

# MapReduce

## Classroom example

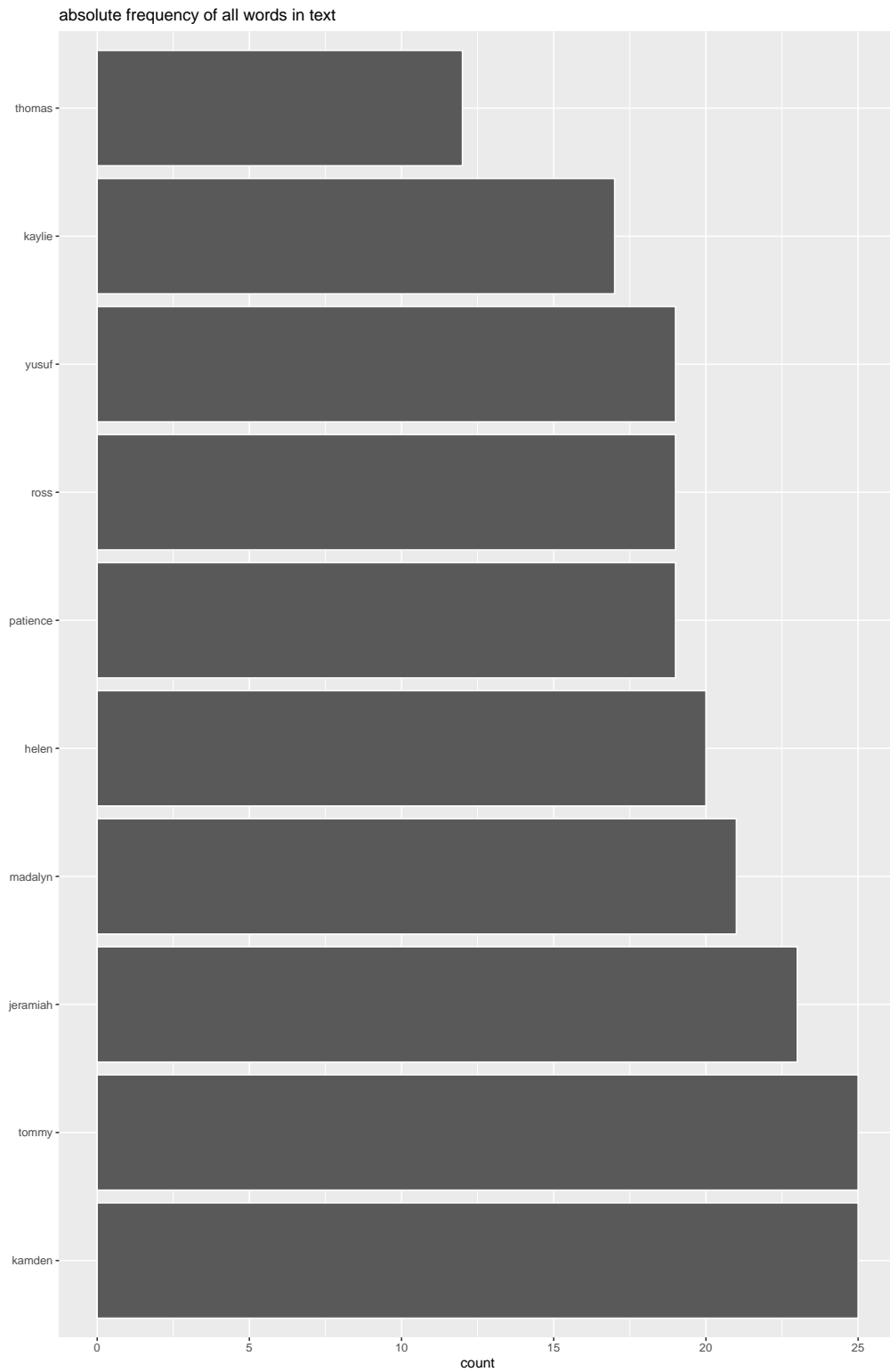
This is the file to create a map reduce classroom example. The setup is as follows

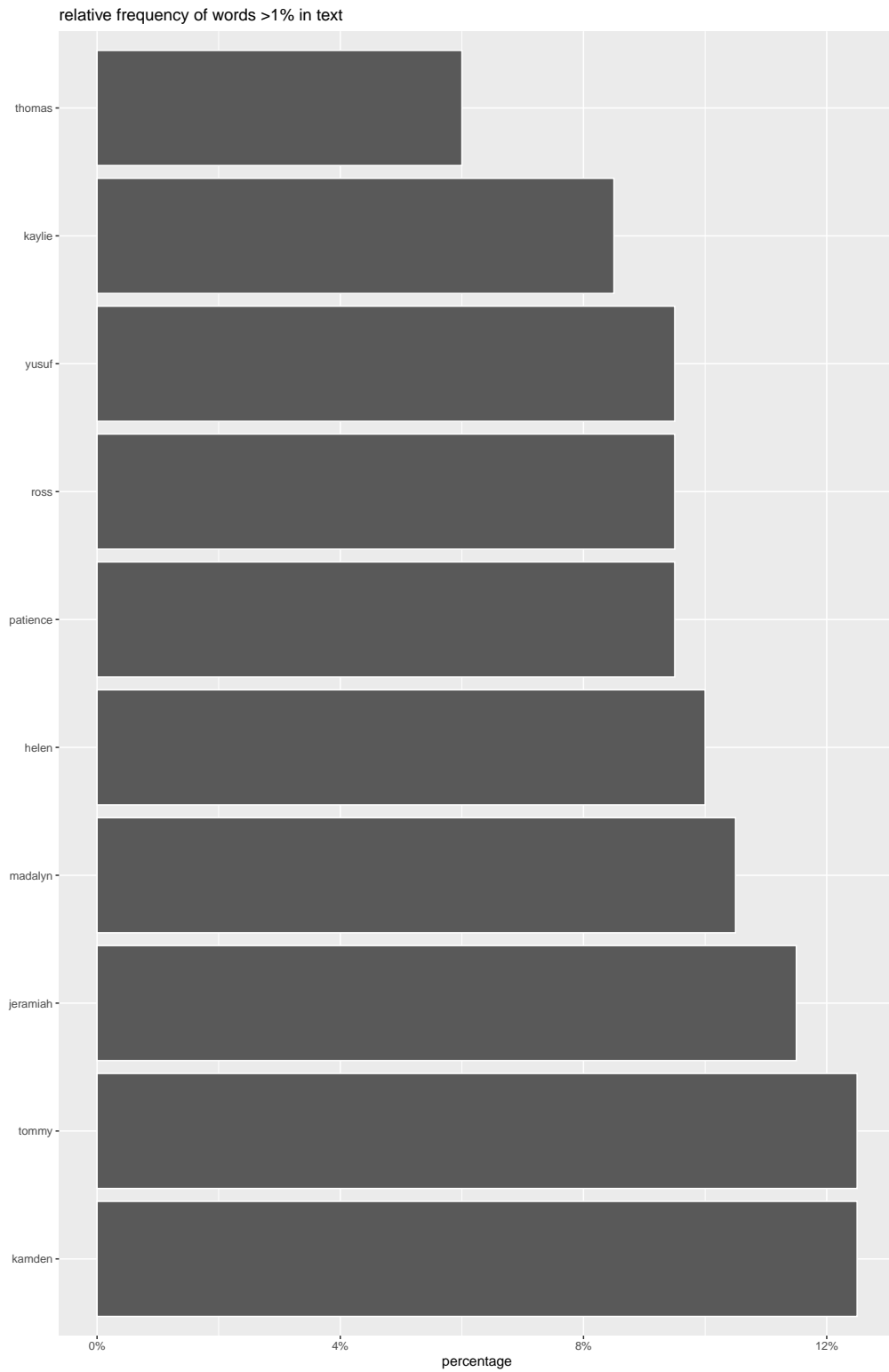
1. print this file
2. give the raw file to 1-4 students, they shall count the words. Measure the time. This is sequential processing.
3. give the chunked file to the respective number of students. There are  $n = 2, 4, 5, 10$  groups available. The number of students is the chunk server.
4. one student acts as the “reduce” server, collecting all the counts.
5. write the counts on the whiteboard including the times
6. which number of groups is the most efficient and which produces considerable overhead?

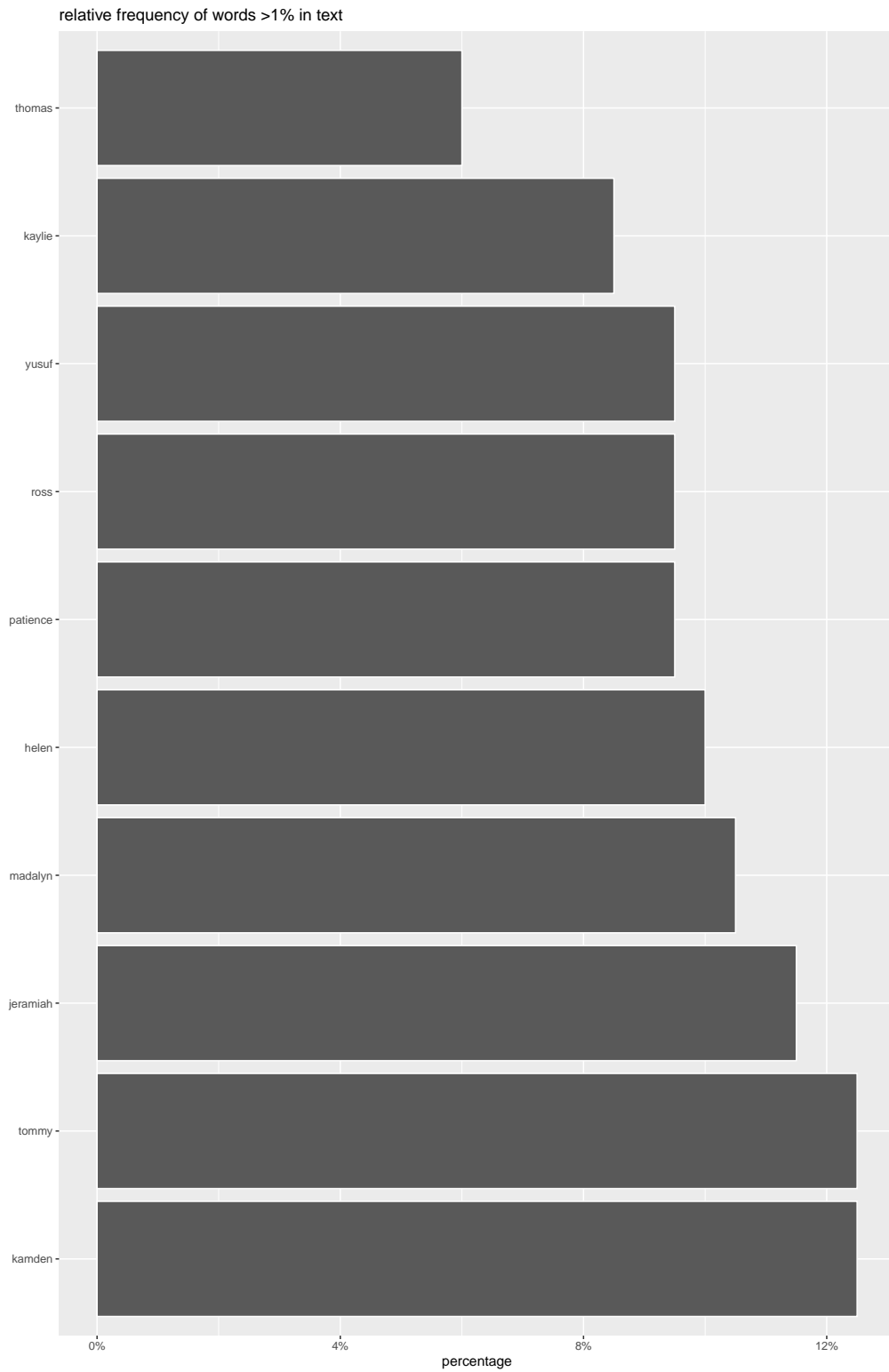
## some summary statistics on the raw data

In total there are 200 words available.

words	Freq	percentage	percentage_round
kamden	25	12.50%	12.50%
tommy	25	12.50%	12.50%
jeramiah	23	11.50%	11.50%
madalyn	21	10.50%	10.50%
helen	20	10.00%	10.00%
patience	19	9.50%	9.50%
ross	19	9.50%	9.50%
yusuf	19	9.50%	9.50%
kaylie	17	8.50%	8.50%
thomas	12	6.00%	6.00%







## The Raw data 01

Thomas, Yusuf, Patience, Thomas, Thomas, Kaylie, Madalyn, Tommy, Kamden, Helen, Kamden, Tommy, Kamden, Patience, Madalyn, Madalyn, Ross , Jeramiah, Kamden, Yusuf, Madalyn, Helen, Kamden, Kamden, Kamden, Tommy, Jeramiah, Madalyn, Tommy, Yusuf, Jeramiah, Ross , Patience, Kamden, Ross , Jeramiah, Madalyn, Patience, Patience, Madalyn, Patience, Patience, Kaylie, Patience, Kaylie, Kaylie, Tommy, Patience, Tommy, Ross , Madalyn, Tommy, Ross , Helen, Jeramiah, Patience, Helen, Patience, Ross , Jeramiah, Tommy, Helen, Ross , Patience, Madalyn, Jeramiah, Patience, Helen, Kamden, Ross , Tommy, Yusuf, Tommy, Kamden, Thomas, Kaylie, Jeramiah, Kaylie, Helen, Tommy, Madalyn, Jeramiah, Kaylie, Madalyn, Patience, Patience, Kamden, Kaylie, Yusuf, Tommy, Yusuf, Yusuf, Kaylie, Tommy, Kaylie, Yusuf, Ross , Tommy, Helen, Ross , Ross , Jeramiah, Yusuf, Jeramiah, Tommy, Yusuf, Tommy, Thomas, Jeramiah, Thomas, Ross , Madalyn, Kaylie, Jeramiah, Thomas, Kamden, Tommy, Madalyn, Kamden, Yusuf, Jeramiah, Helen, Jeramiah, Kamden, Kamden, Jeramiah, Kamden, Helen, Yusuf, Tommy, Ross , Madalyn, Helen, Kamden, Madalyn, Thomas, Helen, Jeramiah, Yusuf, Tommy, Patience, Madalyn, Kaylie, Madalyn, Helen, Tommy, Madalyn, Yusuf, Kamden, Patience, Kaylie, Ross , Kaylie, Kamden, Kamden, Tommy, Yusuf, Ross , Jeramiah, Thomas, Helen, Yusuf, Jeramiah, Kaylie, Kaylie, Tommy, Helen, Thomas, Helen, Ross , Helen, Madalyn, Jeramiah, Kamden, Kamden, Kamden, Ross , Kamden, Ross , Jeramiah, Kaylie, Patience, Thomas, Helen, Jeramiah, Helen, Yusuf, Jeramiah, Thomas, Yusuf, Tommy, Helen, Patience, Madalyn, Kamden, Tommy, Ross , Yusuf, Tommy, Madalyn

## The Raw data 02

Thomas, Yusuf, Patience, Thomas, Thomas, Kaylie, Madalyn, Tommy, Kamden, Helen, Kamden, Tommy, Kamden, Patience, Madalyn, Madalyn, Ross , Jeramiah, Kamden, Yusuf, Madalyn, Helen, Kamden, Kamden, Kamden, Tommy, Jeramiah, Madalyn, Tommy, Yusuf, Jeramiah, Ross , Patience, Kamden, Ross , Jeramiah, Madalyn, Patience, Patience, Madalyn, Patience, Patience, Kaylie, Patience, Kaylie, Kaylie, Tommy, Patience, Tommy, Ross , Madalyn, Tommy, Ross , Helen, Jeramiah, Patience, Helen, Patience, Ross , Jeramiah, Tommy, Helen, Ross , Patience, Madalyn, Jeramiah, Patience, Helen, Kamden, Ross , Tommy, Yusuf, Tommy, Kamden, Thomas, Kaylie, Jeramiah, Kaylie, Helen, Tommy, Madalyn, Jeramiah, Kaylie, Madalyn, Patience, Patience, Kamden, Kaylie, Yusuf, Tommy, Yusuf, Yusuf, Kaylie, Tommy, Kaylie, Yusuf, Ross , Tommy, Helen, Ross , Ross , Jeramiah, Yusuf, Jeramiah, Tommy, Yusuf, Tommy, Thomas, Jeramiah, Thomas, Ross , Madalyn, Kaylie, Jeramiah, Thomas, Kamden, Tommy, Madalyn, Kamden, Yusuf, Jeramiah, Helen, Jeramiah, Kamden, Kamden, Jeramiah, Kamden, Helen, Yusuf, Tommy, Ross , Madalyn, Helen, Kamden, Madalyn, Thomas, Helen, Jeramiah, Yusuf, Tommy, Patience, Madalyn, Kaylie, Madalyn, Helen, Tommy, Madalyn, Yusuf, Kamden, Patience, Kaylie, Ross , Kaylie, Kamden, Kamden, Tommy, Yusuf, Ross , Jeramiah, Thomas, Helen, Yusuf, Jeramiah, Kaylie, Kaylie, Tommy, Helen, Thomas, Helen, Ross , Helen, Madalyn, Jeramiah, Kamden, Kamden, Kamden, Ross , Kamden, Ross , Jeramiah, Kaylie, Patience, Thomas, Helen, Jeramiah, Helen, Yusuf, Jeramiah, Thomas, Yusuf, Tommy, Helen, Patience, Madalyn, Kamden, Tommy, Ross , Yusuf, Tommy, Madalyn

## The Raw data 03

Thomas, Yusuf, Patience, Thomas, Thomas, Kaylie, Madalyn, Tommy, Kamden, Helen, Kamden, Tommy, Kamden, Patience, Madalyn, Madalyn, Ross , Jeramiah, Kamden, Yusuf, Madalyn, Helen, Kamden, Kamden, Kamden, Tommy, Jeramiah, Madalyn, Tommy, Yusuf, Jeramiah, Ross , Patience, Kamden, Ross , Jeramiah, Madalyn, Patience, Patience, Madalyn, Patience, Patience, Kaylie, Patience, Kaylie, Kaylie, Tommy, Patience, Tommy, Ross , Madalyn, Tommy, Ross , Helen, Jeramiah, Patience, Helen, Patience, Ross , Jeramiah, Tommy, Helen, Ross , Patience, Madalyn, Jeramiah, Patience, Helen, Kamden, Ross , Tommy, Yusuf, Tommy, Kamden, Thomas, Kaylie, Jeramiah, Kaylie, Helen, Tommy, Madalyn, Jeramiah, Kaylie, Madalyn, Patience, Patience, Kamden, Kaylie, Yusuf, Tommy, Yusuf, Yusuf, Kaylie, Tommy, Kaylie, Yusuf, Ross , Tommy, Helen, Ross , Ross , Jeramiah, Yusuf, Jeramiah, Tommy, Yusuf, Tommy, Thomas, Jeramiah, Thomas, Ross , Madalyn, Kaylie, Jeramiah, Thomas, Kamden, Tommy, Madalyn, Kamden, Yusuf, Jeramiah, Helen, Jeramiah, Kamden, Kamden, Jeramiah, Kamden, Helen, Yusuf, Tommy, Ross , Madalyn, Helen, Kamden, Madalyn, Thomas, Helen, Jeramiah, Yusuf, Tommy, Patience, Madalyn, Kaylie, Madalyn, Helen, Tommy, Madalyn, Yusuf, Kamden, Patience, Kaylie, Ross , Kaylie, Kamden, Kamden, Tommy, Yusuf, Ross , Jeramiah, Thomas, Helen, Yusuf, Jeramiah, Kaylie, Kaylie, Tommy, Helen, Thomas, Helen, Ross , Helen, Madalyn, Jeramiah, Kamden, Kamden, Kamden, Ross , Kamden, Ross , Jeramiah, Kaylie, Patience, Thomas, Helen, Jeramiah, Helen, Yusuf, Jeramiah, Thomas, Yusuf, Tommy, Helen, Patience, Madalyn, Kamden, Tommy, Ross , Yusuf, Tommy, Madalyn

## The Raw data 04

Thomas, Yusuf, Patience, Thomas, Thomas, Kaylie, Madalyn, Tommy, Kamden, Helen, Kamden, Tommy, Kamden, Patience, Madalyn, Madalyn, Ross , Jeramiah, Kamden, Yusuf, Madalyn, Helen, Kamden, Kamden, Kamden, Tommy, Jeramiah, Madalyn, Tommy, Yusuf, Jeramiah, Ross , Patience, Kamden, Ross , Jeramiah, Madalyn, Patience, Patience, Madalyn, Patience, Patience, Kaylie, Patience, Kaylie, Kaylie, Tommy, Patience, Tommy, Ross , Madalyn, Tommy, Ross , Helen, Jeramiah, Patience, Helen, Patience, Ross , Jeramiah, Tommy, Helen, Ross , Patience, Madalyn, Jeramiah, Patience, Helen, Kamden, Ross , Tommy, Yusuf, Tommy, Kamden, Thomas, Kaylie, Jeramiah, Kaylie, Helen, Tommy, Madalyn, Jeramiah, Kaylie, Madalyn, Patience, Patience, Kamden, Kaylie, Yusuf, Tommy, Yusuf, Yusuf, Kaylie, Tommy, Kaylie, Yusuf, Ross , Tommy, Helen, Ross , Ross , Jeramiah, Yusuf, Jeramiah, Tommy, Yusuf, Tommy, Thomas, Jeramiah, Thomas, Ross , Madalyn, Kaylie, Jeramiah, Thomas, Kamden, Tommy, Madalyn, Kamden, Yusuf, Jeramiah, Helen, Jeramiah, Kamden, Kamden, Jeramiah, Kamden, Helen, Yusuf, Tommy, Ross , Madalyn, Helen, Kamden, Madalyn, Thomas, Helen, Jeramiah, Yusuf, Tommy, Patience, Madalyn, Kaylie, Madalyn, Helen, Tommy, Madalyn, Yusuf, Kamden, Patience, Kaylie, Ross , Kaylie, Kamden, Kamden, Tommy, Yusuf, Ross , Jeramiah, Thomas, Helen, Yusuf, Jeramiah, Kaylie, Kaylie, Tommy, Helen, Thomas, Helen, Ross , Helen, Madalyn, Jeramiah, Kamden, Kamden, Kamden, Ross , Kamden, Ross , Jeramiah, Kaylie, Patience, Thomas, Helen, Jeramiah, Helen, Yusuf, Jeramiah, Thomas, Yusuf, Tommy, Helen, Patience, Madalyn, Kamden, Tommy, Ross , Yusuf, Tommy, Madalyn



## Two Groups

### Part 1 of 2 (100 words)

thomas patience thomas madalyn kamden kamden kamden madalyn ross kamden madalyn kamden kamden jeramiah tommy jeramiah patience ross madalyn patience patience kaylie kaylie tommy tommy madalyn ross jeramiah helen ross tommy ross madalyn patience kamden tommy tommy thomas jeramiah helen madalyn kaylie patience kamden yusuf yusuf kaylie kaylie ross helen ross yusuf tommy tommy jeramiah ross kaylie thomas tommy kamden jeramiah jeramiah kamden kamden yusuf ross helen madalyn helen yusuf patience kaylie helen madalyn kamden kaylie kaylie kamden yusuf jeramiah helen jeramiah kaylie helen helen helen jeramiah kamden ross ross kaylie thomas jeramiah yusuf thomas tommy patience kamden ross tommy

## Part 2 of 2 (100 words)

yusuf thomas kaylie tommy helen tommy patience madalyn jeramiah yusuf helen kamden tommy madalyn yusuf ross kamden jeramiah patience madalyn patience patience kaylie patience ross tommy helen patience patience jeramiah helen patience jeramiah helen ross yusuf kamden kaylie kaylie tommy jeramiah madalyn patience kaylie tommy yusuf tommy yusuf tommy ross jeramiah jeramiah yusuf thomas thomas madalyn jeramiah kamden madalyn yusuf helen kamden jeramiah helen tommy madalyn kamden thomas jeramiah tommy madalyn madalyn tommy yusuf patience ross kamden tommy ross thomas yusuf kaylie tommy thomas ross madalyn kamden kamden kamden jeramiah patience helen helen jeramiah yusuf helen madalyn tommy yusuf madalyn

## Four Groups

### Part 1 of 4 (50 words)

thomas thomas kamden kamden ross madalyn kamden tommy patience madalyn patience  
kaylie tommy ross helen tommy madalyn kamden tommy jeramiah madalyn patience yusuf  
kaylie ross ross tommy jeramiah kaylie tommy jeramiah kamden yusuf helen helen patience  
helen kamden kaylie yusuf helen kaylie helen jeramiah ross kaylie jeramiah thomas patience  
ross

**Part 2 of 4 (50 words)**

yusuf kaylie helen patience jeramiah helen tommy yusuf kamden patience patience kaylie ross  
helen patience helen jeramiah ross kamden kaylie jeramiah patience tommy tommy tommy  
jeramiah yusuf thomas jeramiah madalyn helen jeramiah tommy kamden jeramiah madalyn  
tommy patience kamden ross yusuf tommy ross kamden kamden patience helen yusuf madalyn  
yusuf

**Part 3 of 4 (50 words)**

patience madalyn kamden madalyn kamden kamden jeramiah jeramiah ross patience kaylie  
tommy madalyn jeramiah ross ross patience tommy thomas helen kaylie kamden yusuf kaylie  
helen yusuf tommy ross thomas kamden jeramiah kamden ross madalyn yusuf kaylie mada-  
lyn kaylie kamden jeramiah jeramiah helen helen kamden ross thomas yusuf tommy kamden  
tommy

**Part 4 of 4 (50 words)**

thomas tommy tommy madalyn yusuf kamden madalyn ross jeramiah madalyn patience patience tommy patience jeramiah patience helen yusuf kaylie tommy madalyn kaylie yusuf yusuf ross jeramiah thomas madalyn kamden yusuf kamden helen madalyn thomas tommy madalyn yusuf ross tommy thomas kaylie thomas madalyn kamden jeramiah helen jeramiah helen tommy madalyn

## Five Groups

### Part 1 of 5 (40 words)

thomas kaylie kamden madalyn madalyn tommy jeramiah jeramiah patience kaylie madalyn  
patience tommy jeramiah tommy kaylie madalyn patience yusuf yusuf ross yusuf ross kamden  
jeramiah jeramiah ross thomas patience tommy kaylie tommy helen tommy helen kamden  
kaylie helen tommy tommy

**Part 2 of 5 (40 words)**

yusuf madalyn tommy ross helen jeramiah ross madalyn patience tommy tommy helen helen  
patience yusuf jeramiah jeramiah kamden yusuf ross jeramiah tommy madalyn tommy helen  
kamden madalyn helen madalyn madalyn ross yusuf yusuf helen madalyn ross patience yusuf  
helen ross



**Part 3 of 5 (40 words)**

patience tommy kamden jeramiah kamden madalyn patience patience kaylie patience ross  
patience ross helen tommy kaylie kaylie kaylie kaylie tommy yusuf thomas kaylie madalyn  
jeramiah helen helen jeramiah kaylie yusuf kaylie ross jeramiah thomas jeramiah kamden  
thomas jeramiah patience yusuf

**Part 4 of 5 (40 words)**

thomas kamden patience kamden kamden tommy kamden patience patience tommy helen  
ross patience kamden kamden helen madalyn yusuf tommy helen jeramiah jeramiah jeramiah  
kamden kamden yusuf kamden yusuf madalyn kamden kamden jeramiah kaylie helen kamden  
ross helen thomas madalyn tommy

**Part 5 of 5 (40 words)**

thomas helen madalyn yusuf kamden yusuf ross madalyn kaylie ross jeramiah jeramiah mada-  
lyn ross thomas tommy patience tommy kaylie ross tommy thomas thomas yusuf kamden  
tommy madalyn tommy helen patience kamden thomas kaylie ross kamden jeramiah jeramiah  
yusuf kamden madalyn

## Ten Groups

### Part 1 of 10 (20 words)

thomas kamden madalyn jeramiah patience madalyn tommy tommy madalyn yusuf ross ross  
jeramiah ross patience kaylie helen helen kaylie tommy

**Part 2 of 10 (20 words)**

yusuf tommy helen ross patience tommy helen yusuf jeramiah yusuf jeramiah madalyn helen  
madalyn madalyn ross yusuf madalyn patience helen

**Part 3 of 10 (20 words)**

patience kamden kamden patience kaylie ross ross tommy kaylie kaylie yusuf kaylie jeramiah  
helen kaylie kaylie jeramiah jeramiah thomas patience

**Part 4 of 10 (20 words)**

thomas patience kamden kamden patience helen patience kamden madalyn tommy jeramiah  
jeramiah kamden kamden madalyn kamden kaylie kamden helen madalyn

**Part 5 of 10 (20 words)**

thomas madalyn kamden ross kaylie jeramiah madalyn thomas patience kaylie tommy thomas  
kamden madalyn helen kamden kaylie kamden jeramiah kamden



**Part 6 of 10 (20 words)**

kaylie madalyn tommy jeramiah kaylie patience jeramiah kaylie patience yusuf yusuf kamden  
jeramiah thomas tommy tommy tommy kamden helen tommy

**Part 7 of 10 (20 words)**

madalyn ross jeramiah madalyn tommy helen patience jeramiah kamden ross tommy tommy  
kamden helen madalyn yusuf helen ross yusuf ross

**Part 8 of 10 (20 words)**

tommy jeramiah madalyn patience patience patience helen kaylie kaylie tommy thomas mada-  
lyn helen jeramiah yusuf ross thomas kamden jeramiah yusuf

**Part 9 of 10 (20 words)**

kamden kamden tommy patience tommy ross kamden helen yusuf helen jeramiah kamden  
yusuf yusuf kamden jeramiah helen ross thomas tommy

**Part 10 of 10 (20 words)**

helen yusuf yusuf madalyn ross jeramiah ross tommy tommy ross thomas yusuf tommy tommy  
patience thomas ross jeramiah yusuf madalyn

## **Twenty Groups**

### **Part 1 of 20 (10 words)**

thomas madalyn patience tommy madalyn ross jeramiah patience helen kaylie

**Part 2 of 20 (10 words)**

yusuf helen patience helen jeramiah jeramiah helen madalyn yusuf patience

**Part 3 of 20 (10 words)**

patience kamden kaylie ross kaylie yusuf jeramiah kaylie jeramiah thomas



**Part 4 of 20 (10 words)**

thomas kamden patience patience madalyn jeramiah kamden madalyn kaylie helen

**Part 5 of 20 (10 words)**

thomas kamden kaylie madalyn patience tommy kamden helen kaylie jeramiah

**Part 6 of 20 (10 words)**

kaylie tommy kaylie jeramiah patience yusuf jeramiah tommy tommy helen

**Part 7 of 20 (10 words)**

madalyn jeramiah tommy patience kamden tommy kamden madalyn helen yusuf

**Part 8 of 20 (10 words)**

tommy madalyn patience helen kaylie thomas helen yusuf thomas jeramiah

**Part 9 of 20 (10 words)**

kamden tommy tommy kamden yusuf jeramiah yusuf kamden helen thomas

**Part 10 of 20 (10 words)**

helen yusuf ross ross tommy thomas tommy patience ross yusuf

**Part 11 of 20 (10 words)**

kamden jeramiah madalyn tommy yusuf ross ross kaylie helen tommy



**Part 12 of 20 (10 words)**

tommy ross tommy yusuf yusuf madalyn madalyn ross madalyn helen

**Part 13 of 20 (10 words)**

kamden patience ross tommy kaylie kaylie helen kaylie jeramiah patience

**Part 14 of 20 (10 words)**

patience kamden helen kamden tommy jeramiah kamden kamden kamden madalyn

**Part 15 of 20 (10 words)**

madalyn ross jeramiah thomas kaylie thomas madalyn kamden kamden kamden

**Part 16 of 20 (10 words)**

madalyn jeramiah patience kaylie yusuf kamden thomas tommy kamden tommy

**Part 17 of 20 (10 words)**

ross madalyn helen jeramiah ross tommy helen yusuf ross ross

**Part 18 of 20 (10 words)**

jeramiah patience patience kaylie tommy madalyn jeramiah ross kamden yusuf

**Part 19 of 20 (10 words)**

kamden patience ross helen helen kamden yusuf jeramiah ross tommy



**Part 20 of 20 (10 words)**

yusuf madalyn jeramiah tommy ross yusuf tommy thomas jeramiah madalyn