

# MapReduce

## Classroom example

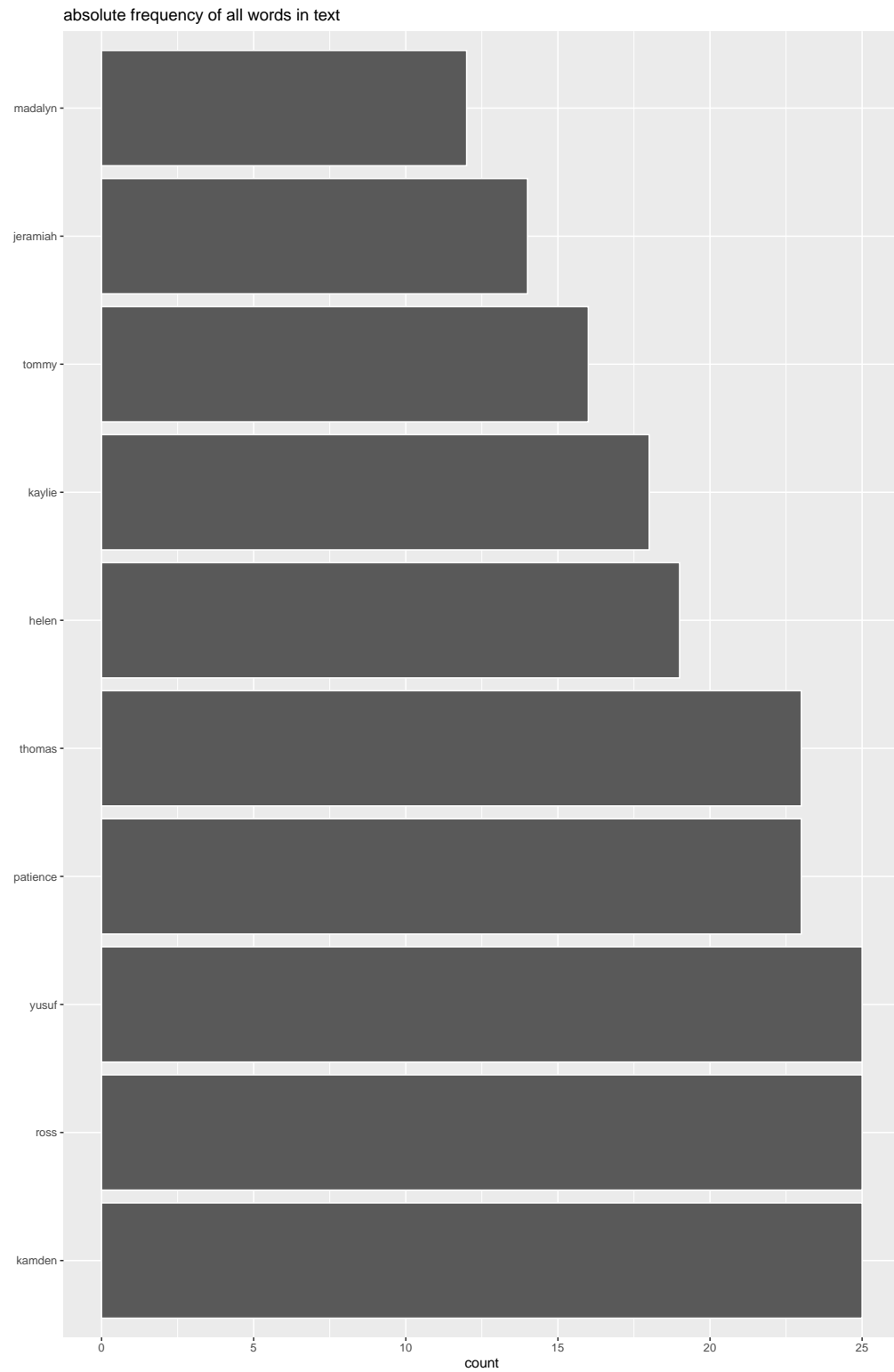
This is the file to create a map reduce classroom example. The setup is as follows

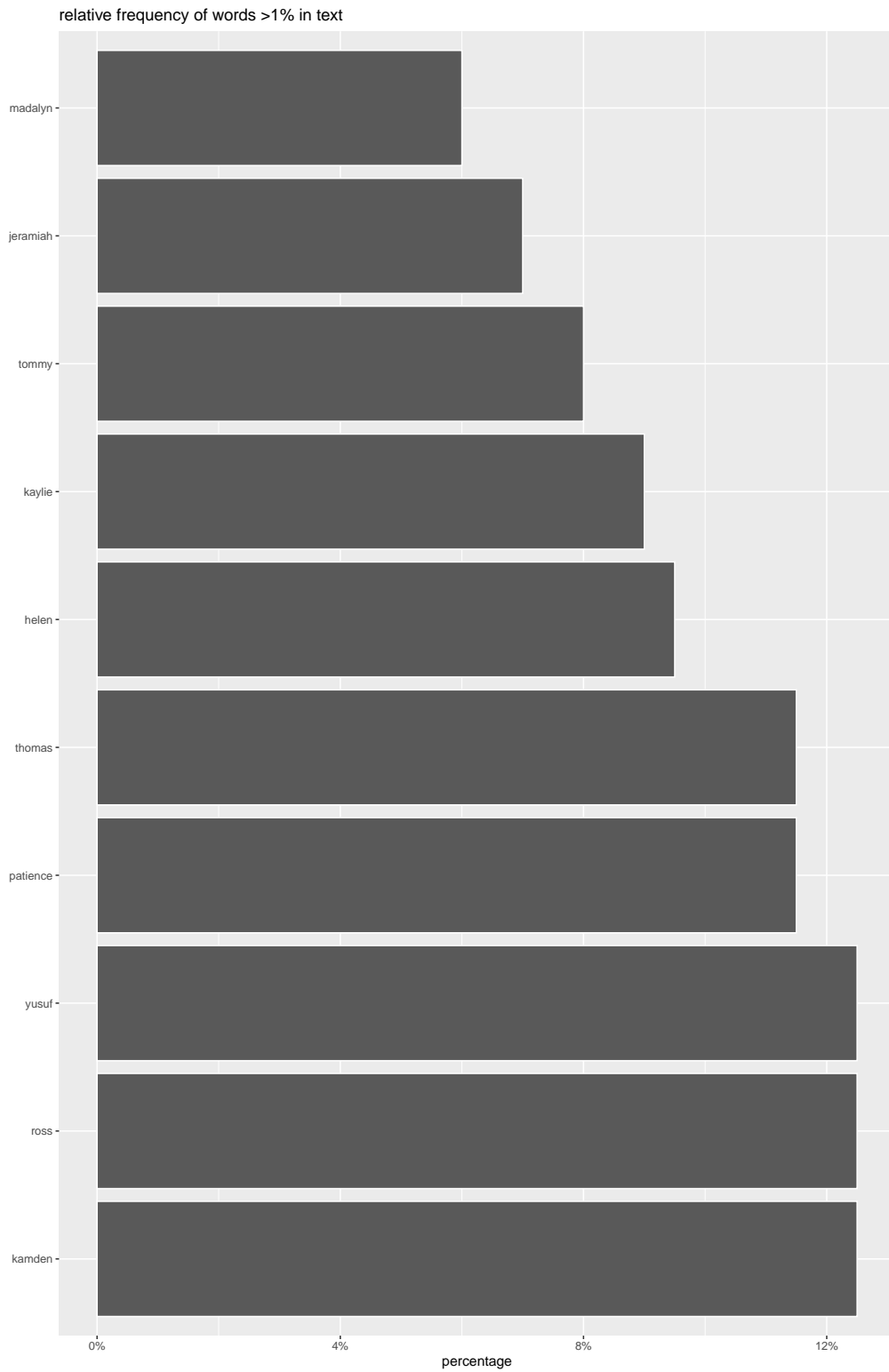
1. print this file
2. give the raw file to 1-4 students, they shall count the words. Measure the time. This is sequential processing.
3. give the chunked file to the respective number of students. There are  $n = 2, 4, 5, 10$  groups available. The number of students is the chunk server.
4. one student 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?

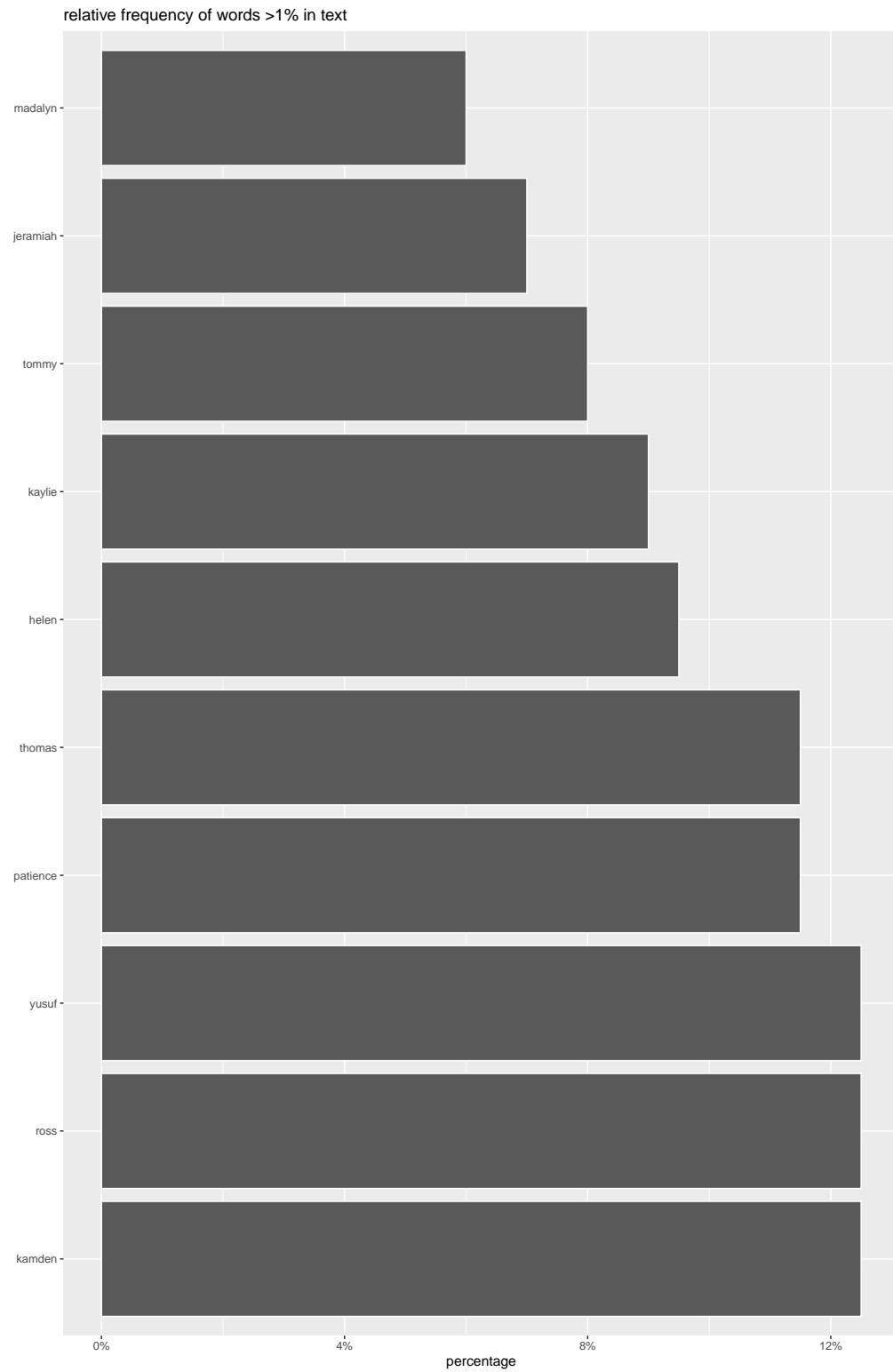
## some summary statistics on the raw data

In total there are 200 words available.

words	Freq	percentage	percentage_round
kamden	25	12.50%	12.50%
ross	25	12.50%	12.50%
yusuf	25	12.50%	12.50%
patience	23	11.50%	11.50%
thomas	23	11.50%	11.50%
helen	19	9.50%	9.50%
kaylie	18	9.00%	9.00%
tommy	16	8.00%	8.00%
jeramiah	14	7.00%	7.00%
madalyn	12	6.00%	6.00%







## The Raw data 01

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

## The Raw data 02

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

## The Raw data 03

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

## The Raw data 04

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



## Two Groups

### Part 1 of 2 (100 words)

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

**Part 2 of 2 (100 words)**

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

## Four Groups

### Part 1 of 4 (50 words)

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

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

ross patience madalyn jeramiah kamden kamden tommy helen kamden yusuf thomas kamden  
ross madalyn patience tommy madalyn patience helen kaylie yusuf yusuf tommy thomas pa-  
tience ross jeramiah thomas yusuf kamden helen kaylie yusuf kamden patience thomas thomas  
thomas patience jeramiah ross yusuf jeramiah yusuf helen kaylie kaylie helen ross yusuf

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

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

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

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

## Five Groups

### Part 1 of 5 (40 words)

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

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

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



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

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

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

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

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

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

## Ten Groups

### Part 1 of 10 (20 words)

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

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

ross thomas kamden thomas thomas kamden tommy kamden yusuf kamden ross ross helen  
thomas thomas kamden ross ross kaylie kaylie

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

## **Twenty Groups**

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

kaylie kaylie jeramiah ross thomas yusuf patience tommy kamden tommy

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

ross kamden thomas tommy yusuf ross helen thomas ross kaylie

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

ross thomas helen jeramiah kamden kamden kaylie thomas ross jeramiah



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

jeramiah patience thomas kamden tommy kamden madalyn kaylie patience tommy

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

kaylie helen madalyn kamden thomas thomas madalyn madalyn madalyn ross

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

patience tommy kamden madalyn yusuf jeramiah kaylie thomas yusuf kaylie

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

helen ross yusuf tommy tommy yusuf ross patience ross jeramiah

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

ross thomas helen yusuf yusuf patience kaylie patience thomas jeramiah

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

helen kaylie patience kaylie thomas tommy ross kamden yusuf thomas

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

madalyn helen ross patience tommy thomas yusuf thomas jeramiah helen

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

kaylie ross yusuf yusuf thomas thomas jeramiah patience tommy helen



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

thomas thomas kamden kamden kamden ross thomas kamden ross kaylie

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

patience kamden jeramiah kaylie kaylie ross ross madalyn patience kamden

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

jeramiah kamden madalyn helen thomas yusuf kamden patience yusuf ross

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

tommy kamden helen ross patience yusuf yusuf patience tommy helen

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

patience helen tommy ross helen kaylie yusuf yusuf madalyn yusuf

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

helen madalyn patience thomas patience helen ross ross kamden kamden

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

kamden yusuf patience kaylie patience kamden patience jeramiah helen yusuf

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

helen jeramiah ross thomas yusuf ross tommy tommy kaylie kamden



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

patience jeramiah helen yusuf kamden patience yusuf yusuf madalyn kamden