

# MapReduce

## Classroom example

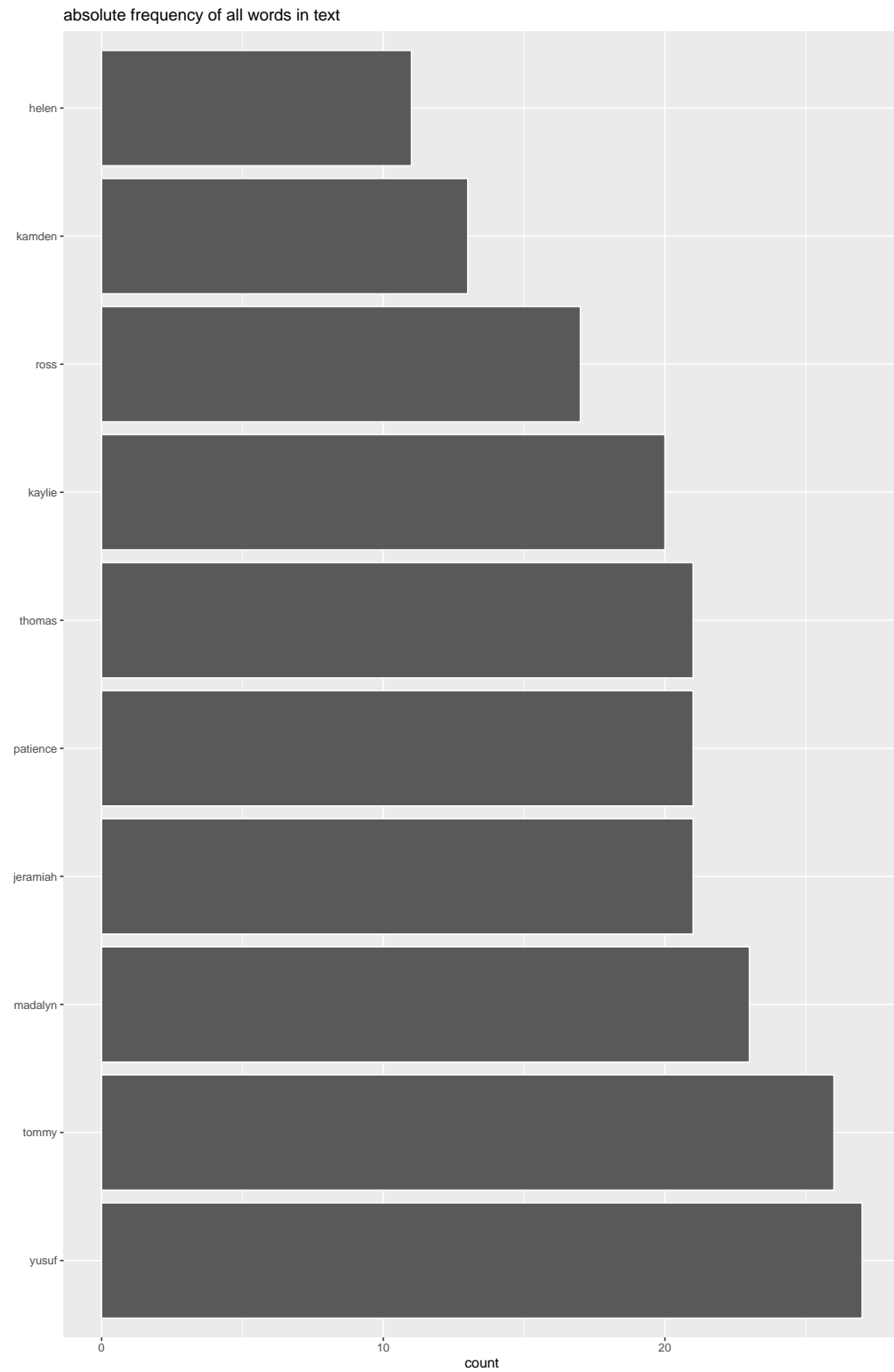
This is the file to create a map reduce classroom example. The setup is as follows

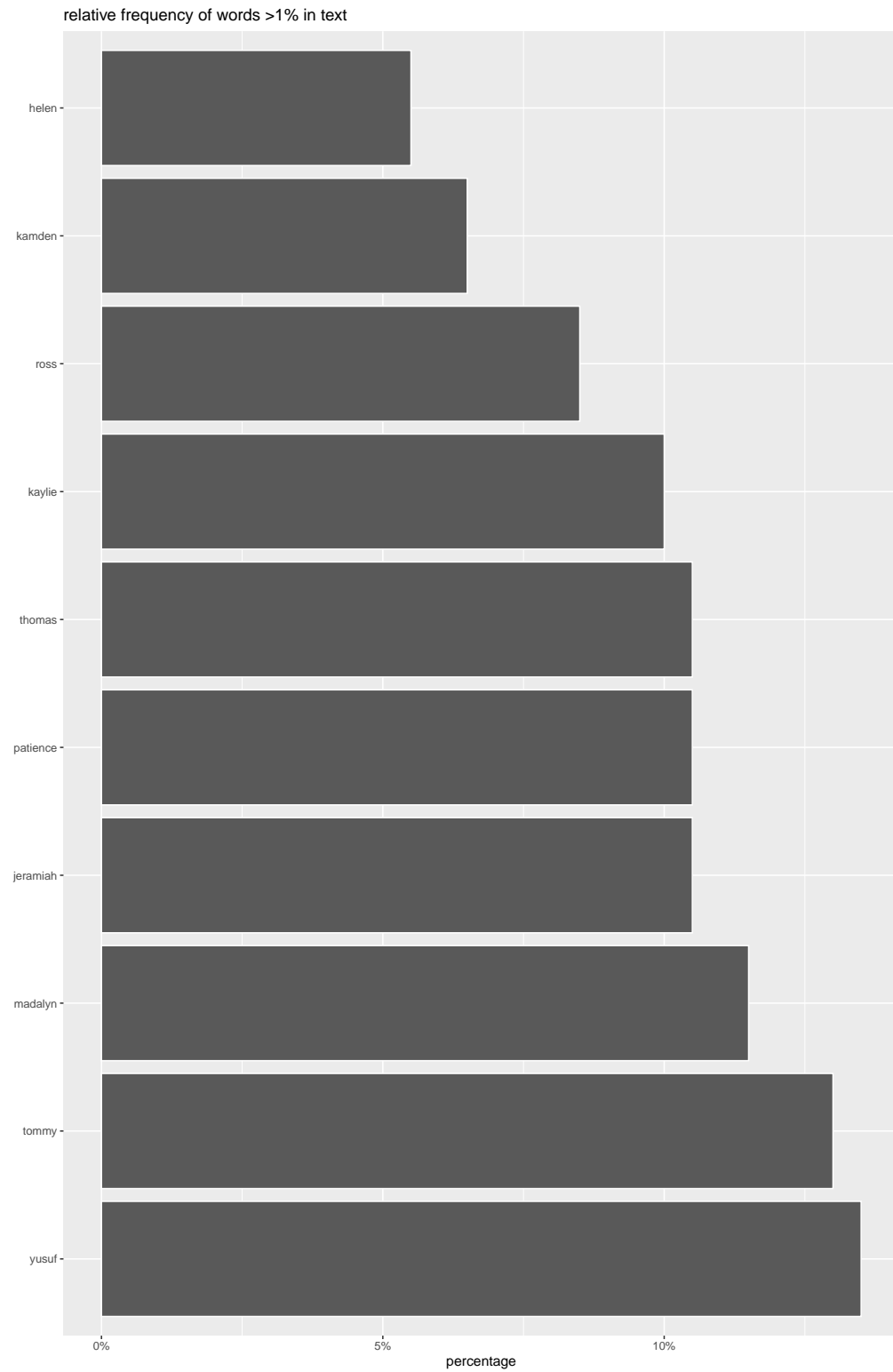
1. print this file
2. give the raw file to 1-4 students, they shall count the words. Measure the time. This is sequential processing.
3. give the chunked file to the respective number of students. There are  $n = 2, 4, 5, 10$  groups available. The number of students is the chunk server.
4. one student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

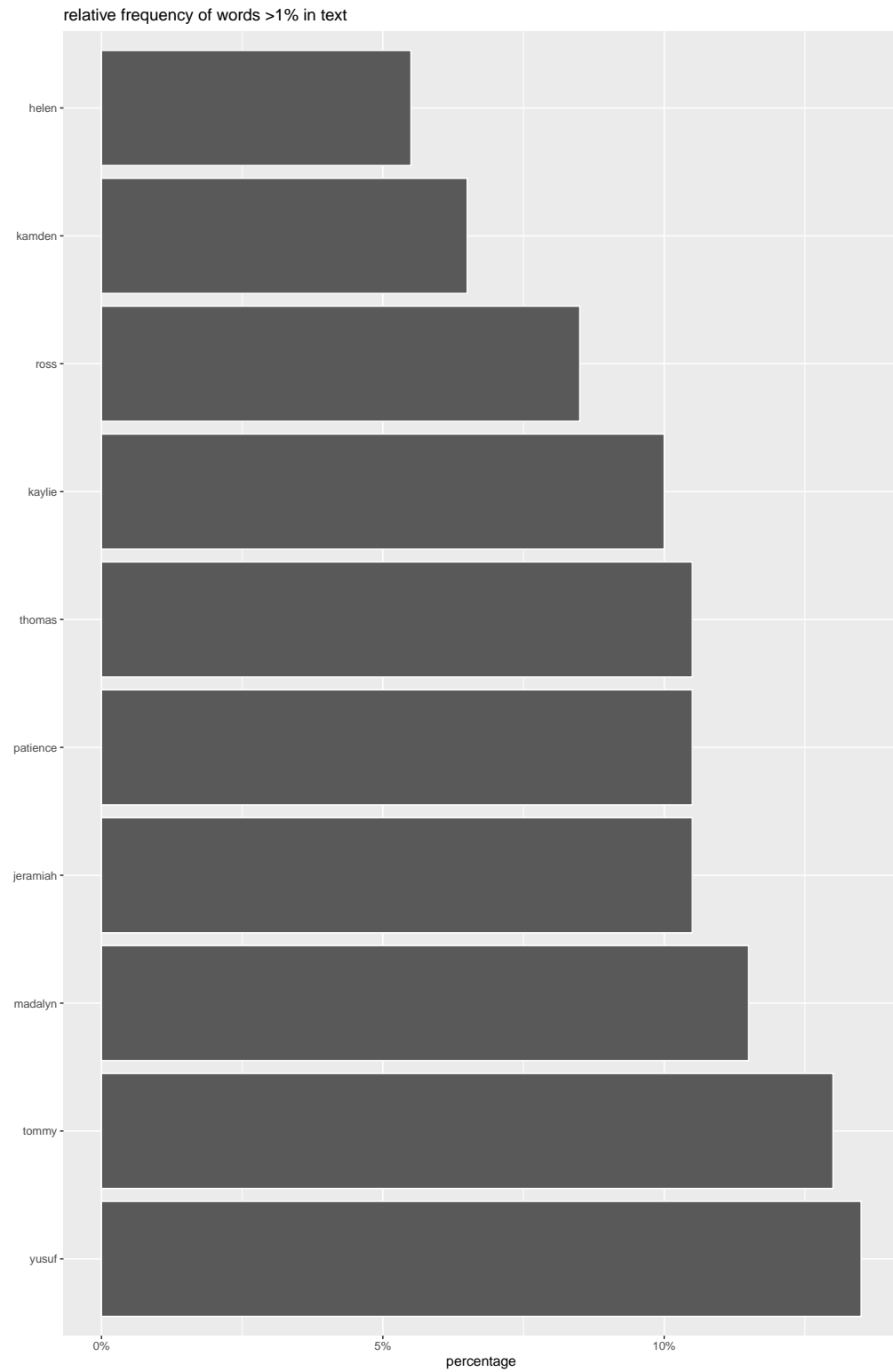
## some summary statistics on the raw data

In total there are 200 words available.

words	Freq	percentage	percentage_round
yusuf	27	13.50%	13.50%
tommy	26	13.00%	13.00%
madalyn	23	11.50%	11.50%
jeramiah	21	10.50%	10.50%
patience	21	10.50%	10.50%
thomas	21	10.50%	10.50%
kaylie	20	10.00%	10.00%
ross	17	8.50%	8.50%
kamden	13	6.50%	6.50%
helen	11	5.50%	5.50%







## The Raw data 01

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

## The Raw data 02

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

## The Raw data 03

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

## The Raw data 04

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



## Two Groups

### Part 1 of 2 (100 words)

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

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

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

## Four Groups

### Part 1 of 4 (50 words)

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

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

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

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

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

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

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

## Five Groups

### Part 1 of 5 (40 words)

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

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

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



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

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

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

helen yusuf ross yusuf patience tommy ross madalyn kamden kaylie kaylie tommy thomas  
thomas thomas kamden tommy ross tommy jeramiah patience thomas tommy thomas kam-  
den tommy helen thomas kamden yusuf yusuf madalyn madalyn yusuf patience kaylie kaylie  
madalyn kaylie tommy

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

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

## Ten Groups

### Part 1 of 10 (20 words)

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

## **Twenty Groups**

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

jeramiah madalyn kaylie kaylie yusuf thomas patience jeramiah tommy tommy

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

jeramiah yusuf patience helen madalyn yusuf tommy tommy jeramiah thomas

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

yusuf ross madalyn madalyn patience madalyn ross jeramiah jeramiah ross



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

helen patience kamden thomas tommy patience kamden kamden madalyn kaylie

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

patience ross yusuf kaylie helen thomas jeramiah helen yusuf tommy

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

tommy patience patience ross thomas patience madalyn ross ross kaylie

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

patience kamden patience yusuf kaylie madalyn yusuf thomas madalyn thomas

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

helen jeramiah tommy madalyn thomas madalyn tommy patience ross patience

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

yusuf tommy kaylie thomas ross thomas tommy yusuf yusuf madalyn

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

jeramiah ross ross thomas tommy yusuf kamden madalyn kaylie ross

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

patience madalyn patience helen tommy kamden jeramiah tommy kaylie tommy



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

kaylie yusuf kamden tommy kaylie yusuf helen madalyn ross yusuf

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

madalyn thomas jeramiah patience kaylie yusuf thomas madalyn helen madalyn

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

ross ross kaylie thomas tommy tommy helen yusuf patience kaylie

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

helen kamden kaylie tommy yusuf kaylie kamden thomas kamden jeramiah

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

kamden jeramiah tommy yusuf tommy thomas helen thomas jeramiah jeramiah

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

ross yusuf kaylie jeramiah kaylie yusuf patience tommy tommy yusuf

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

yusuf thomas jeramiah patience jeramiah yusuf yusuf tommy yusuf patience

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

yusuf madalyn tommy kamden jeramiah thomas thomas madalyn kaylie tommy



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

thomas ross jeramiah madalyn madalyn patience kamden kaylie jeramiah madalyn