each partition of this RDD

```
x = sc.parallelize([1,2,3], 2)

def f(iterator): yield sum(iterator); yield 42

y = x.mapPartitions(f)

# glom() flattens elements on the same partition
print(x.glom().collect())
print(y.glom().collect())
```

```
x: [[1], [2, 3]]

y: [[1, 42], [5, 42]]
```

MAPPARTITIONS





mapPartitions(*f*, *preservesPartitioning=False*)

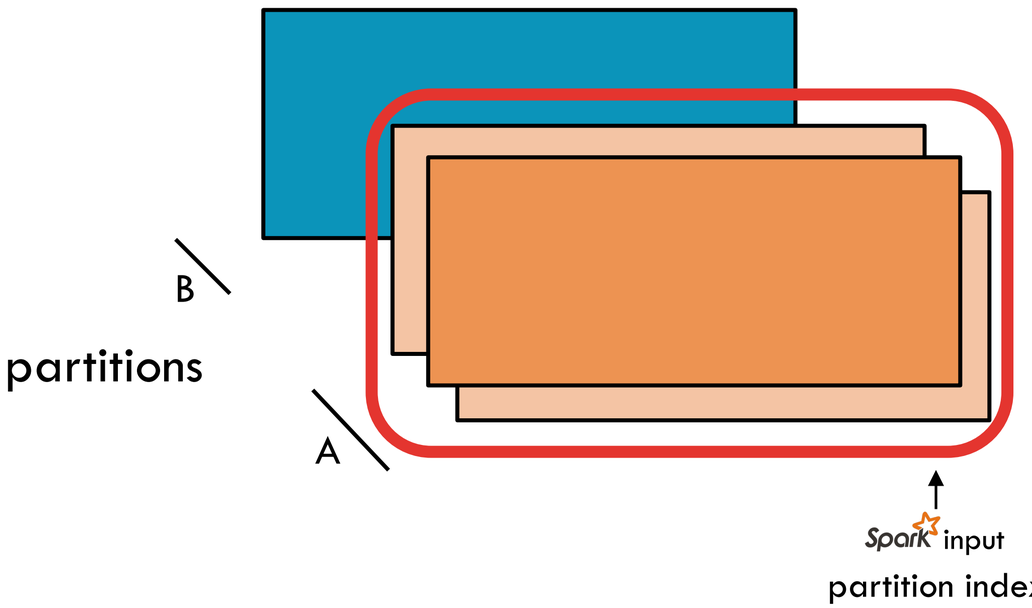
Return a new RDD by applying a function to each partition of this RDD

```
val x = sc.parallelize(Array(1,2,3), 2)

def f(i:Iterator[Int])={ (i.sum,42).productIterator }

val y = x.mapPartitions(f)

// glom() flattens elements on the same partition
val xOut = x.glom().collect()
val yOut = y.glom().collect()
```

```
x: Array(Array(1), Array(2, 3))

y: Array(Array(1, 42), Array(5, 42))
```

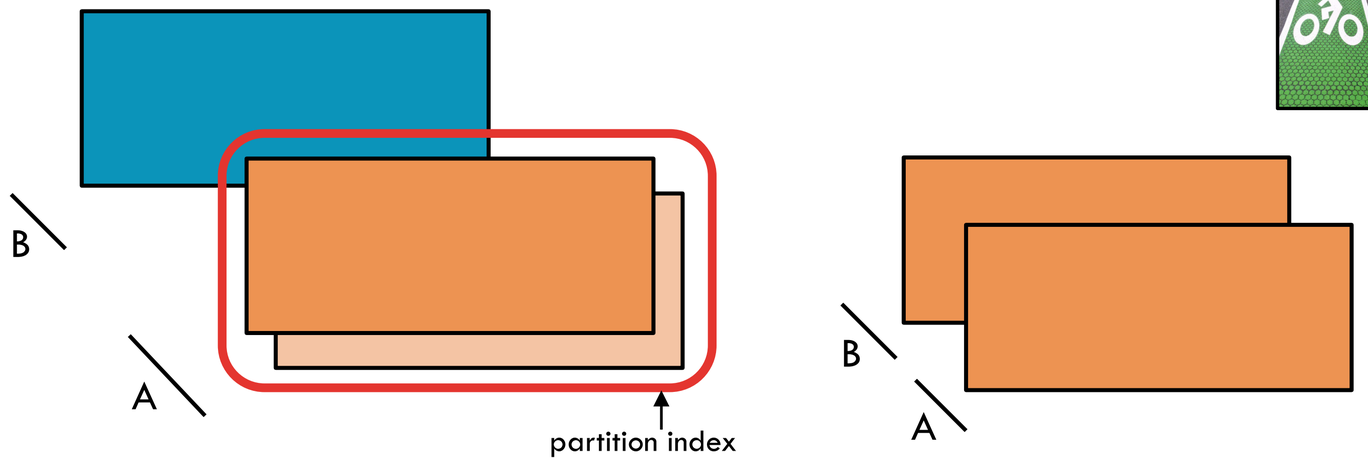
MAPPARTITIONSWITHINDEX

RDD: x



RDD: y

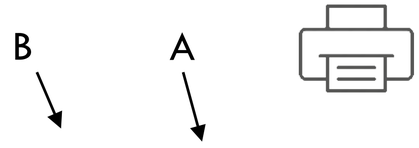
MAPPARTITIONSWITHINDEX



`mapPartitionsWithIndex(f, preservesPartitioning=False)`

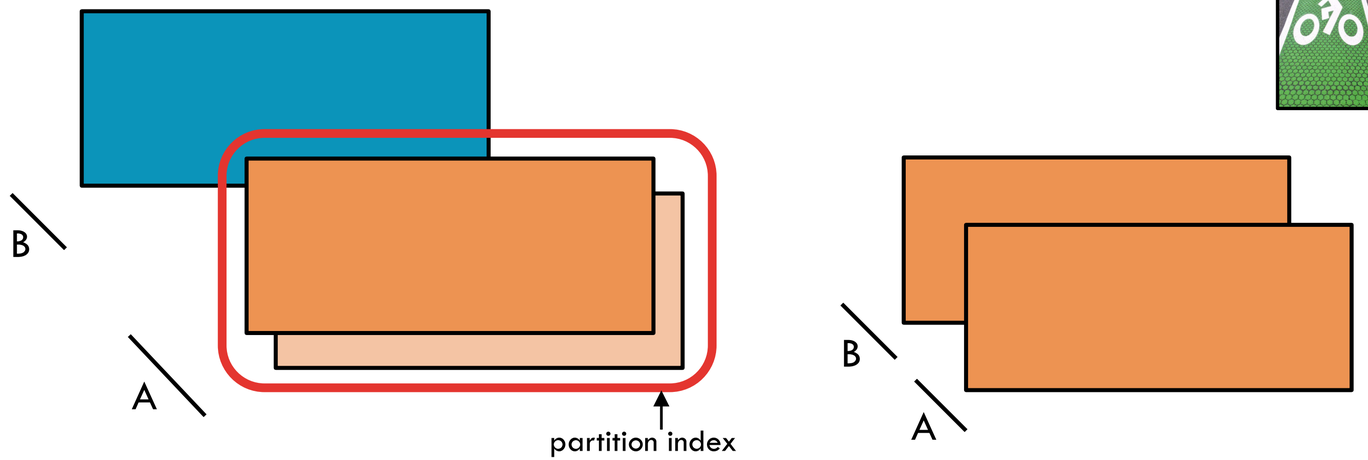
Return a new RDD by applying a function to each partition of this RDD, while tracking the index of the original partition

```
x = sc.parallelize([1,2,3], 2)

def f(partitionIndex, iterator): yield (partitionIndex, sum(iterator))

y = x.mapPartitionsWithIndex(f)

# glom() flattens elements on the same partition
print(x.glom().collect())
print(y.glom().collect())
```




```
x: [[1], [2, 3]]

y: [[0, 1], [1, 5]]
```

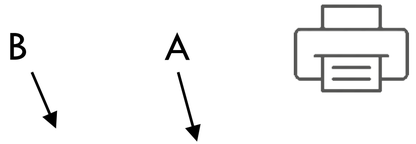
MAPPARTITIONSWITHINDEX



`mapPartitionsWithIndex(f, preservesPartitioning=False)`

Return a new RDD by applying a function to each partition of this RDD, while tracking the index of the original partition.

```
val x = sc.parallelize(Array(1,2,3), 2)

def f(partitionIndex:Int, i:Iterator[Int]) = {
 (partitionIndex, i.sum).productIterator
}

val y = x.mapPartitionsWithIndex(f)

// glom() flattens elements on the same partition
val xOut = x.glom().collect()
val yOut = y.glom().collect()
```

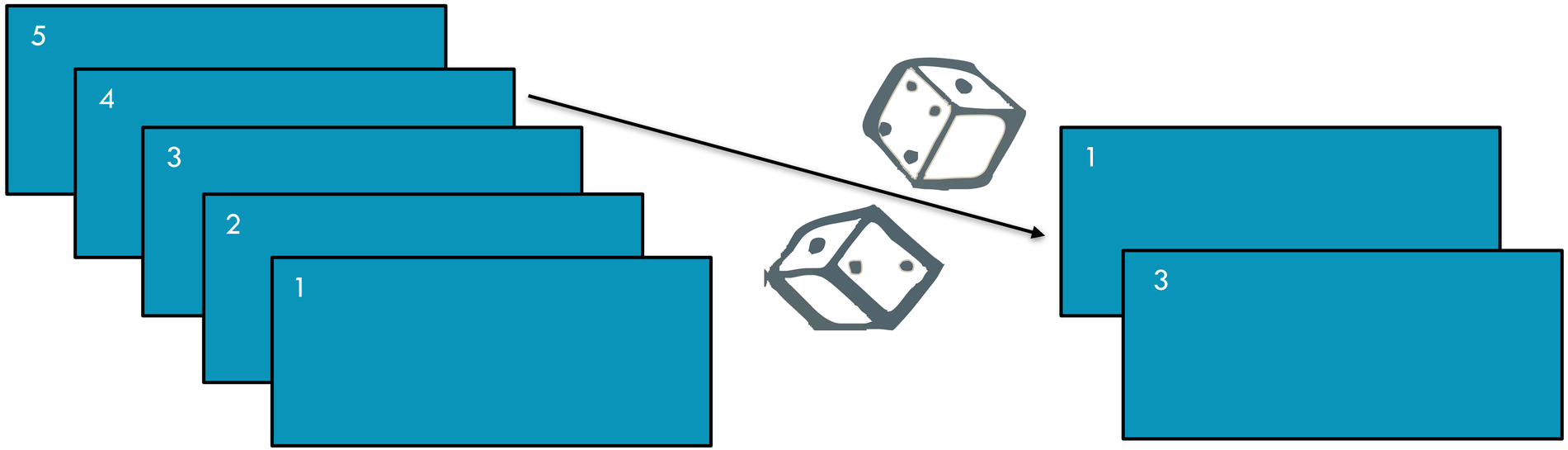



```
x:  Array(Array(1), Array(2, 3))

y:  Array(Array(0, 1), Array(1, 5))
```

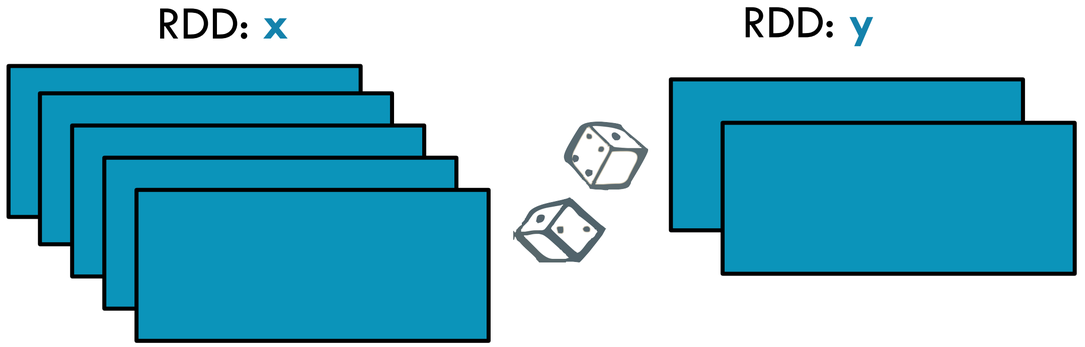
SAMPLE

RDD: **x**

RDD: **y**



SAMPLE



`sample(withReplacement, fraction, seed=None)`

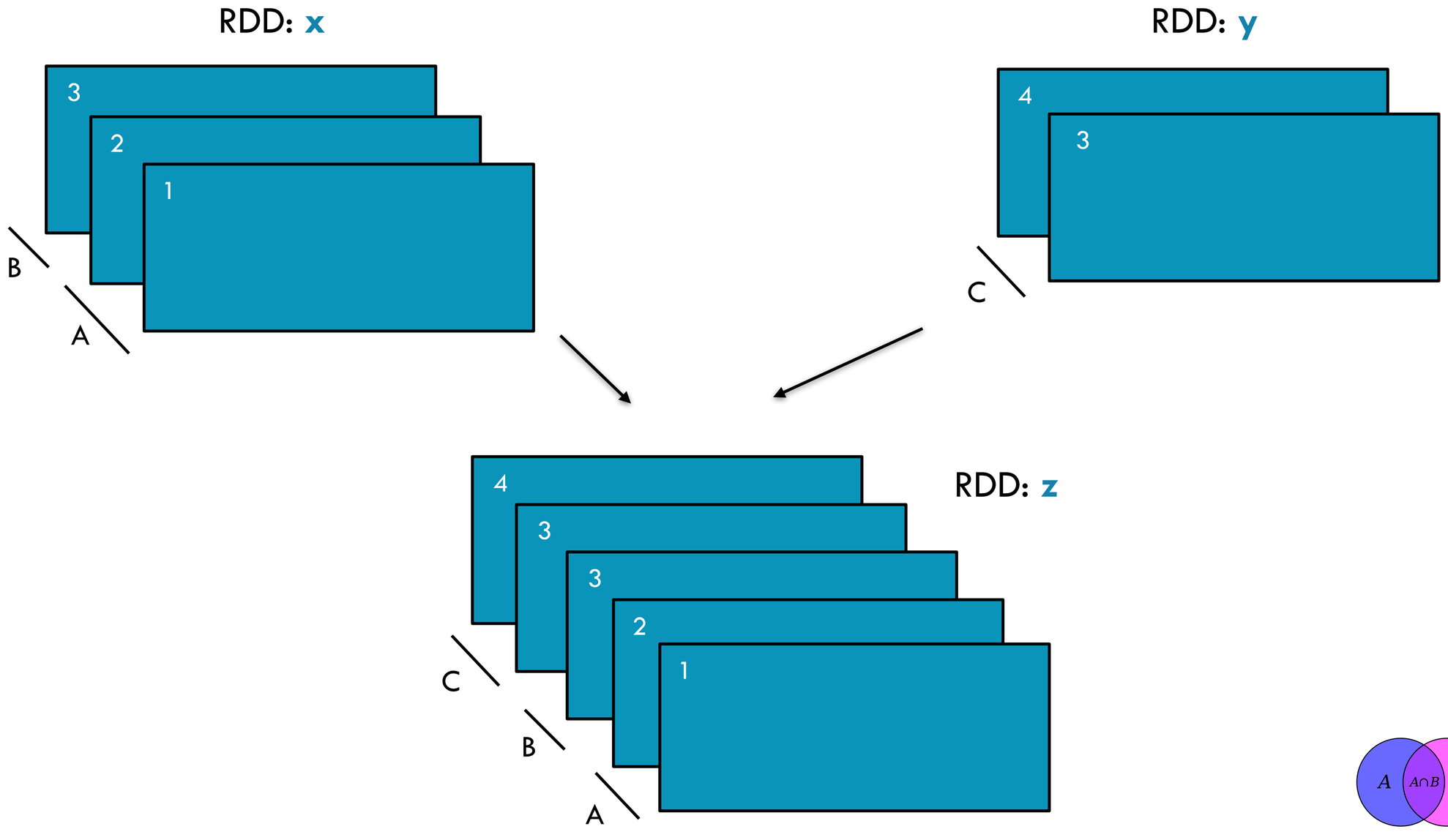
Return a new RDD containing a statistical sample of the original RDD

```python
x = sc.parallelize([1, 2, 3, 4, 5])
y = x.sample(False, 0.4, 42)
print(x.collect())
print(y.collect())
```

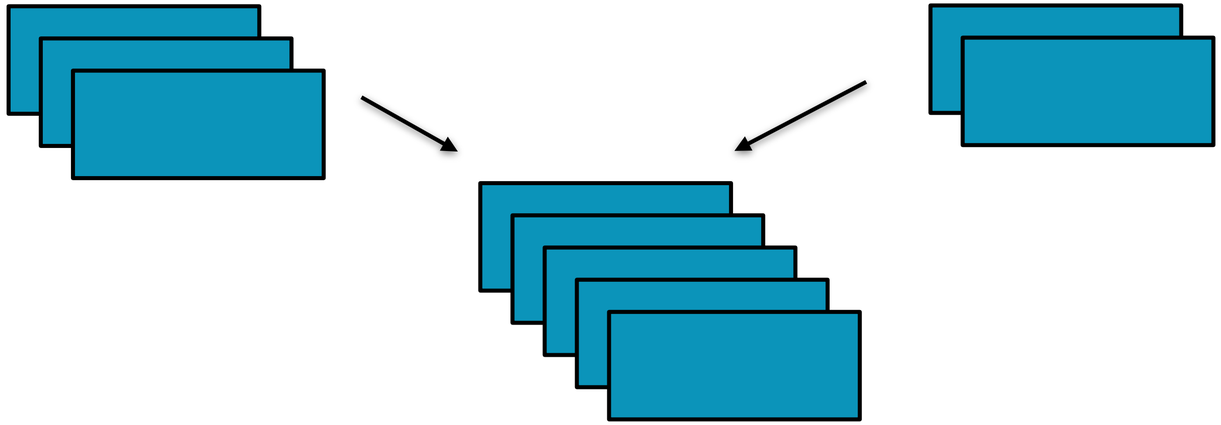
```
x: [1, 2, 3, 4, 5]

y: [1, 3]
```

```scala
val x = sc.parallelize(Array(1, 2, 3, 4, 5))
val y = x.sample(false, 0.4)

// omitting seed will yield different output
println(y.collect().mkString(", "))
```

UNION



UNION



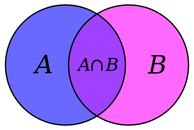
Return a new RDD containing all items from two original RDDs. Duplicates are *not* culled.

union(*otherRDD*)

```
x = sc.parallelize([1,2,3], 2)
y = sc.parallelize([3,4], 1)
z = x.union(y)
print(z.glom().collect())
```

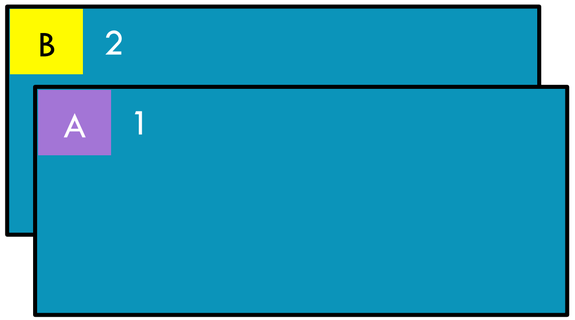
```
val x = sc.parallelize(Array(1,2,3), 2)
val y = sc.parallelize(Array(3,4), 1)
val z = x.union(y)
val zOut = z.glom().collect()
```

```
x: [1, 2, 3]

y: [3, 4]

z: [[1], [2, 3], [3, 4]]
```

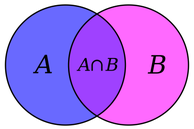


JOIN

RDD: **x**



RDD: **y**



JOIN

RDD: **x**

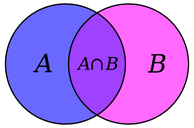
B	2
A	1

RDD: **y**

B	5
A	4
A	3

RDD: **z**

A	(1, 3)



JOIN

RDD: **x**

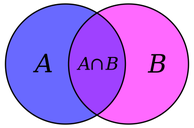
B	2
A	1

RDD: **y**

B	5
A	4
A	3

RDD: **z**

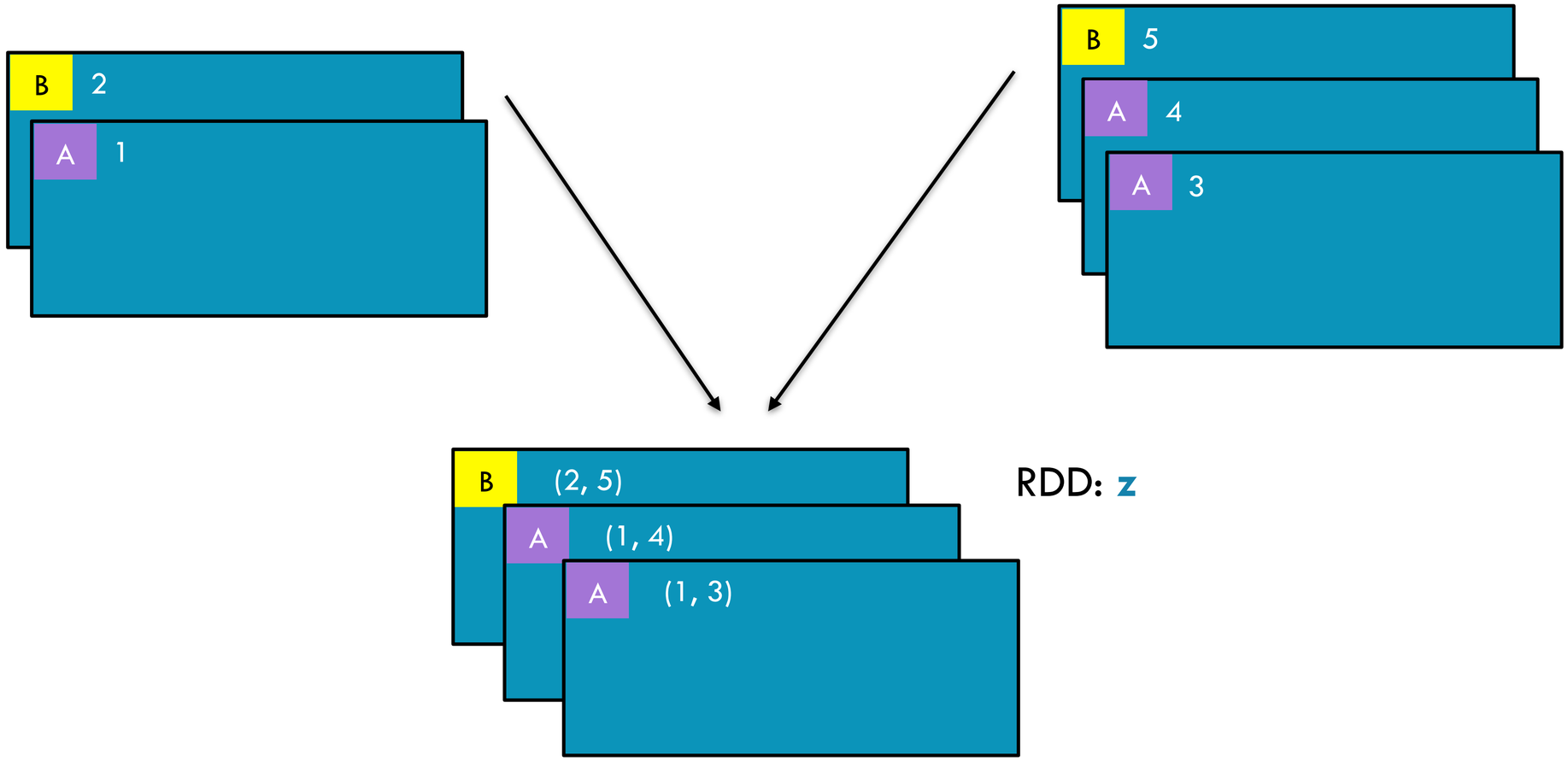
A	(1, 4)
A	(1, 3)



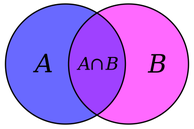
JOIN

RDD: **x**

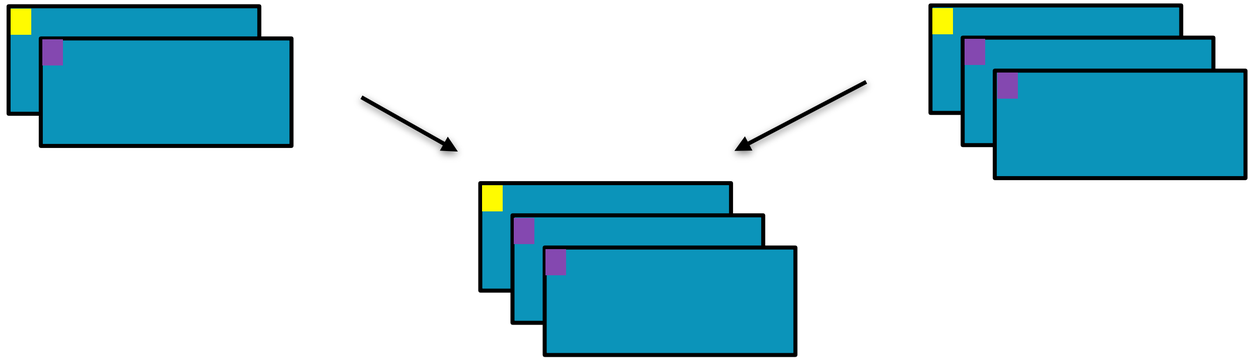
RDD: **y**



RDD: **z**



JOIN



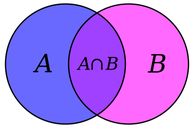
Return a new RDD containing all pairs of elements having the same key in the original RDDs

join(*otherRDD, numPartitions=None*)

```python
x = sc.parallelize([("a", 1), ("b", 2)])
y = sc.parallelize([("a", 3), ("a", 4), ("b", 5)])
z = x.join(y)
print(z.collect())
```

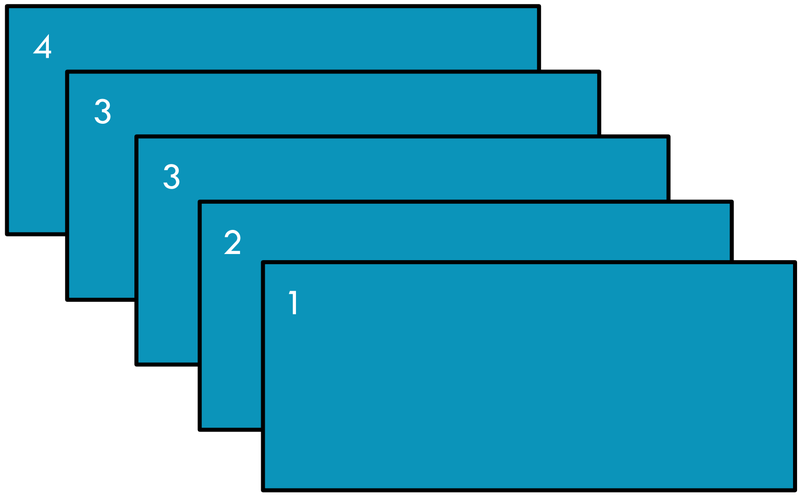
```
x: [("a", 1), ("b", 2)]

y: [("a", 3), ("a", 4), ("b", 5)]

z: [('a', (1, 3)), ('a', (1, 4)), ('b', (2, 5))]
```

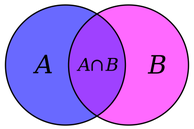
```scala
val x = sc.parallelize(Array(("a", 1), ("b", 2)))
val y = sc.parallelize(Array(("a", 3), ("a", 4), ("b", 5)))
val z = x.join(y)
println(z.collect().mkString(", "))
```



DISTINCT

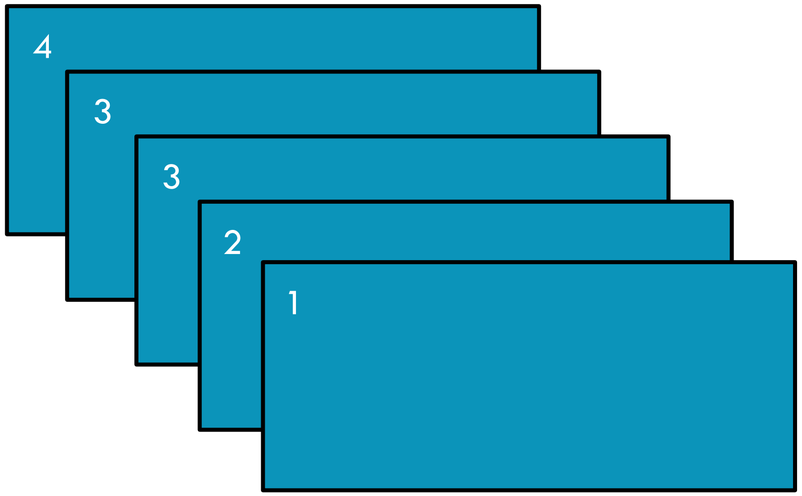
RDD: **x**



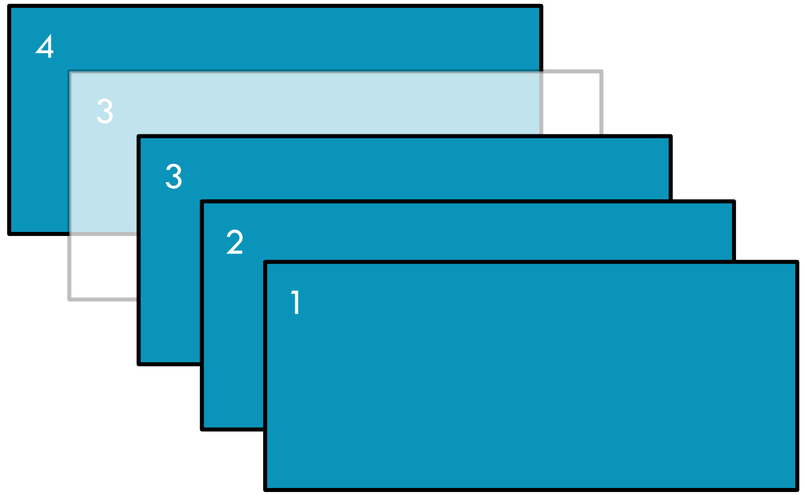


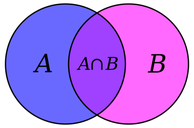
DISTINCT

RDD: **x**



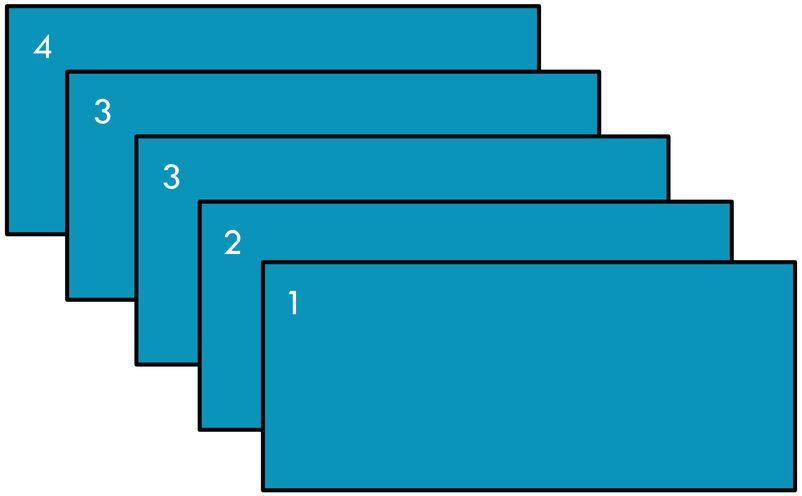
RDD: **y**



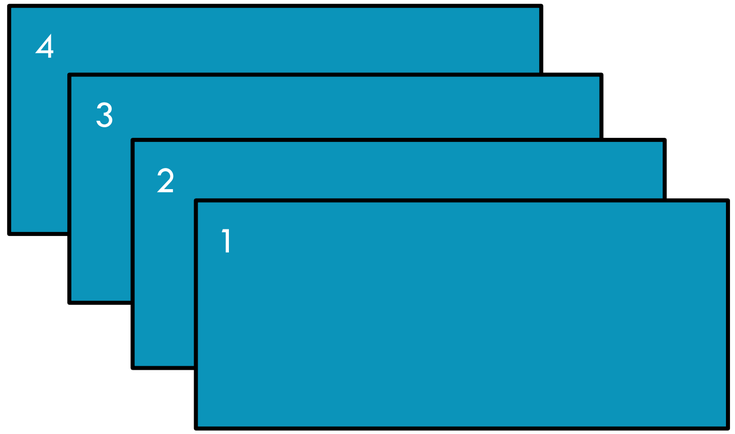


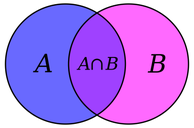
DISTINCT

RDD: **x**

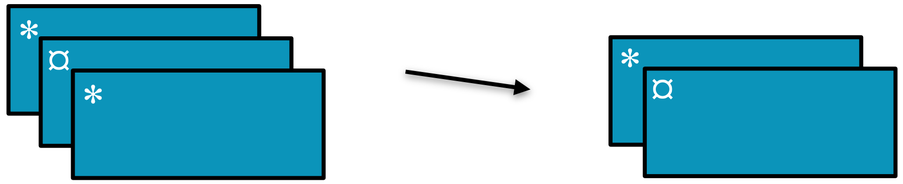


RDD: **y**





DISTINCT



Return a new RDD containing distinct items from the original RDD (omitting all duplicates)

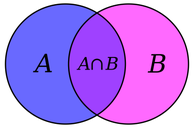
distinct(*numPartitions=None*)

```
x = sc.parallelize([1,2,3,3,4])
y = x.distinct()

print(y.collect())
```

```
val x = sc.parallelize(Array(1,2,3,3,4))
val y = x.distinct()

println(y.collect().mkString(", "))
```

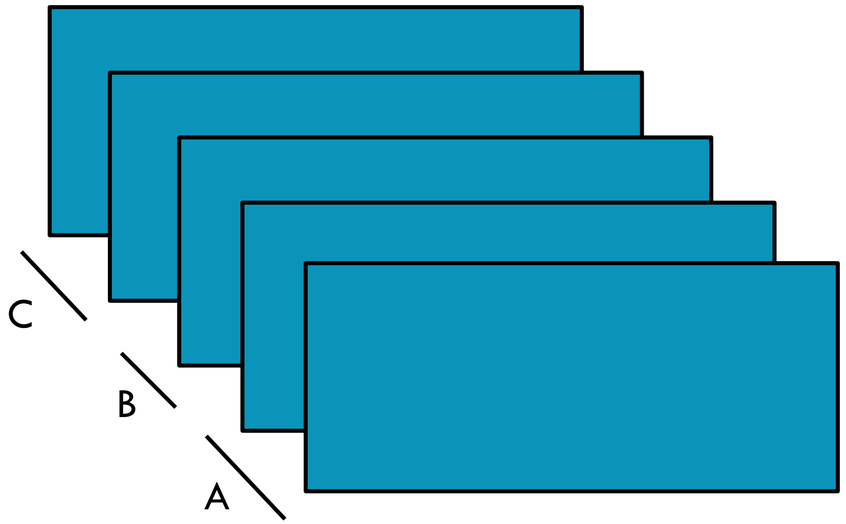
x: [1, 2, 3, 3, 4]

y: [1, 2, 3, 4]



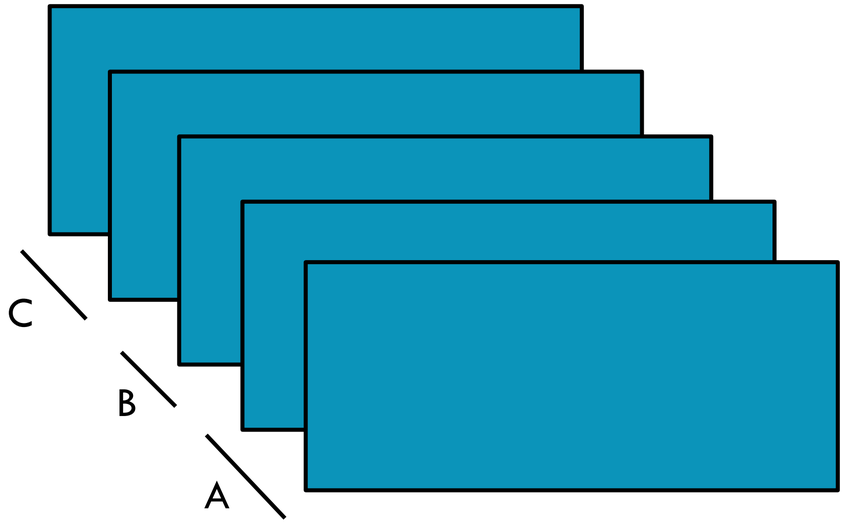
COALESCE

RDD: **x**

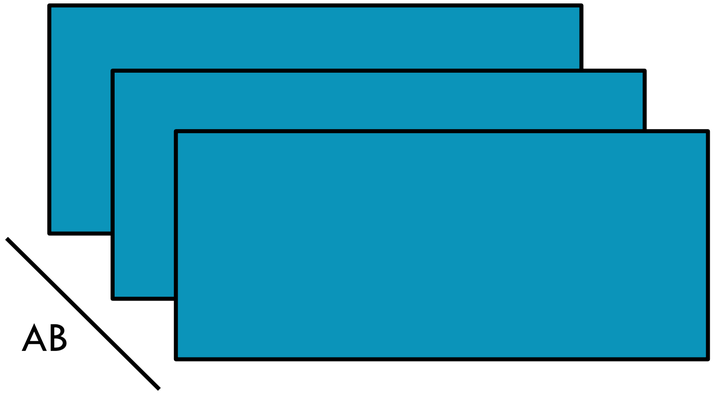


COALESCE

RDD: **x**

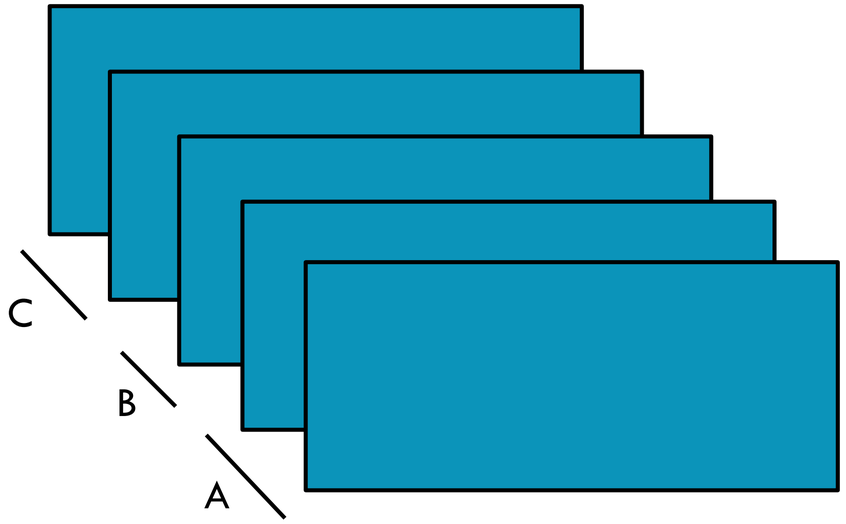


RDD: **y**

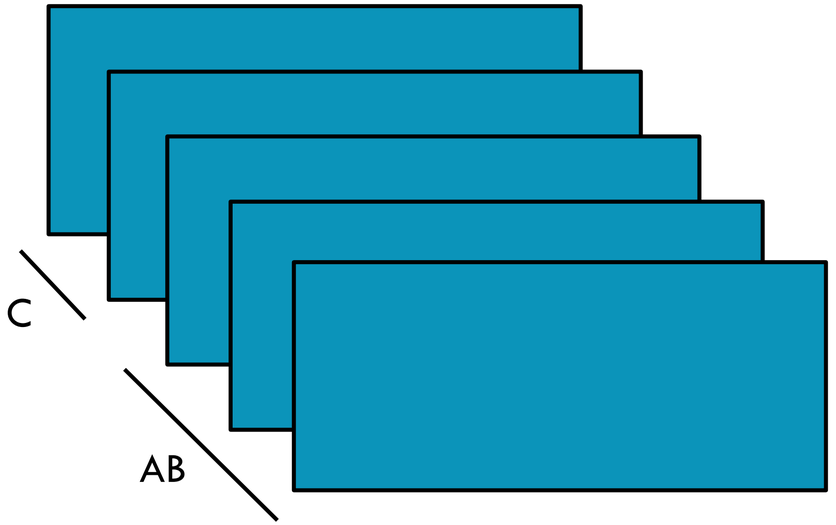


COALESCE

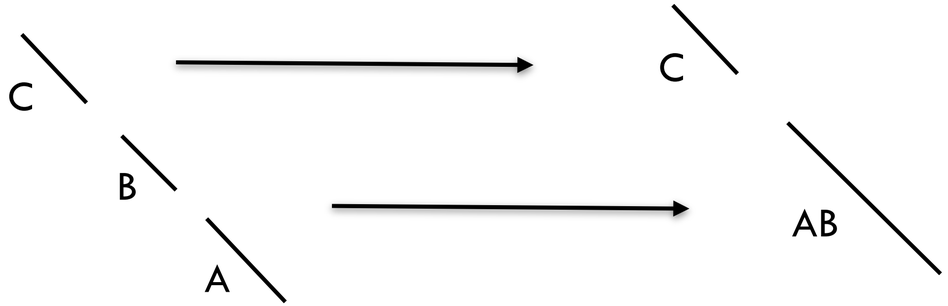
RDD: **x**



RDD: **y**



COALESCE



Return a new RDD which is reduced to a smaller number of partitions

coalesce(*numPartitions, shuffle=False*)

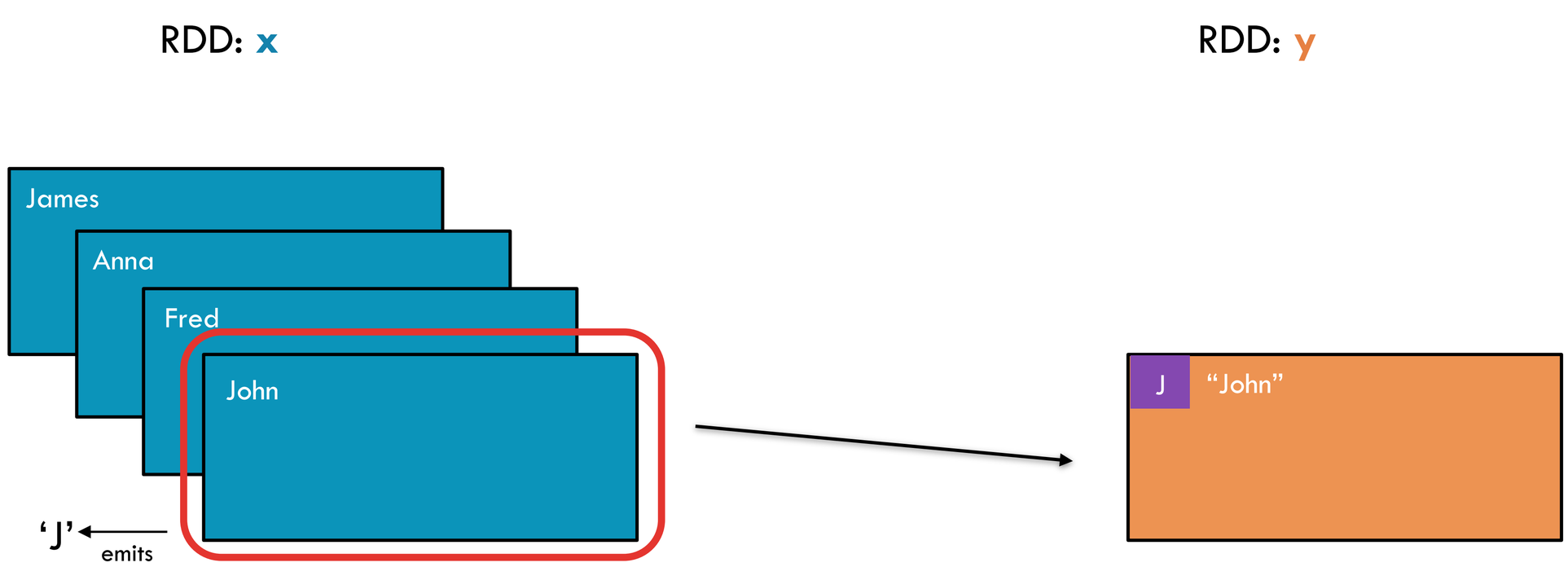
```
x = sc.parallelize([1, 2, 3, 4, 5], 3)
y = x.coalesce(2)
print(x.glom().collect())
print(y.glom().collect())
```

x: [[1], [2, 3], [4, 5]]

y: [[1], [2, 3, 4, 5]]

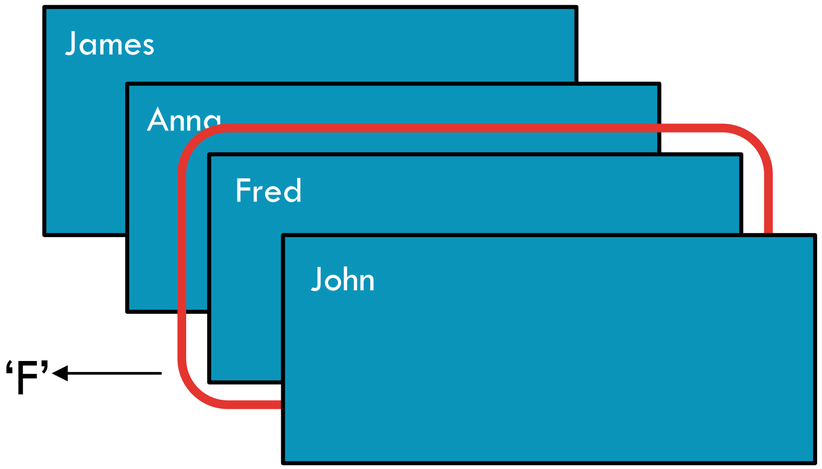
```
val x = sc.parallelize(Array(1, 2, 3, 4, 5), 3)
val y = x.coalesce(2)
val xOut = x.glom().collect()
val yOut = y.glom().collect()
```

KEYBY

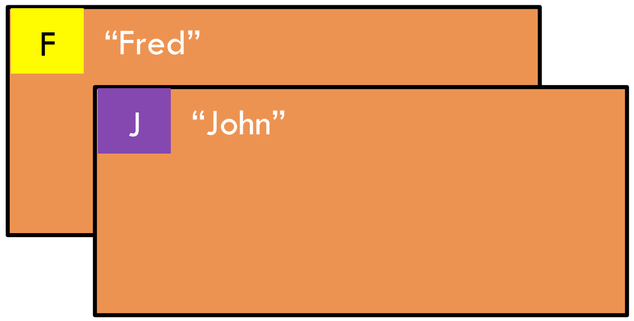


KEYBY

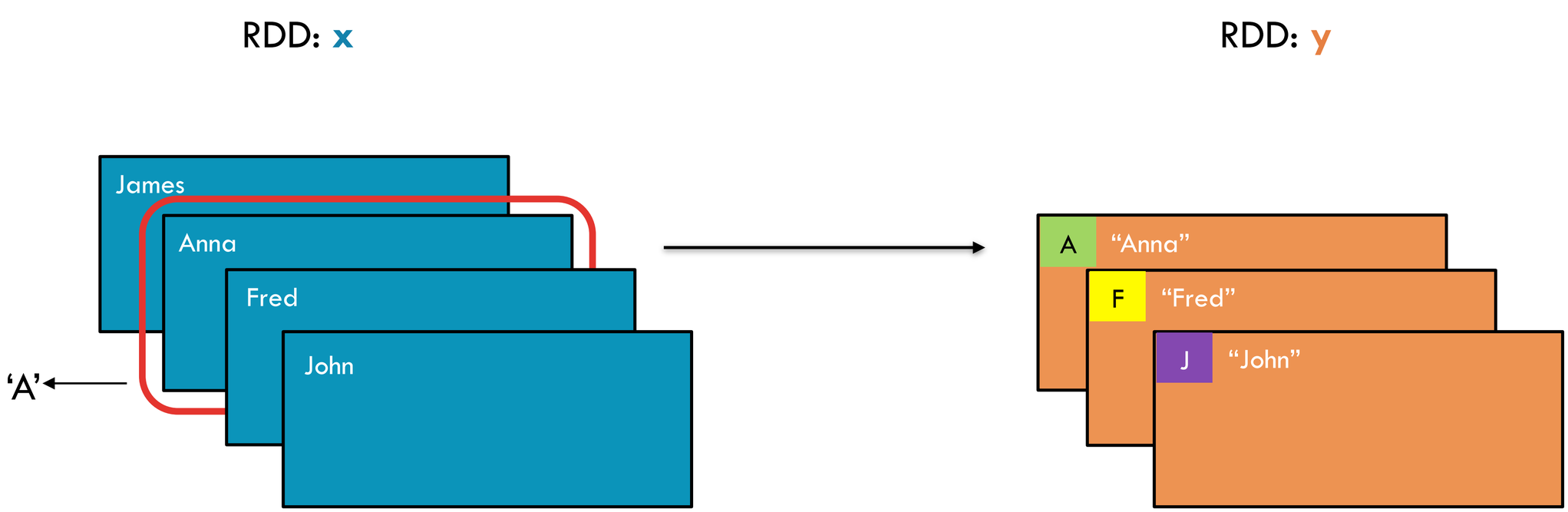
RDD: x



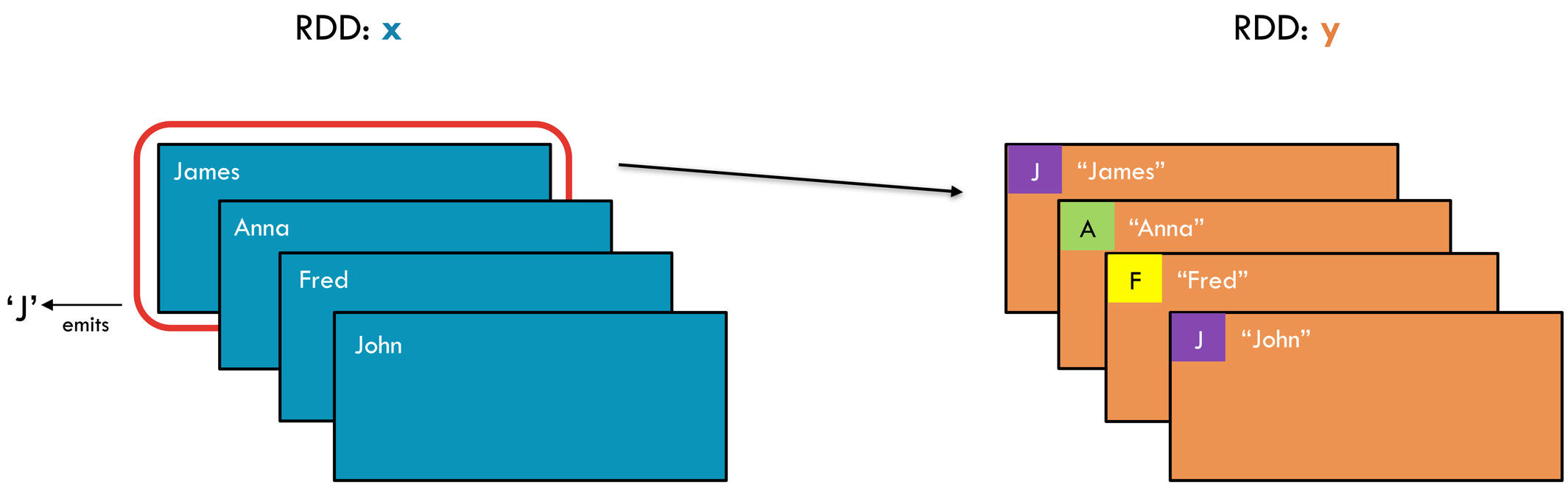
RDD: y



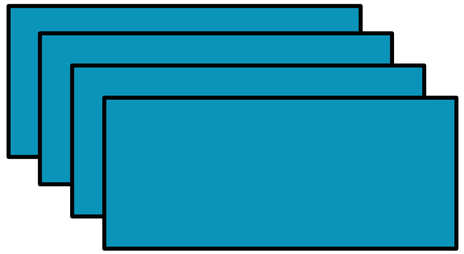
KEYBY

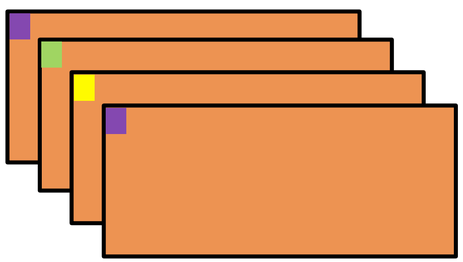


KEYBY


RDD: x
RDD: y
James
Anna
Fred
John
'J'
emits
J
"James"
A
"Anna"
F
"Fred"
J
"John"

KEYBY





keyBy(*f*)

Create a Pair RDD, forming one pair for each item in the original RDD. The pair's key is calculated from the value via a user-supplied function.

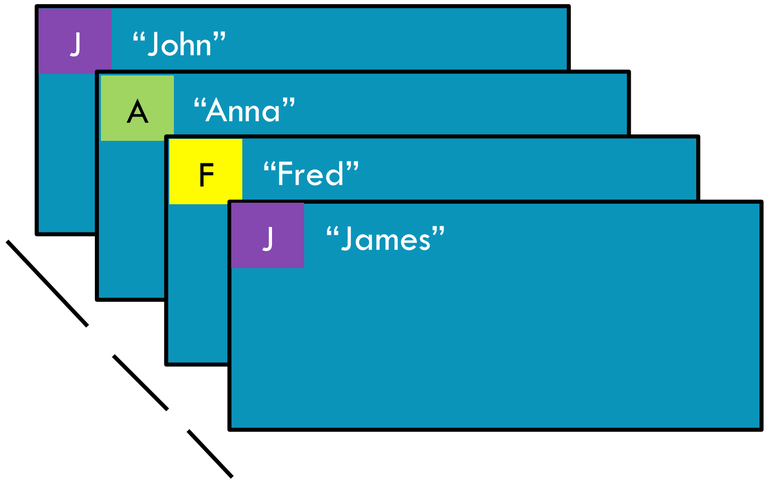
```
x = sc.parallelize(['John', 'Fred', 'Anna', 'James'])
y = x.keyBy(lambda w: w[0])
print y.collect()
```

```
val x = sc.parallelize(
     Array("John", "Fred", "Anna", "James"))
val y = x.keyBy(w => w.charAt(0))
println(y.collect().mkString(", "))
```

```
x: ['John', 'Fred', 'Anna', 'James']

y: [('J','John'),('F','Fred'),('A','Anna'),('J','James')]
```

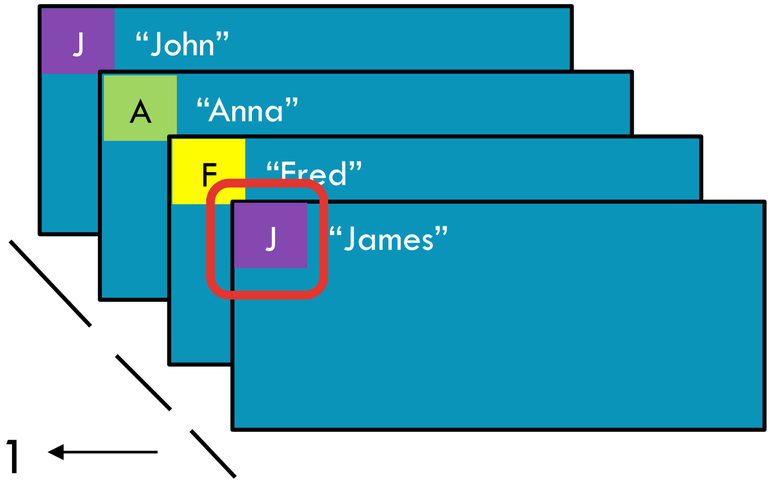
PARTITIONBY

RDD: **x**

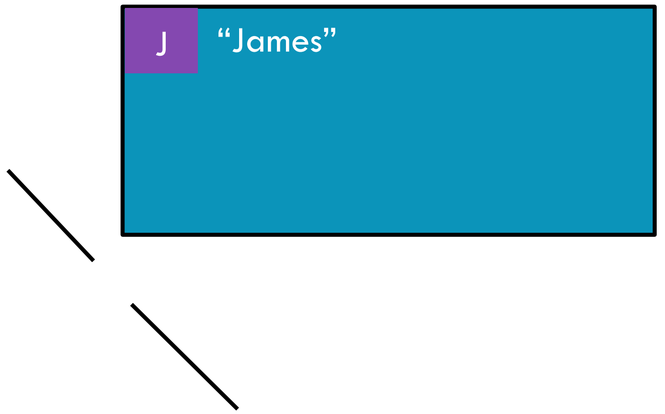


PARTITIONBY

RDD: **x**

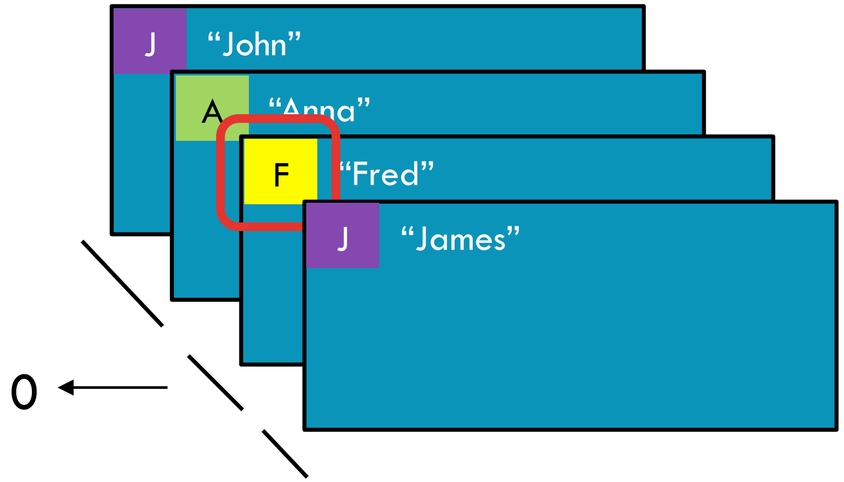


RDD: **y**

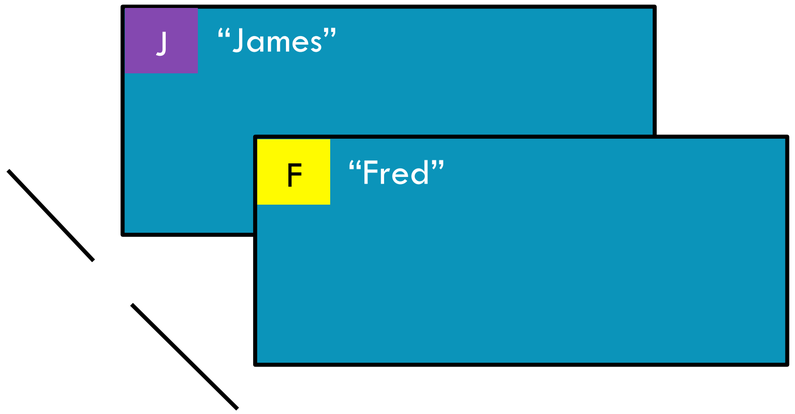


PARTITIONBY

RDD: **x**

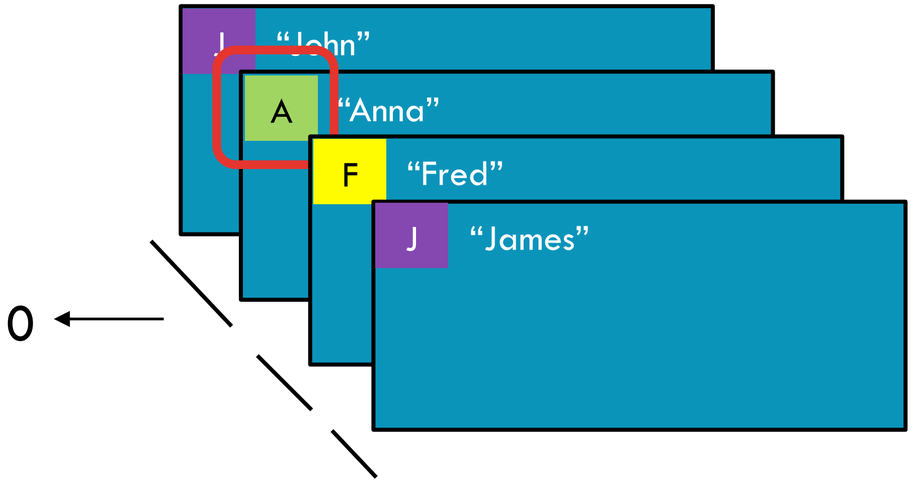


RDD: **y**

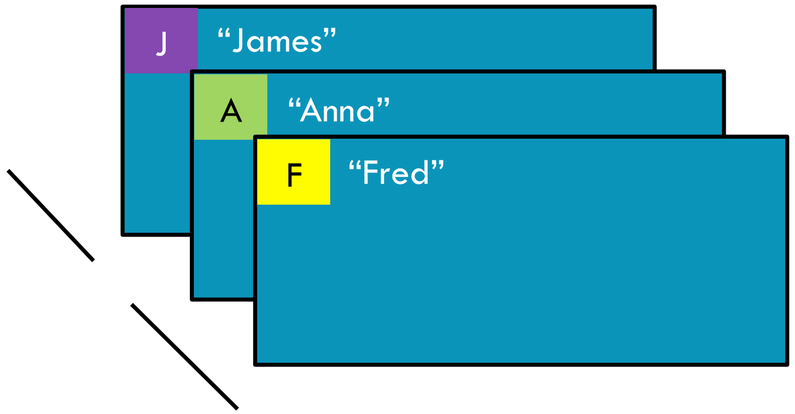


PARTITIONBY

RDD: **x**

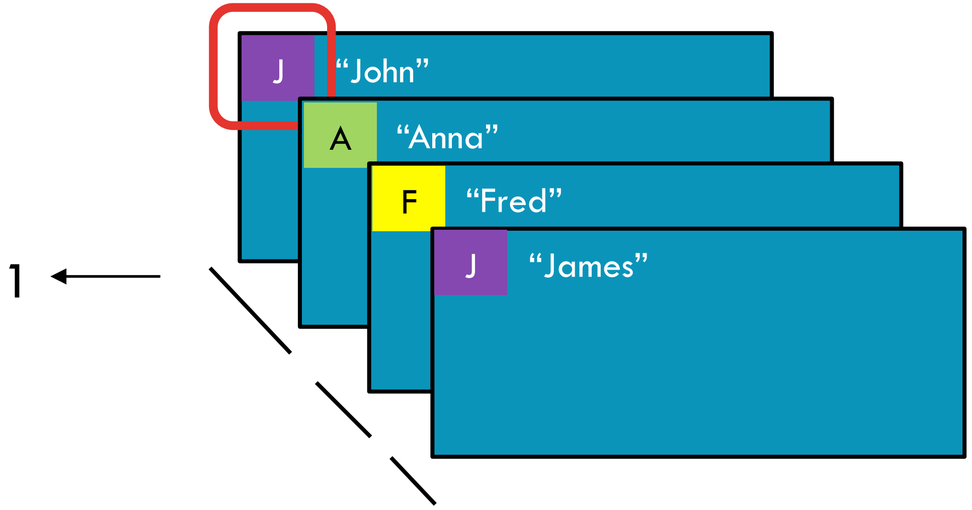


RDD: **y**

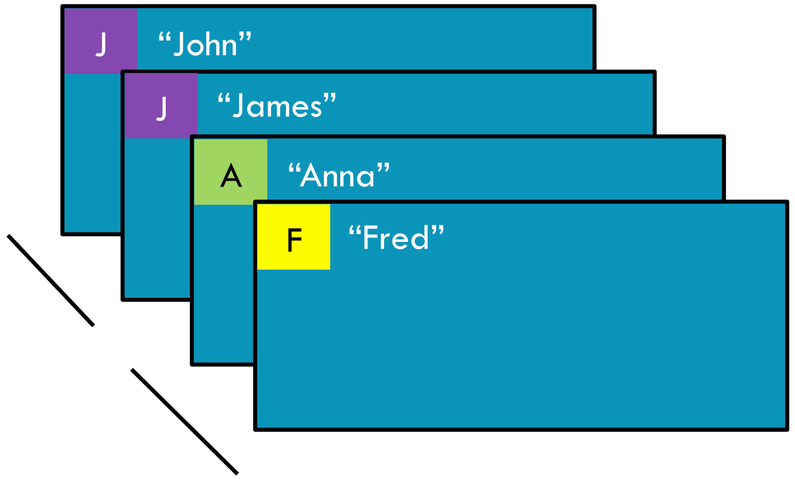


PARTITIONBY

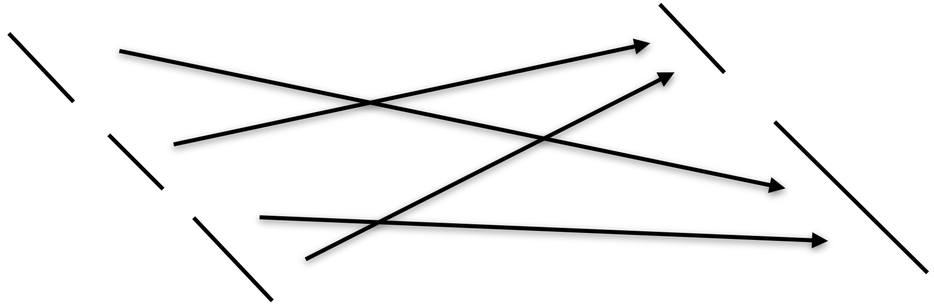
RDD: **x**



RDD: **y**



PARTITIONBY



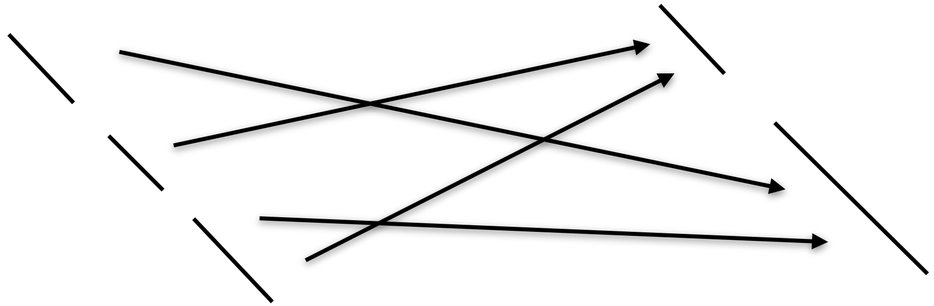
Return a new RDD with the specified number of partitions, placing original items into the partition returned by a user supplied function

```
partitionBy(numPartitions, partitioner=portable_hash)
```

```
x = sc.parallelize([('J','James'),('F','Fred'),
      ('A','Anna'),('J','John')], 3)

y = x.partitionBy(2, lambda w: 0 if w[0] < 'H' else 1)
print x.glom().collect()
print y.glom().collect()
```

```
x: [[('J', 'James')], [('F', 'Fred')],
    [('A', 'Anna'), ('J', 'John')]]

y: [[('A', 'Anna'), ('F', 'Fred')],
    [('J', 'James'), ('J', 'John')]]
```

PARTITIONBY



Return a new RDD with the specified number of partitions, placing original items into the partition returned by a user supplied function.

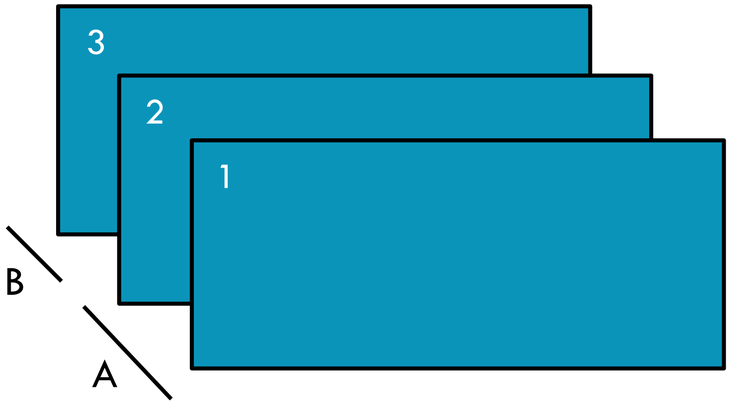
partitionBy(*numPartitions, partitioner=portable_hash*)

```
import org.apache.spark.Partitioner
val x = sc.parallelize(Array(('J',"James"),('F',"Fred"),
    ('A',"Anna"),('J',"John")), 3)

val y = x.partitionBy(new Partitioner() {
  val numPartitions = 2
  def getPartition(k:Any) = {
    if (k.asInstanceOf[Char] < 'H') 0 else 1
  }
})

val yOut = y.glom().collect()
```

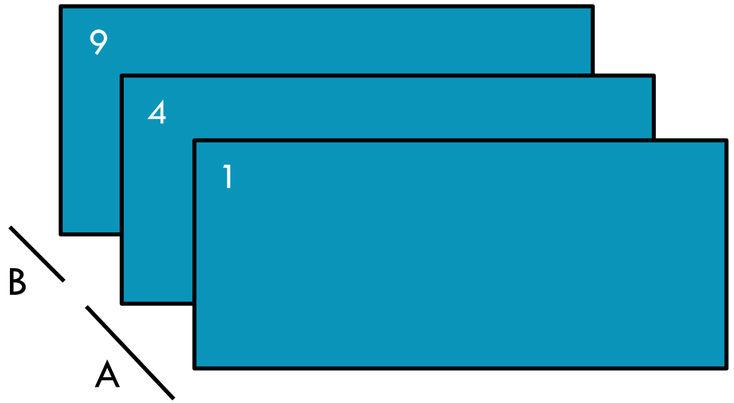
```
x: Array(Array((A,Anna), (F,Fred)),
         Array((J,John), (J,James)))

y: Array(Array((F,Fred), (A,Anna)),
         Array((J,John), (J,James)))
```

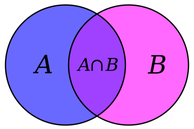
ZIP

RDD: **x**

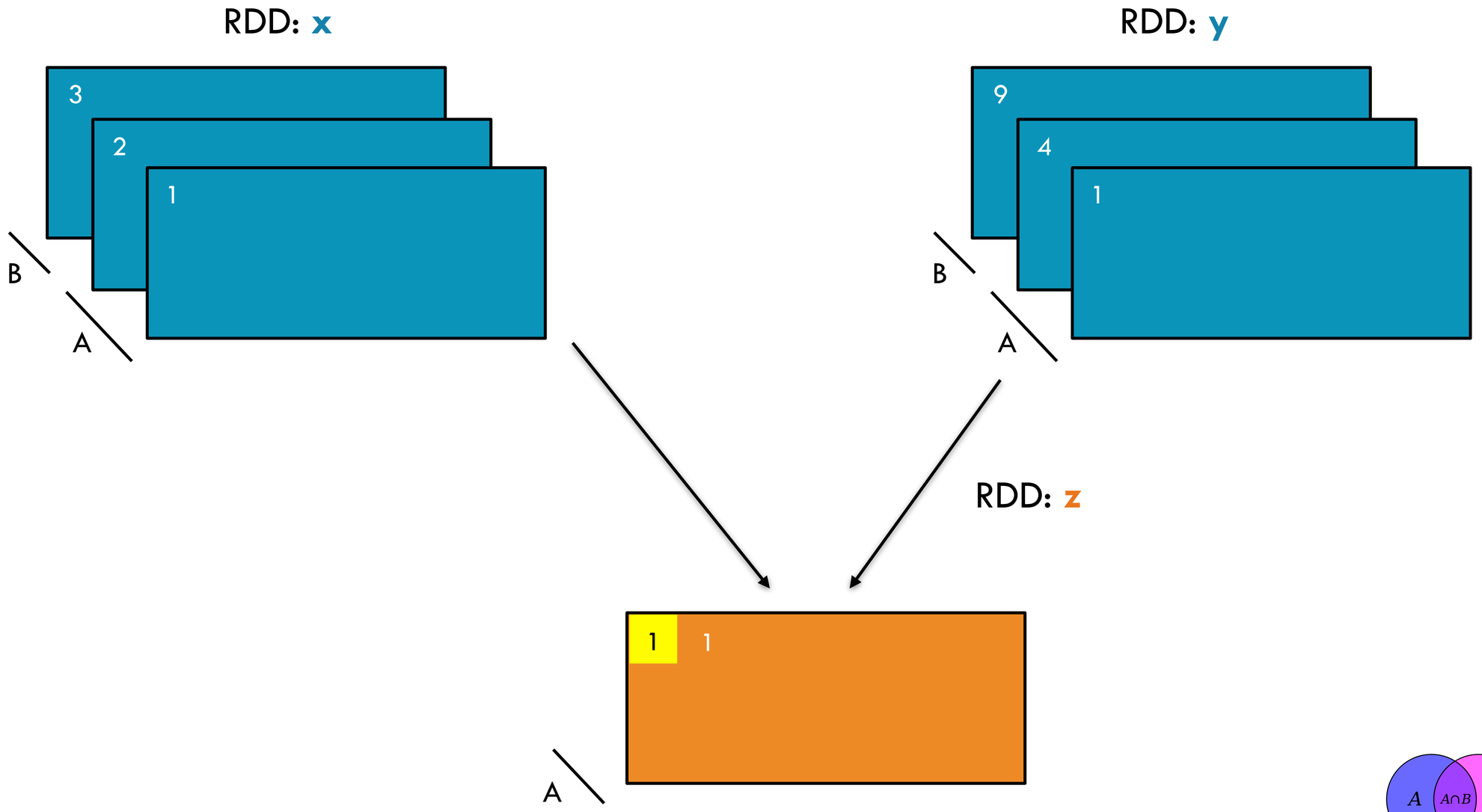


RDD: **y**

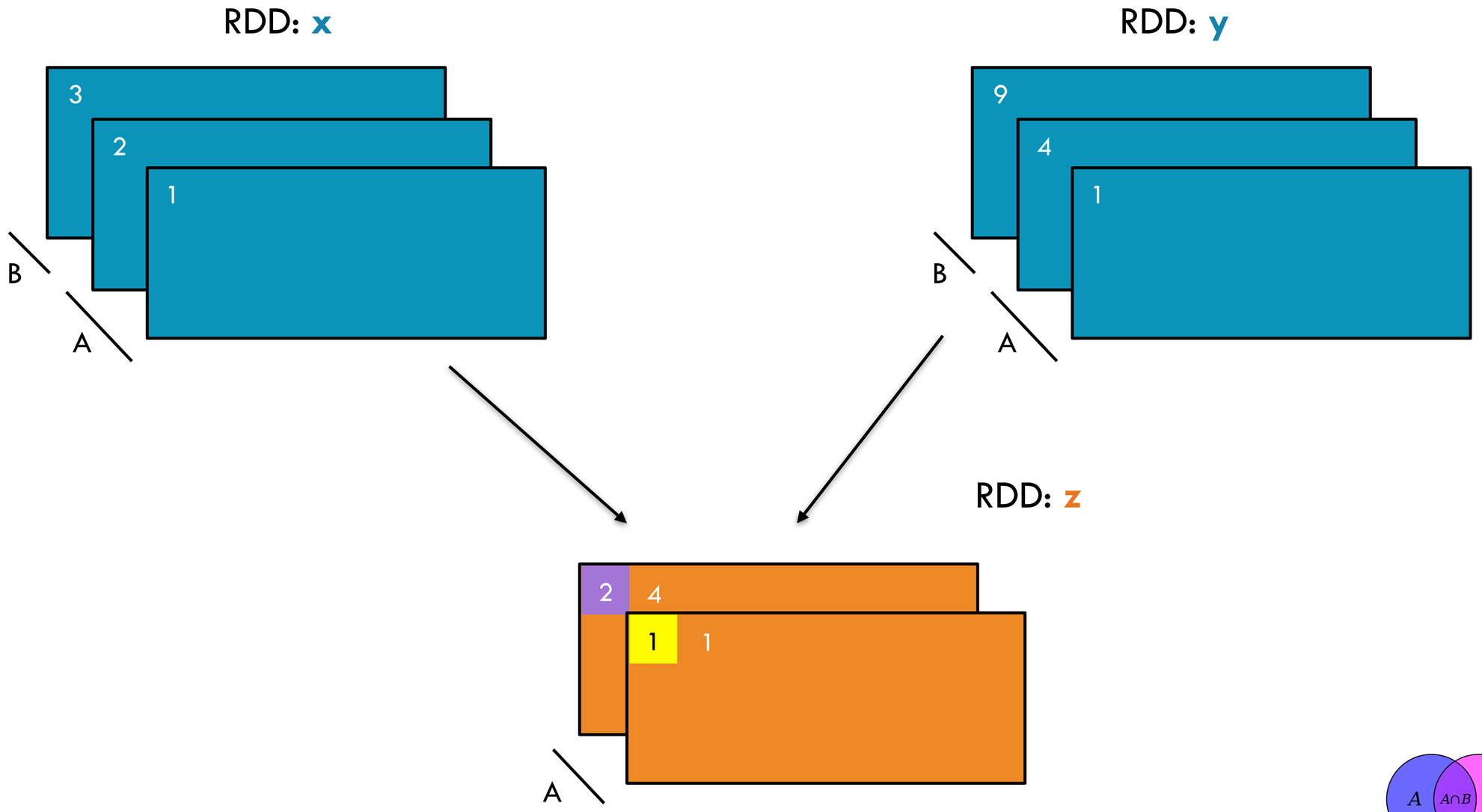




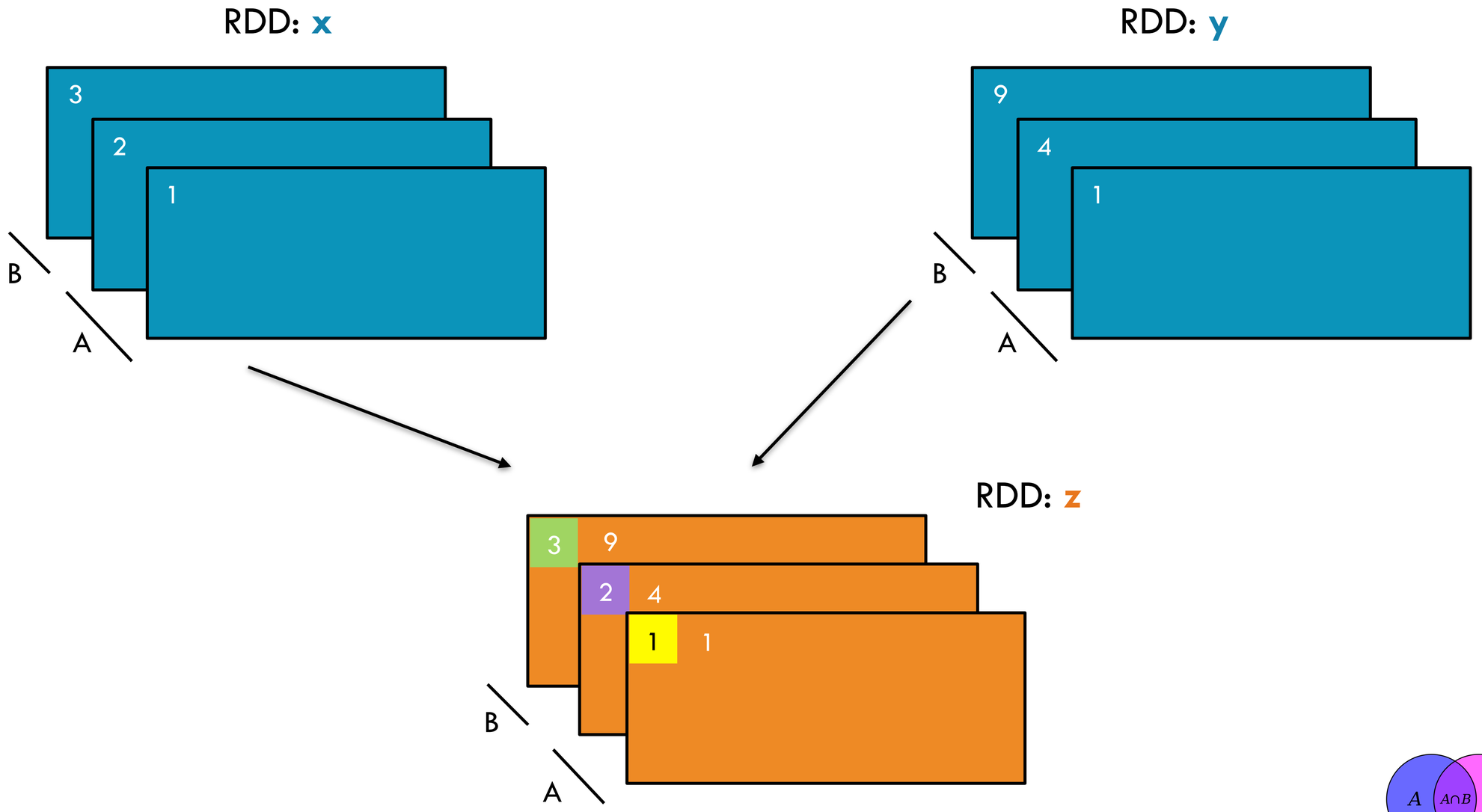
ZIP

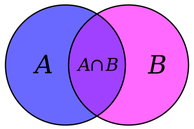


ZIP

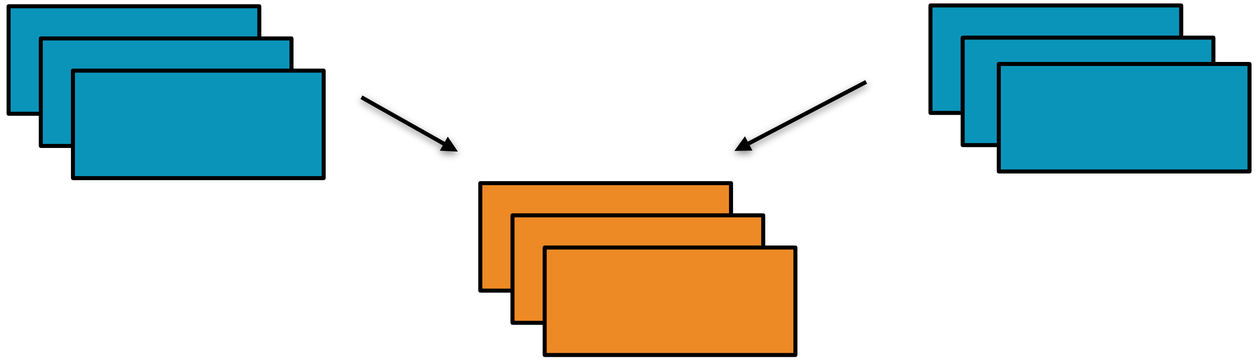


ZIP





ZIP



Return a new RDD containing pairs whose key is the item in the original RDD, and whose value is that item's corresponding element (same partition, same index) in a second RDD

zip(*otherRDD*)

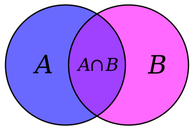
```python
x = sc.parallelize([1, 2, 3])
y = x.map(lambda n:n*n)
z = x.zip(y)

print(z.collect())
```

```scala
val x = sc.parallelize(Array(1,2,3))
val y = x.map(n=>n*n)
val z = x.zip(y)

println(z.collect().mkString(", "))
```

x: [1, 2, 3]

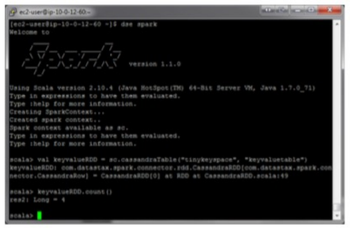
y: [1, 4, 9]

z: [(1, 1), (2, 4), (3, 9)]



ACTIONS

vs



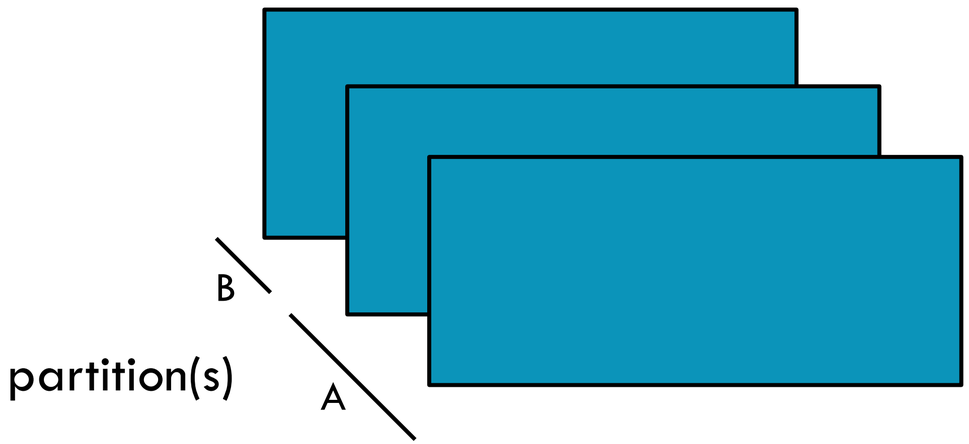
distributed

occurs across the cluster

driver

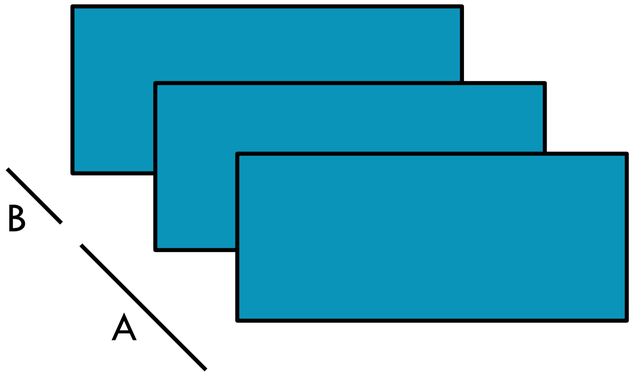
result must fit in driver JVM

GETNUMPARTITIONS



2

GETNUMPARTITIONS



getNumPartitions()

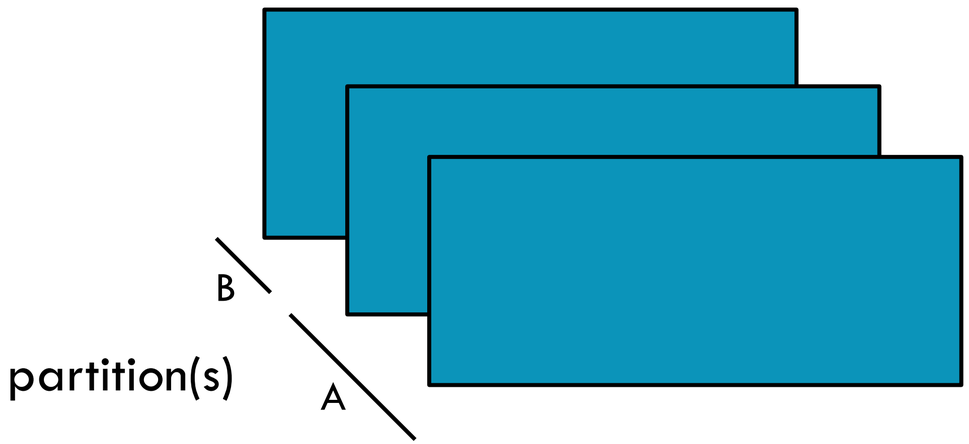
Return the number of partitions in RDD

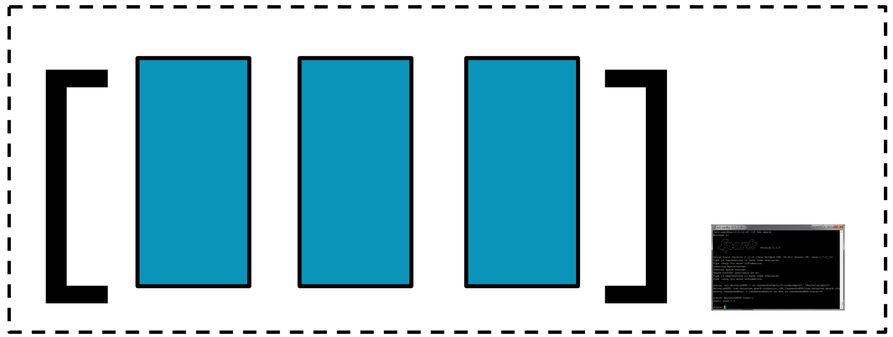
```python
x = sc.parallelize([1,2,3], 2)
y = x.getNumPartitions()

print(x.glom().collect())
print(y)
```

```scala
val x = sc.parallelize(Array(1,2,3), 2)
val y = x.partitions.size
val xOut = x.glom().collect()
println(y)
```

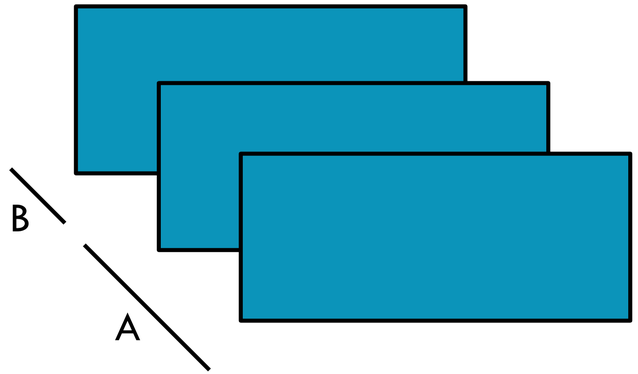
```
x: [[1], [2, 3]]

y: 2
```

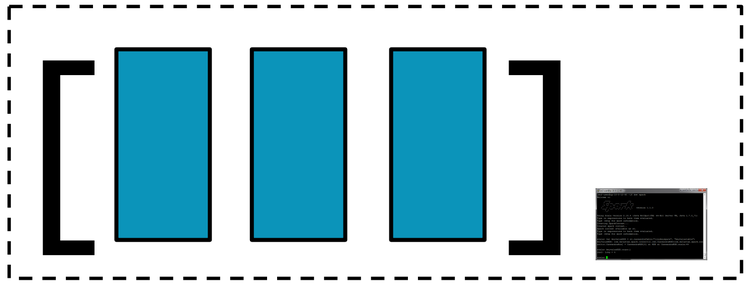
COLLECT





COLLECT





collect()

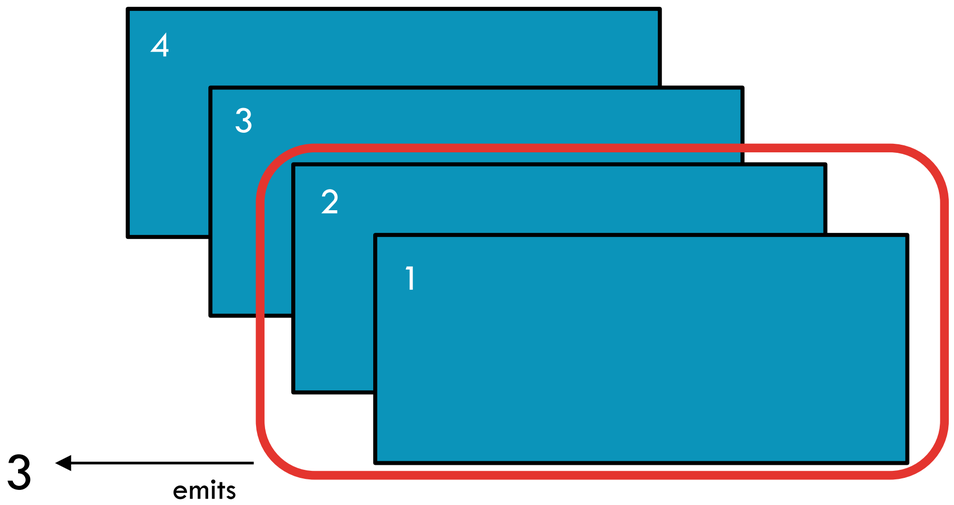
Return all items in the RDD to the driver in a single list

```python
x = sc.parallelize([1,2,3], 2)
y = x.collect()

print(x.glom().collect())
print(y)
```

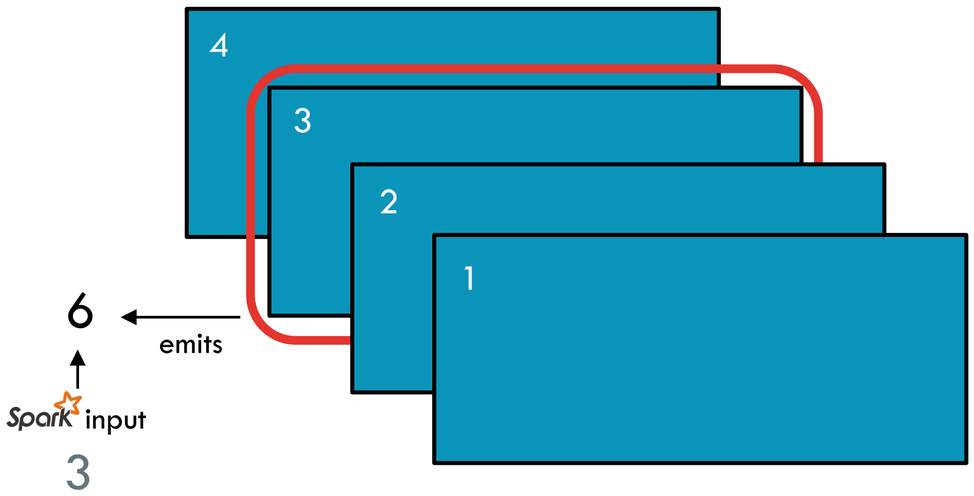
```scala
val x = sc.parallelize(Array(1,2,3), 2)
val y = x.collect()

val xOut = x.glom().collect()
println(y)
```

```
x: [[1], [2, 3]]

y: [1, 2, 3]
```

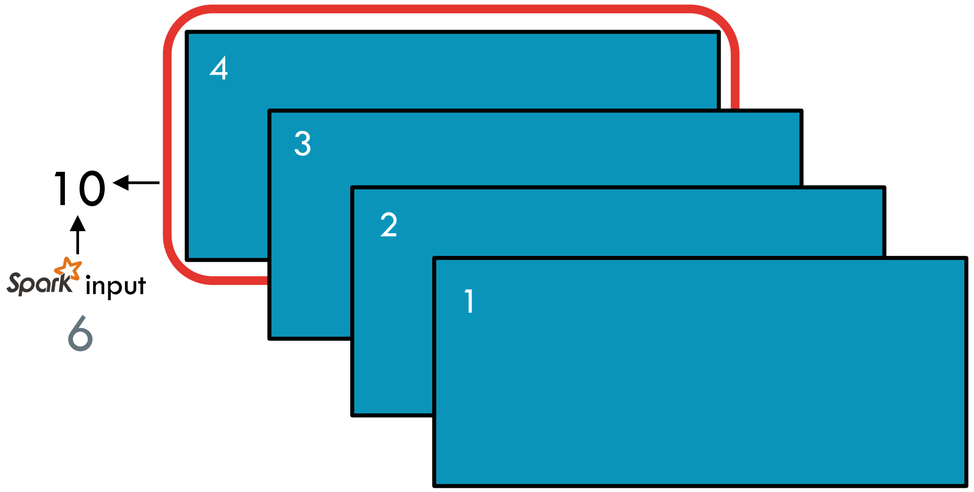
REDUCE



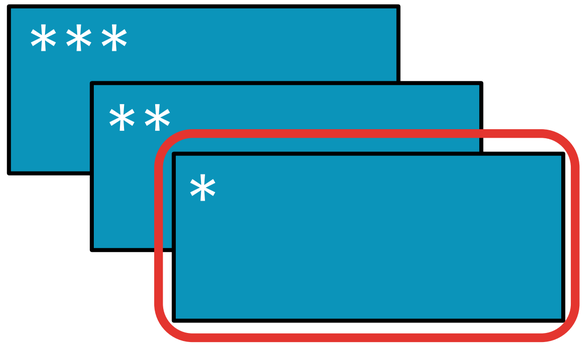
REDUCE

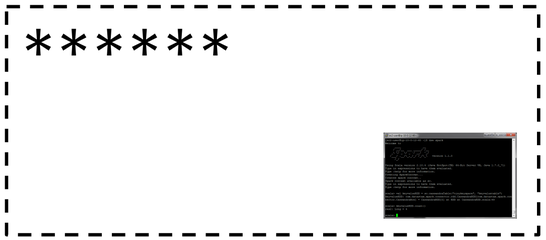


REDUCE



REDUCE





reduce(*f*)

Aggregate all the elements of the RDD by applying a user function pairwise to elements and partial results, and returns a result to the driver

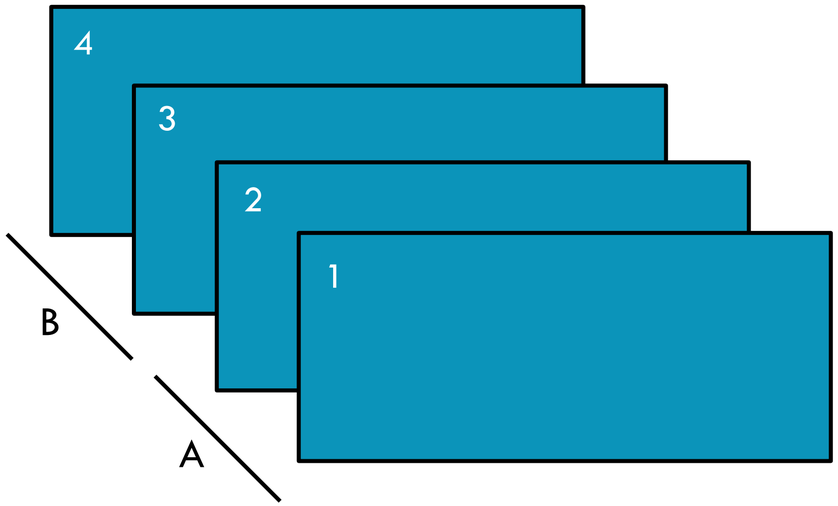
```python
x = sc.parallelize([1,2,3,4])
y = x.reduce(lambda a,b: a+b)

print(x.collect())
print(y)
```

```scala
val x = sc.parallelize(Array(1,2,3,4))
val y = x.reduce((a,b) => a+b)

println(x.collect.mkString(", "))
println(y)
```

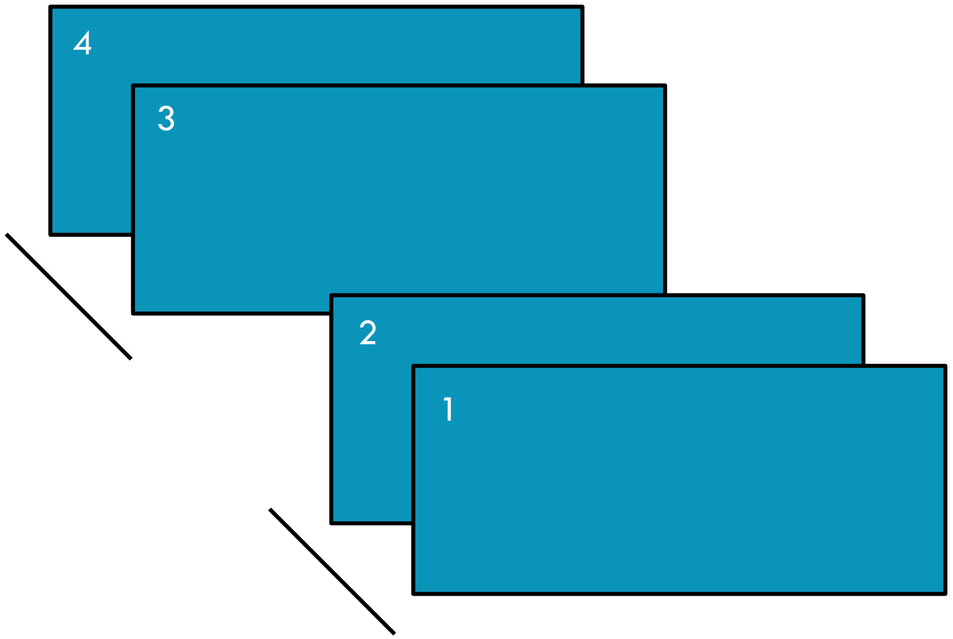
x: [1, 2, 3, 4]

y: 10

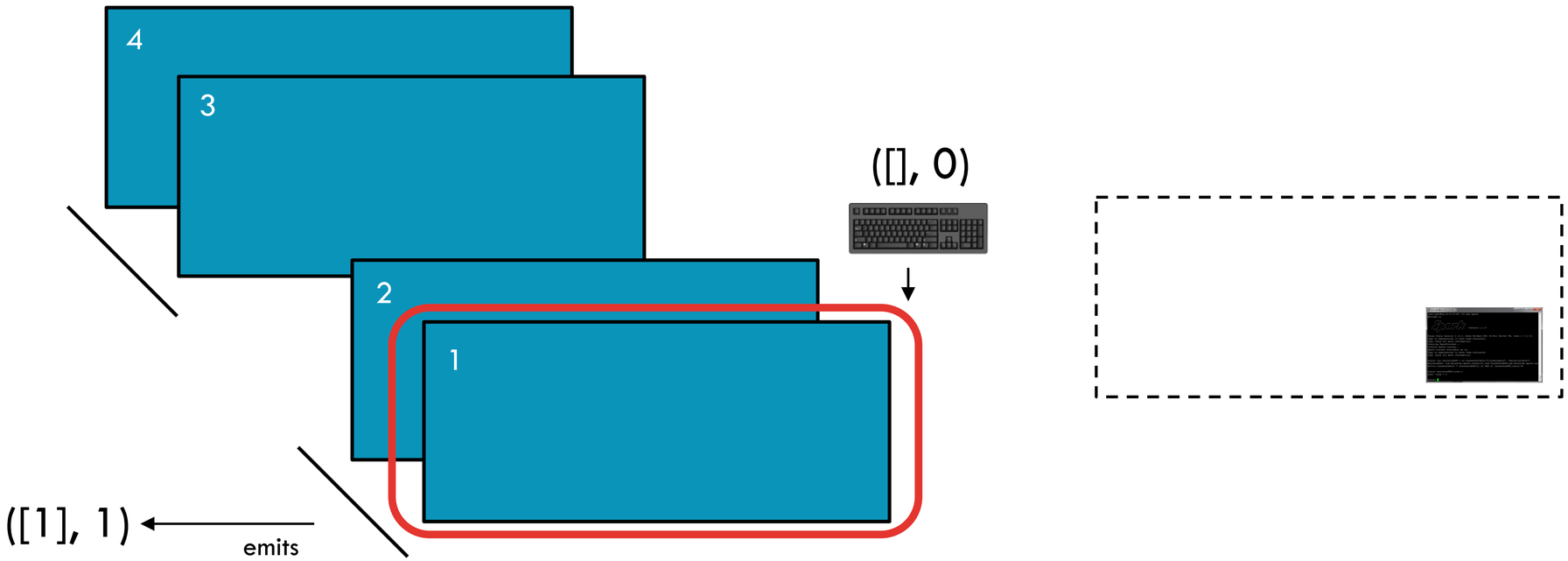
AGGREGATE



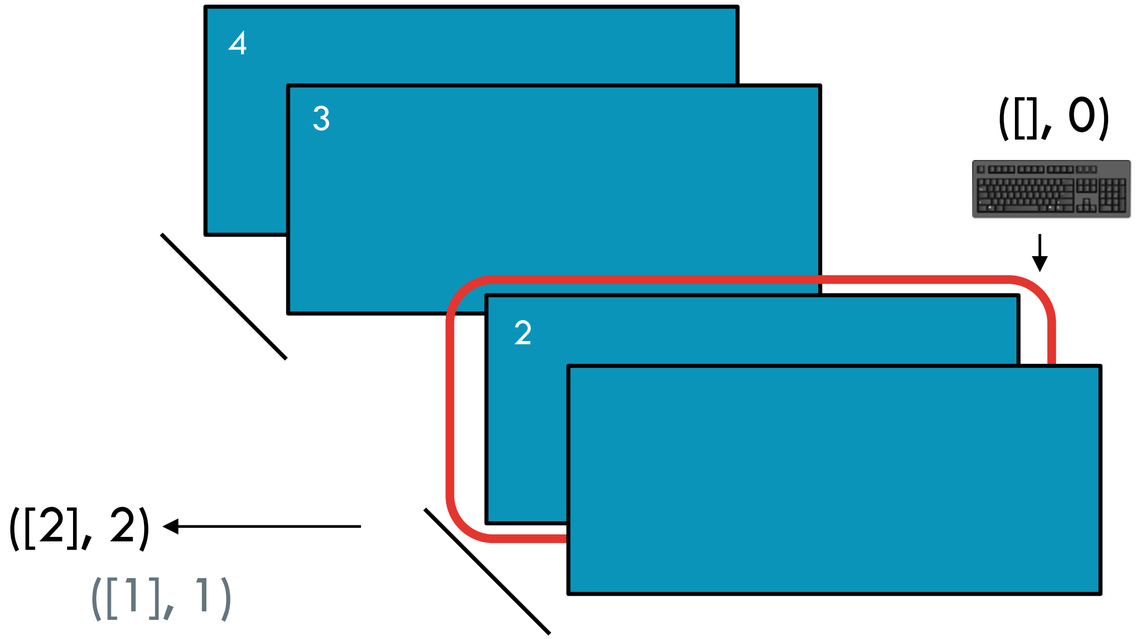
AGGREGATE



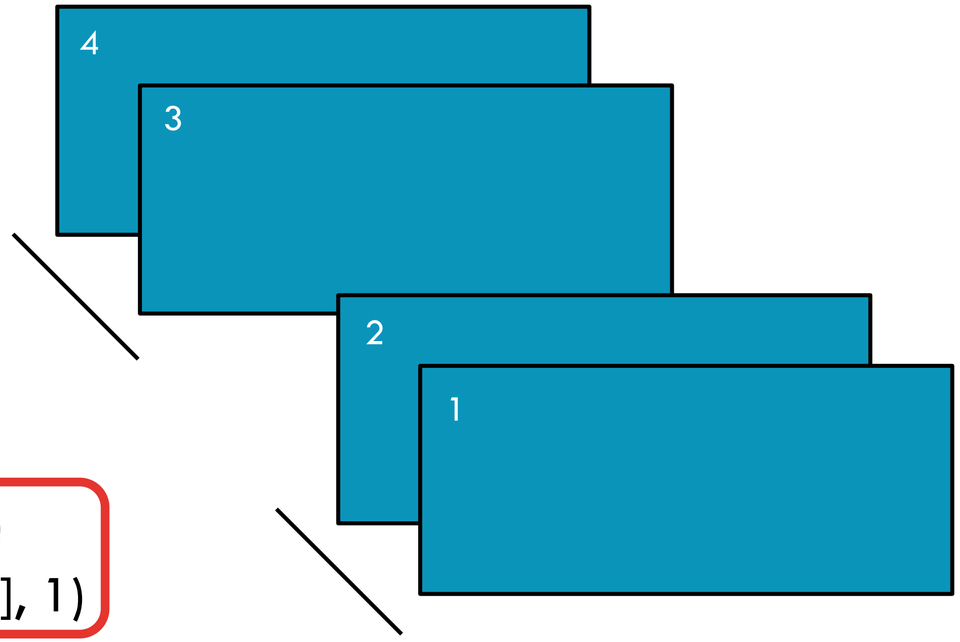
AGGREGATE



AGGREGATE



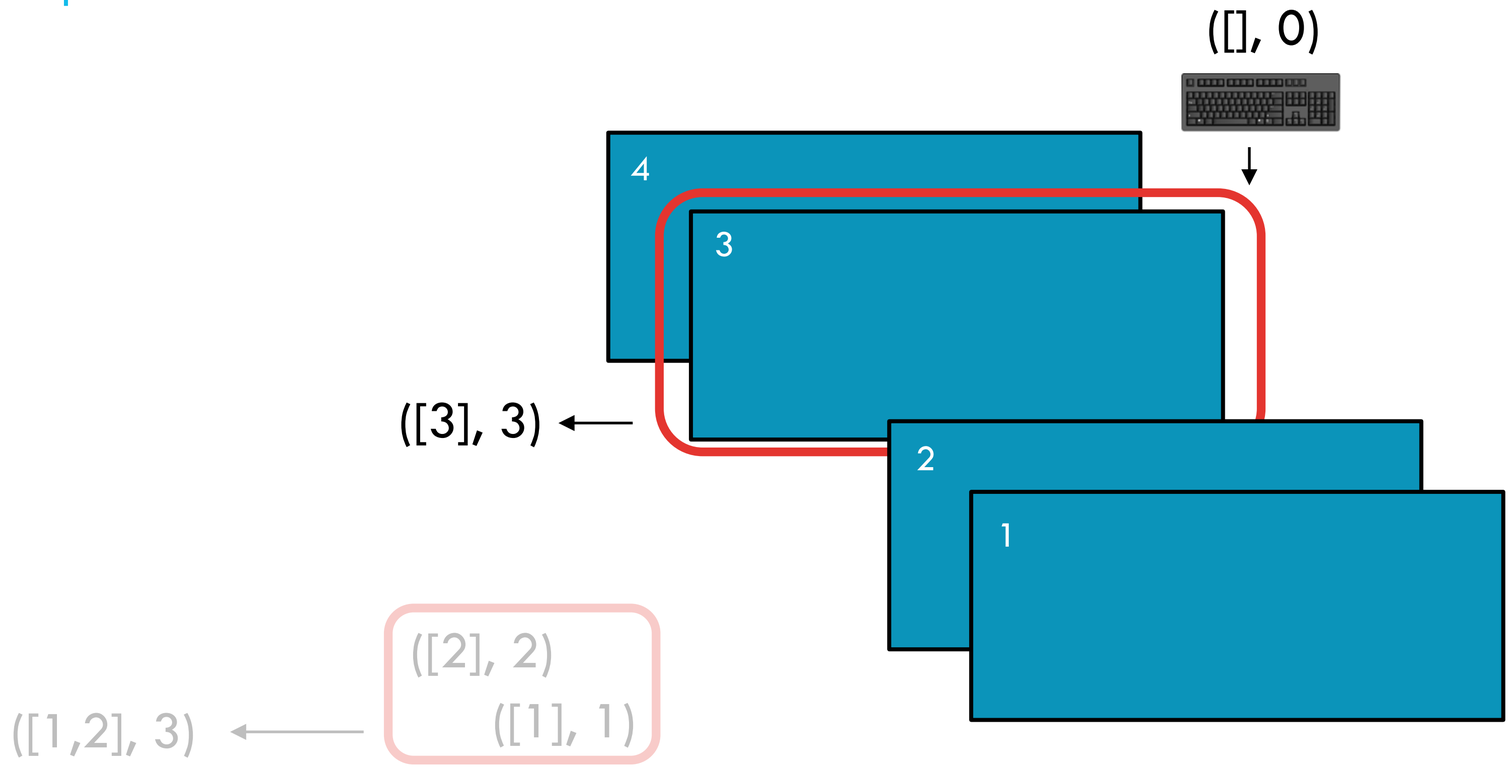
AGGREGATE



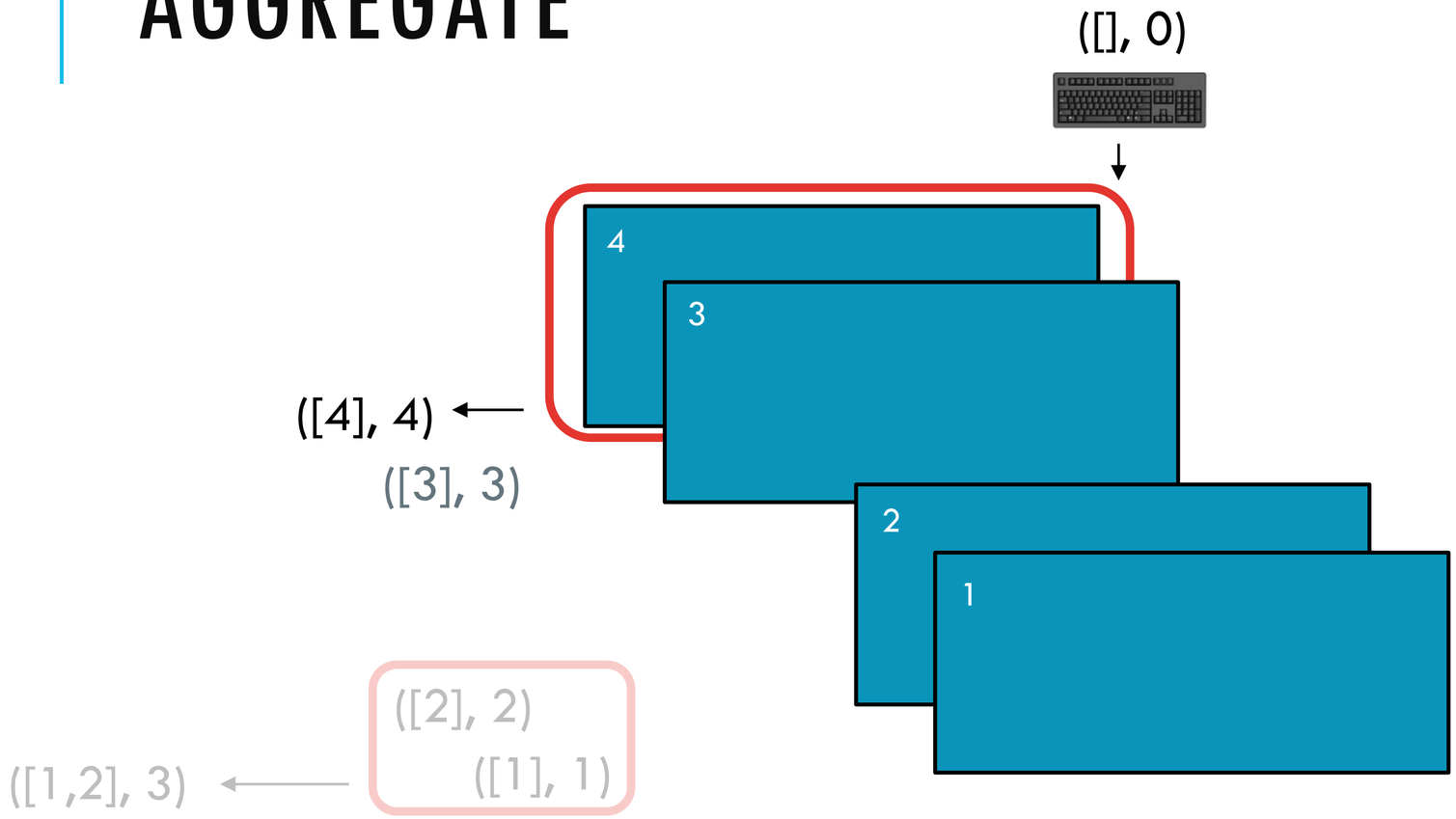
([2], 2)
([1], 1)

([1,2], 3)

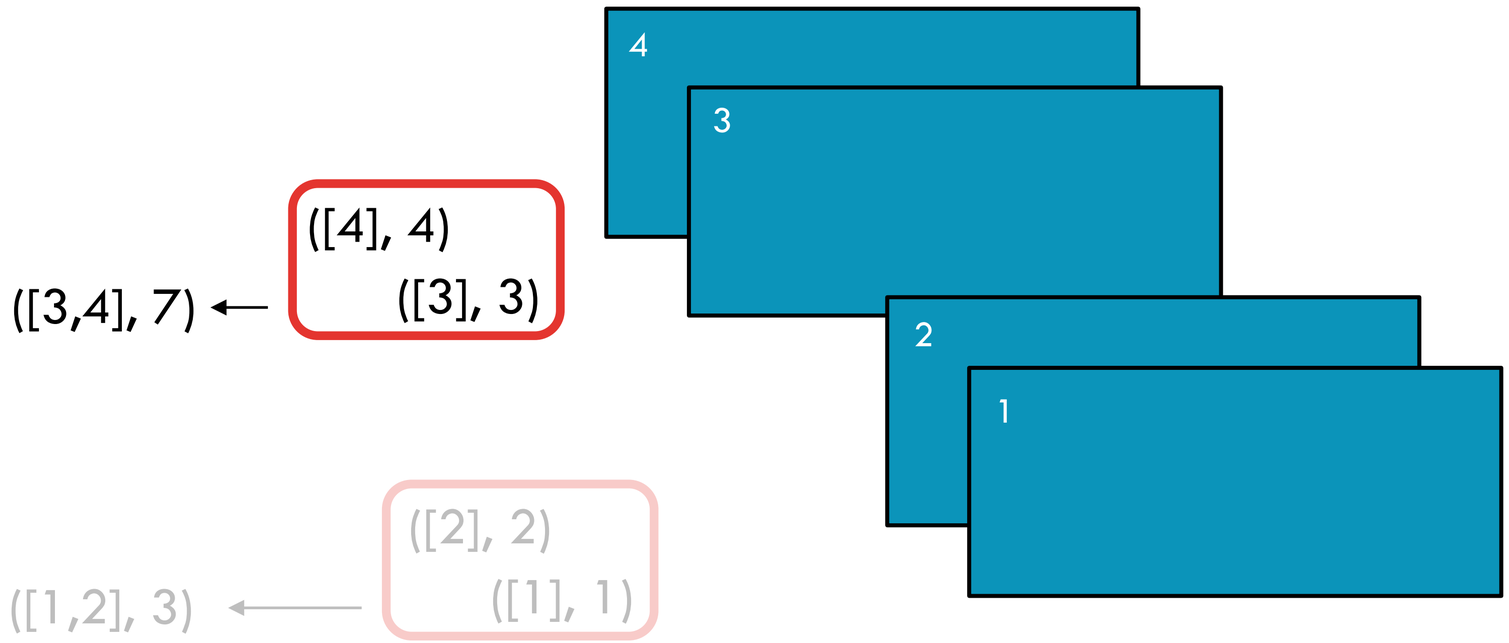
AGGREGATE



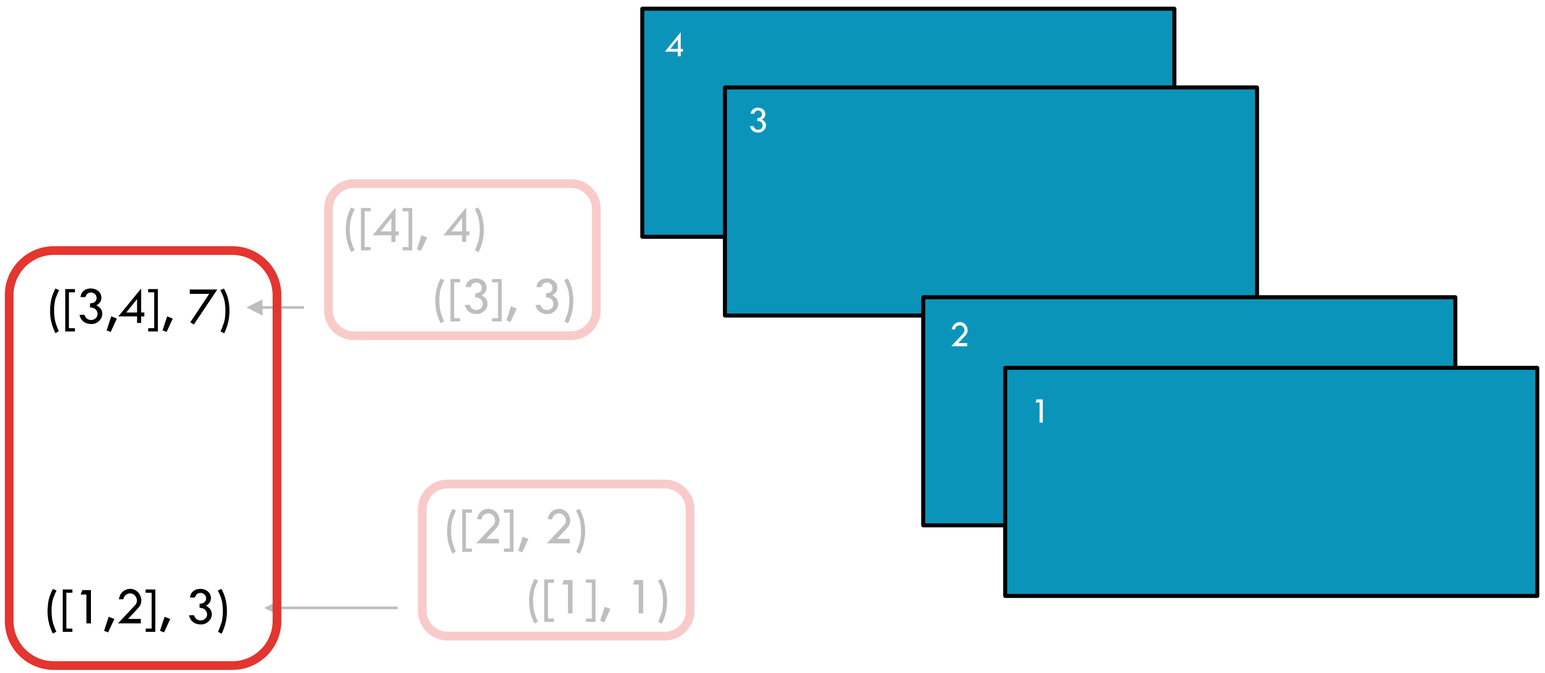
AGGREGATE



AGGREGATE



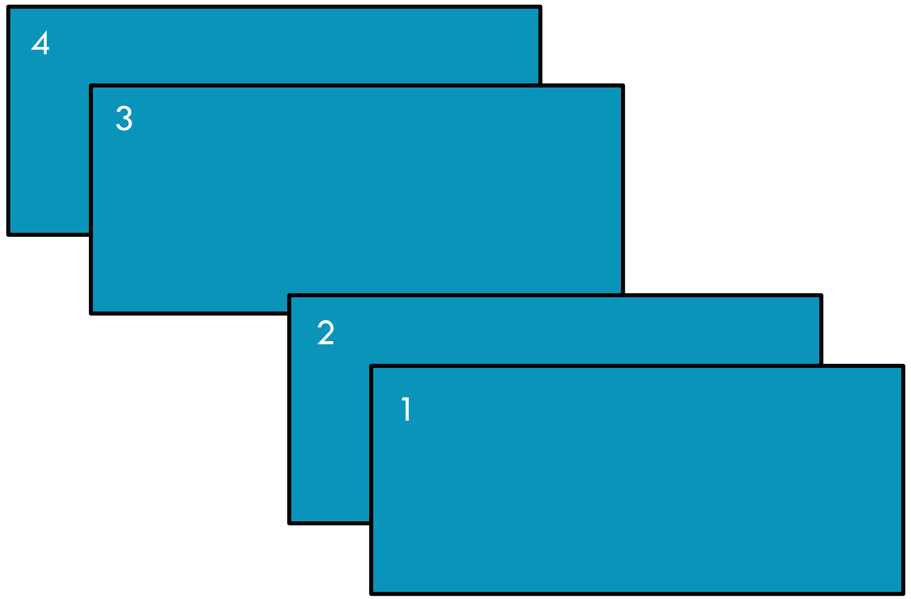
AGGREGATE



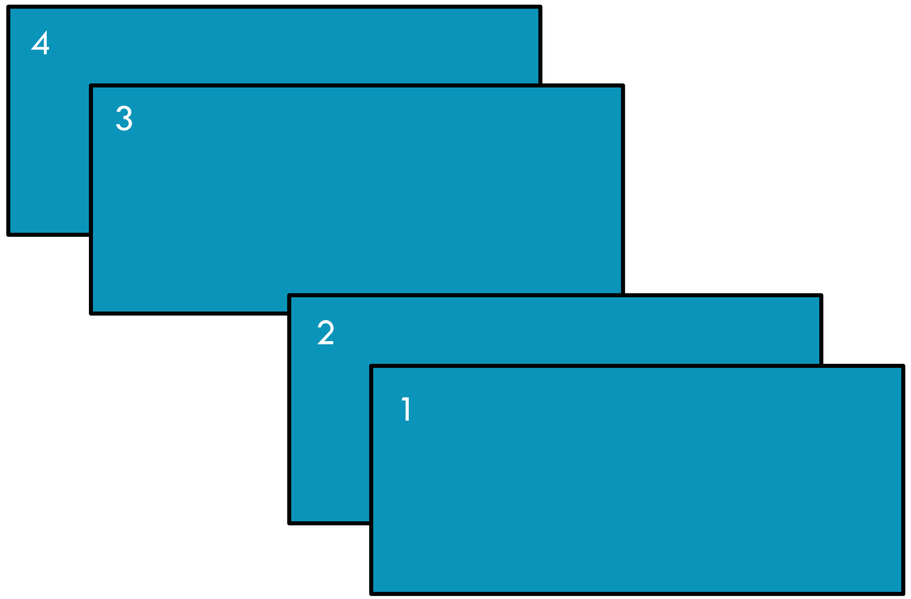
AGGREGATE

([3,4], 7)

([1,2], 3)



AGGREGATE



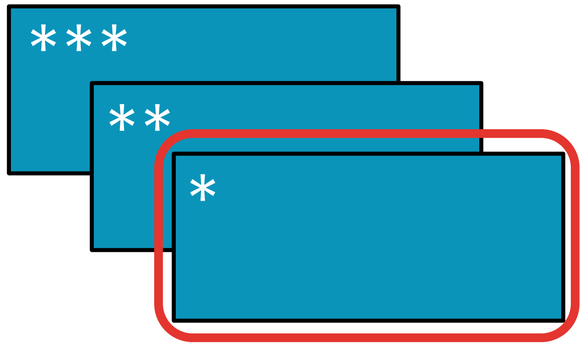
([3,4], 7)

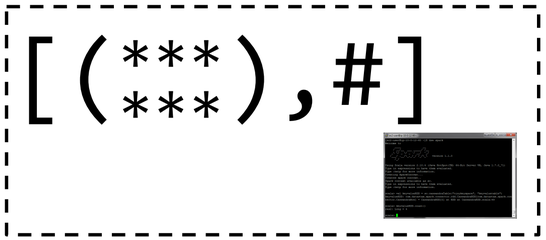
([1,2], 3)

([1,2,3,4], 10)

([1,2,3,4], 10)

AGGREGATE





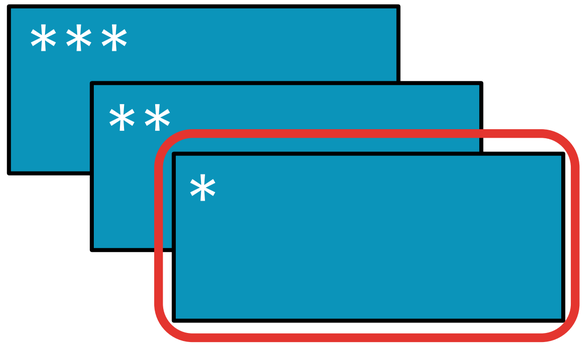
`aggregate(identity, seqOp, combOp)`

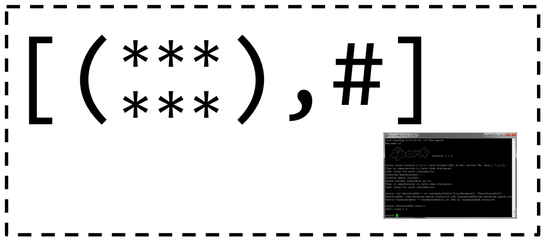
Aggregate all the elements of the RDD by:
- applying a user function to combine elements with user-supplied objects,
- then combining those user-defined results via a second user function,
- and finally returning a result to the driver.

```
seqOp = lambda data, item: (data[0] + [item], data[1] + item)
combOp = lambda d1, d2: (d1[0] + d2[0], d1[1] + d2[1])

x = sc.parallelize([1,2,3,4])
y = x.aggregate(([], 0), seqOp, combOp)

print(y)
```

```
x: [1, 2, 3, 4]

y: ([1, 2, 3, 4], 10)
```

AGGREGATE





`aggregate(identity, seqOp, combOp)`

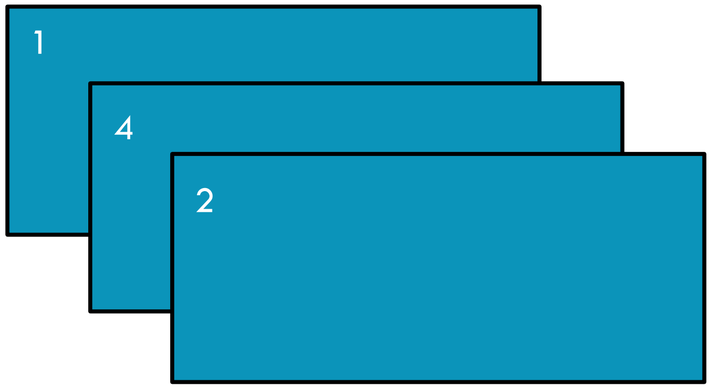
Aggregate all the elements of the RDD by:
- applying a user function to combine elements with user-supplied objects,
- then combining those user-defined results via a second user function,
- and finally returning a result to the driver.

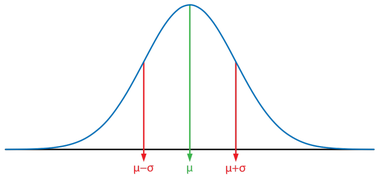
```
def seqOp = (data:(Array[Int], Int), item:Int) =>
     (data._1 :+ item, data._2 + item)

def combOp = (d1:(Array[Int], Int), d2:(Array[Int], Int)) =>
     (d1._1.union(d2._1), d1._2 + d2._2)

val x = sc.parallelize(Array(1,2,3,4))
val y = x.aggregate((Array[Int](), 0))(seqOp, combOp)

println(y)
```

x: [1, 2, 3, 4]

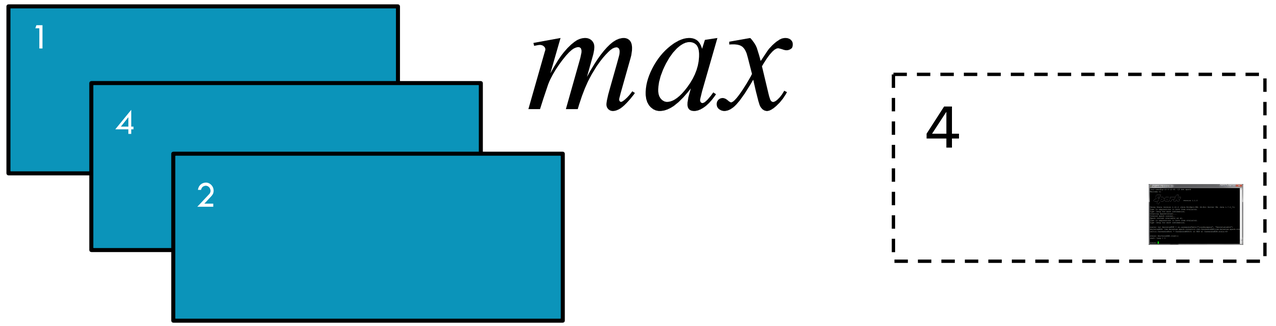
y: (Array(3, 1, 2, 4),10)

MAX





MAX



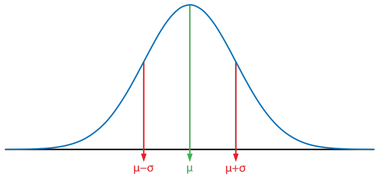
max()

Return the maximum item in the RDD

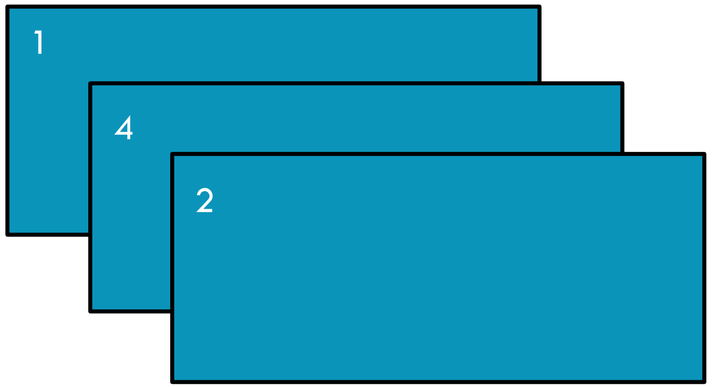
```python
x = sc.parallelize([2,4,1])
y = x.max()

print(x.collect())
print(y)
```

```scala
val x = sc.parallelize(Array(2,4,1))
val y = x.max

println(x.collect().mkString(", "))
println(y)
```

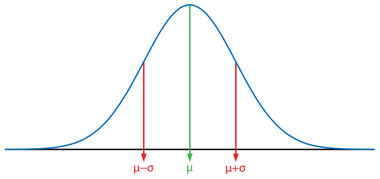
```
x: [2, 4, 1]
y: 4
```



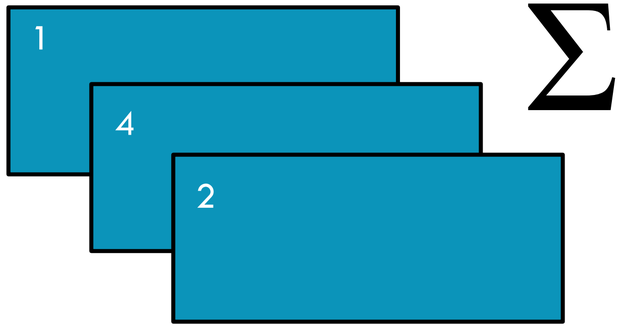
SUM



7



SUM



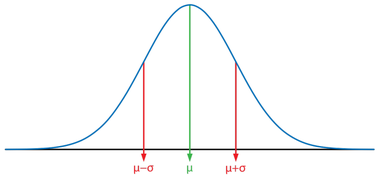
sum()

Return the sum of the items in the RDD

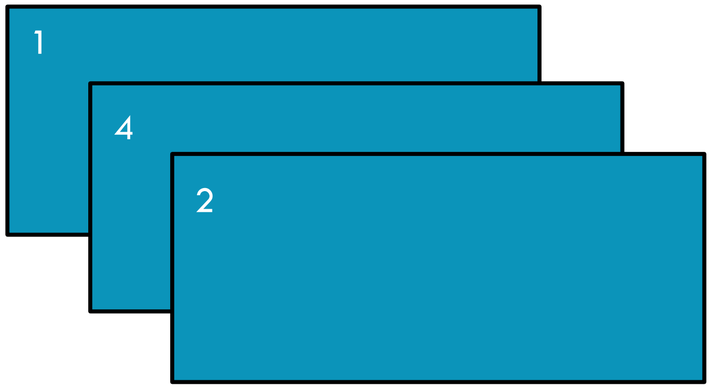
```
x = sc.parallelize([2,4,1])
y = x.sum()

print(x.collect())
print(y)
```

```
val x = sc.parallelize(Array(2,4,1))
val y = x.sum

println(x.collect().mkString(", "))
println(y)
```

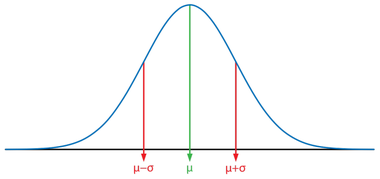
```
x: [2, 4, 1]

y: 7
```



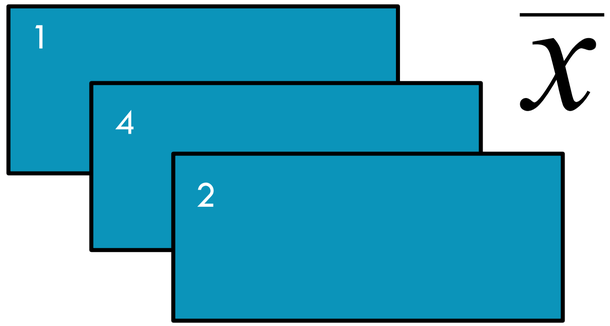
MEAN



2.33333333



MEAN



2.3333333

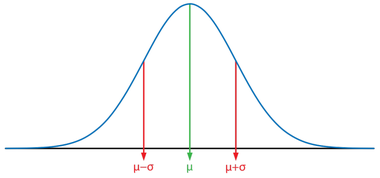
mean()

Return the mean of the items in the RDD

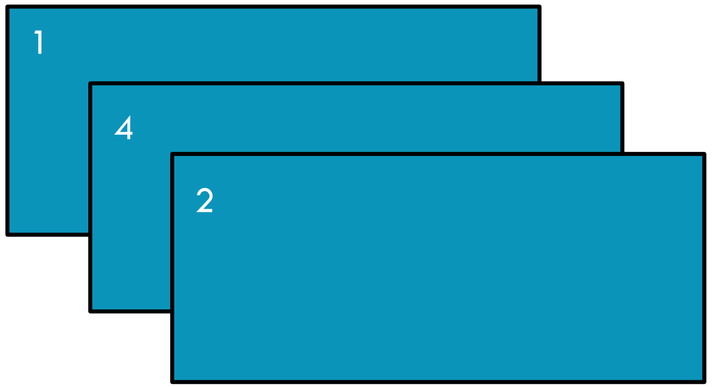
```
x = sc.parallelize([2,4,1])
y = x.mean()

print(x.collect())
print(y)
```

```
val x = sc.parallelize(Array(2,4,1))
val y = x.mean

println(x.collect().mkString(", "))
println(y)
```

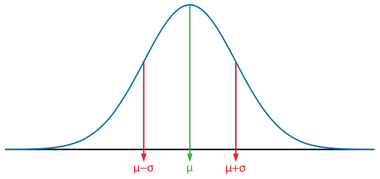
```
x: [2, 4, 1]

y: 2.3333333
```



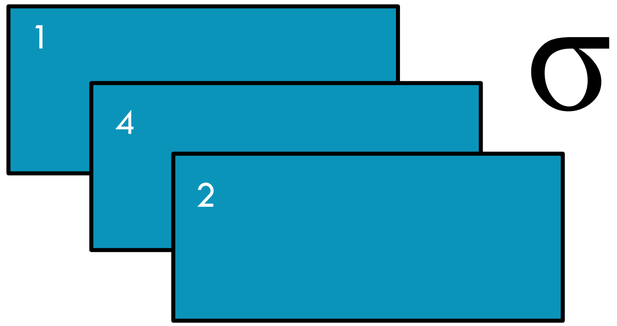
STDEV



1.2472191



STDEV



1.2472191

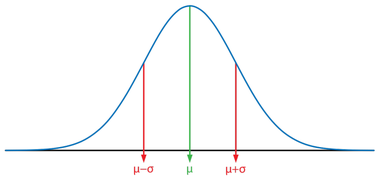
stdev()

Return the standard deviation of the items in the RDD

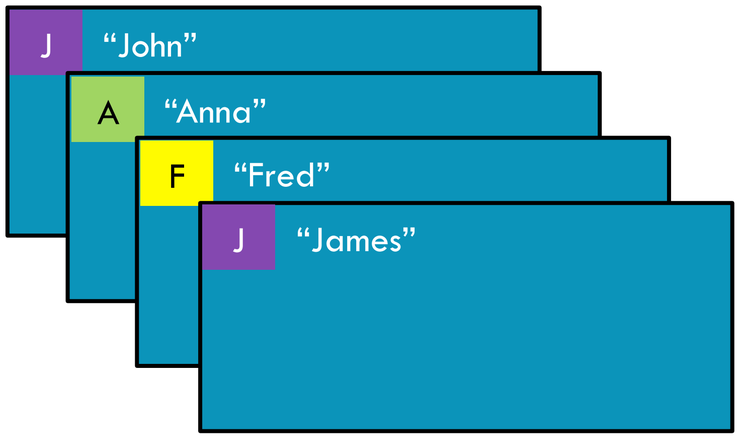
```python
x = sc.parallelize([2,4,1])
y = x.stdev()

print(x.collect())
print(y)
```

```scala
val x = sc.parallelize(Array(2,4,1))
val y = x.stdev

println(x.collect().mkString(", "))
println(y)
```

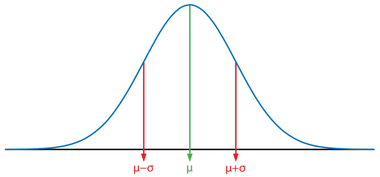
```
x: [2, 4, 1]

y: 1.2472191
```



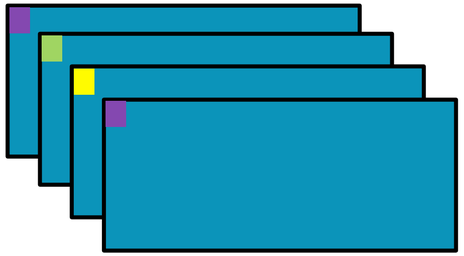
COUNTBYKEY

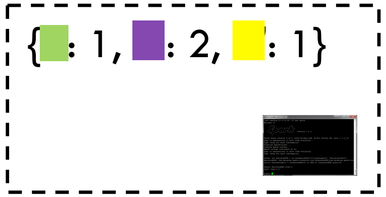


{'A': 1, 'J': 2, 'F': 1}



COUNTBYKEY





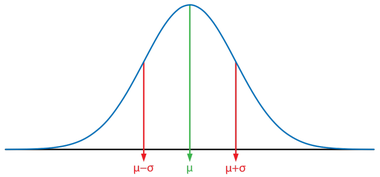
countByKey()

Return a map of keys and counts of their occurrences in the RDD

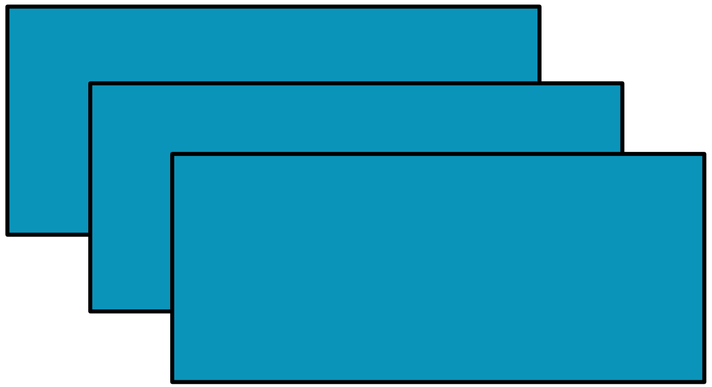
```
x = sc.parallelize([('J', 'James'), ('F','Fred'),
                    ('A','Anna'), ('J','John')])

y = x.countByKey()
print(y)
```

```
val x = sc.parallelize(Array(('J',"James"),('F',"Fred"),
          ('A',"Anna"),('J',"John")))

val y = x.countByKey()
println(y)
```

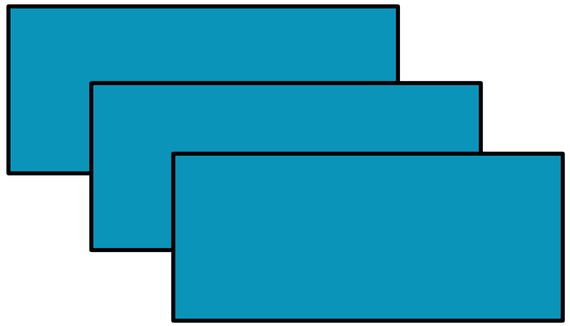
```
x: [('J', 'James'), ('F','Fred'),
    ('A','Anna'), ('J','John')]

y: {'A': 1, 'J': 2, 'F': 1}
```



SAVEASTEXTFILE



SAVEASTEXTFILE



saveAsTextFile(*path, compressionCodecClass=None*)

Save the RDD to the filesystem indicated in the path

```
dbutils.fs.rm("/temp/demo", True)
x = sc.parallelize([2,4,1])
x.saveAsTextFile("/temp/demo")

y = sc.textFile("/temp/demo")
print(y.collect())
```

```
dbutils.fs.rm("/temp/demo", true)
val x = sc.parallelize(Array(2,4,1))
x.saveAsTextFile("/temp/demo")

val y = sc.textFile("/temp/demo")
println(y.collect().mkString(", "))
```

```
x: [2, 4, 1]

y: [u'2', u'4', u'1']
```

THANKS

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