

# MapReduce

## Classroom example

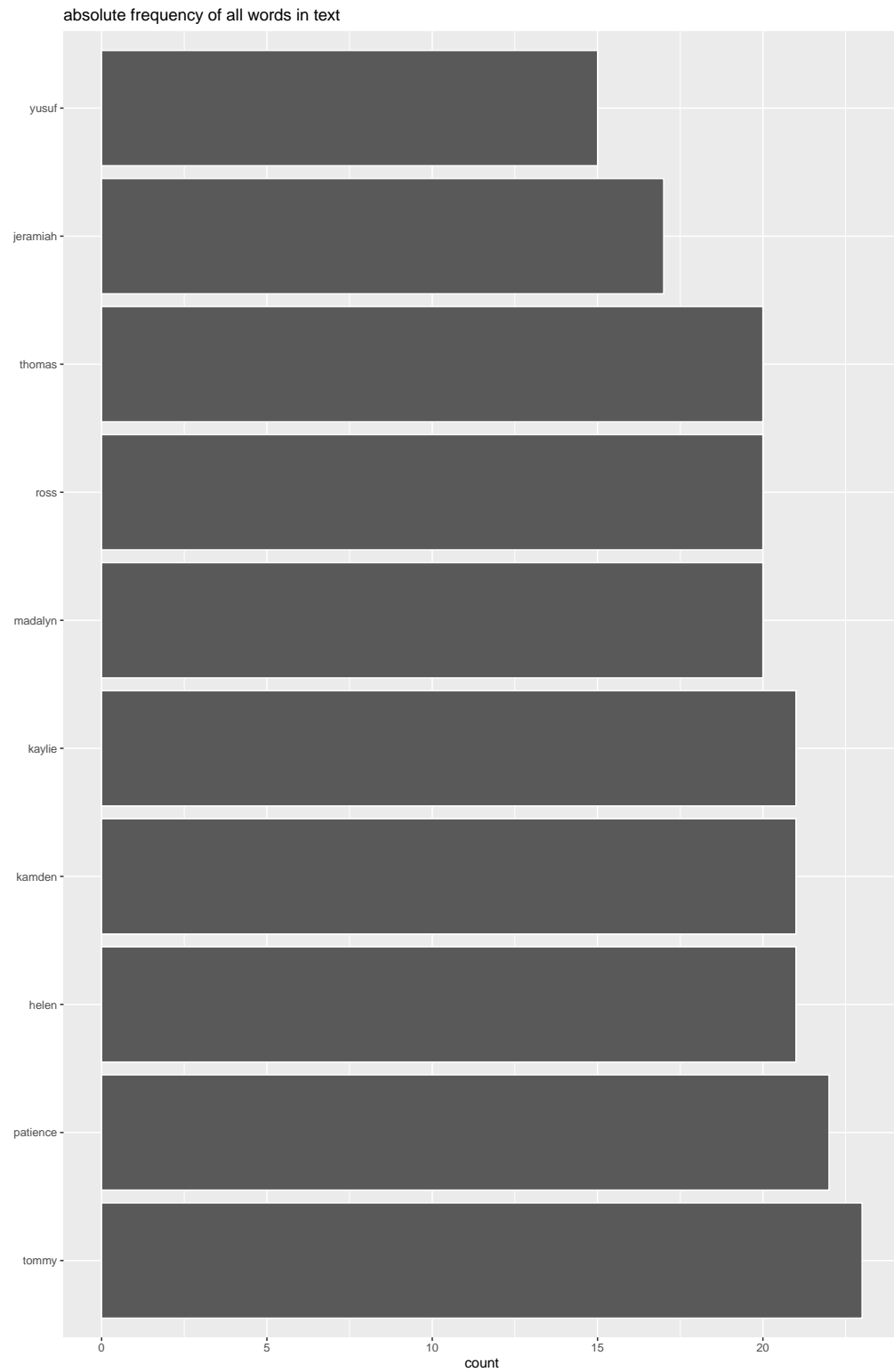
This is the file to create a map reduce classroom example. The setup is as follows

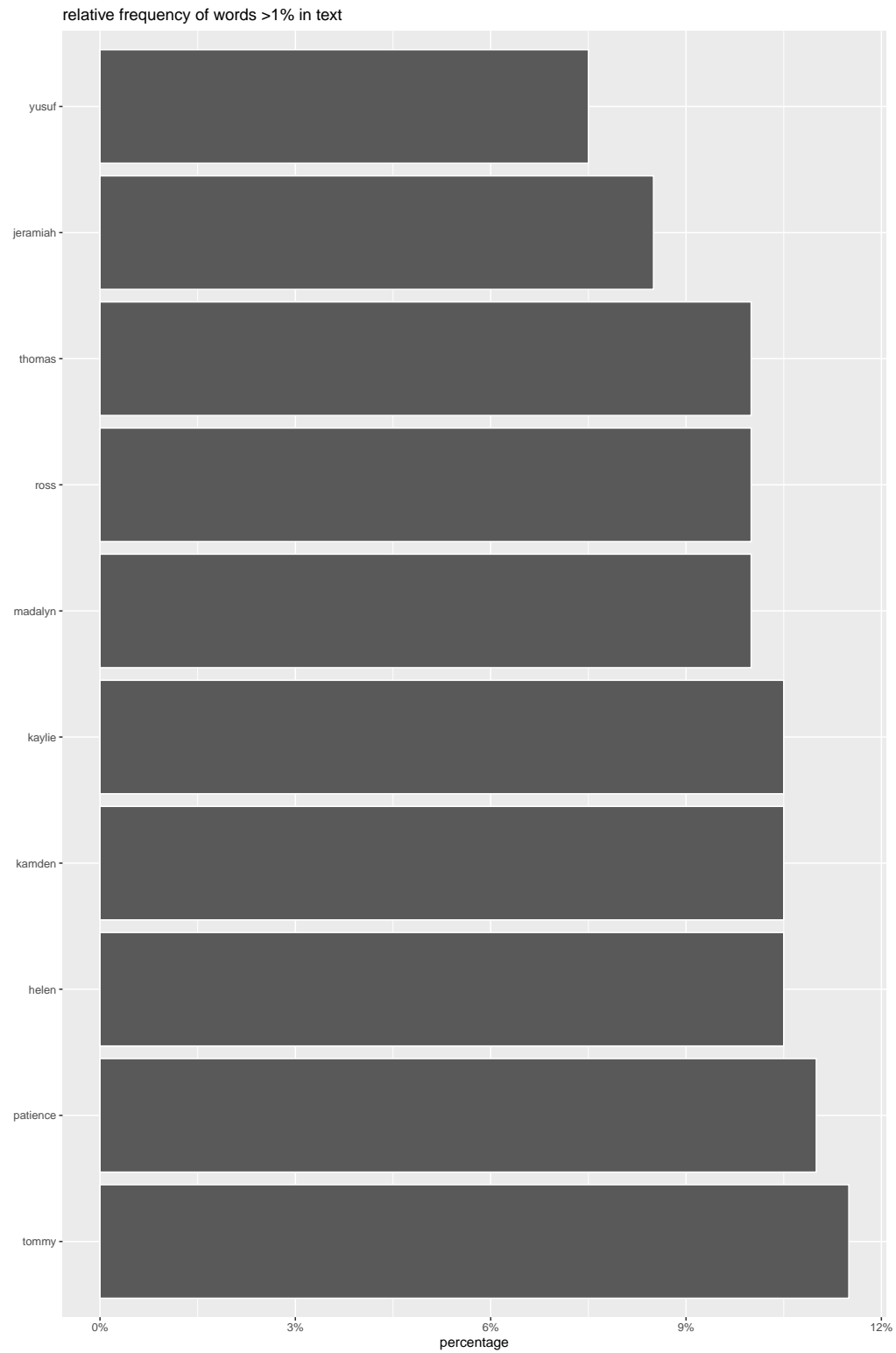
1. print this file
2. give the raw file to 1-4 students, they shall count the words. Measure the time. This is sequential processing.
3. give the chunked file to the respective number of students. There are  $n = 2, 4, 5, 10$  groups available. The number of students is the chunk server.
4. one student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

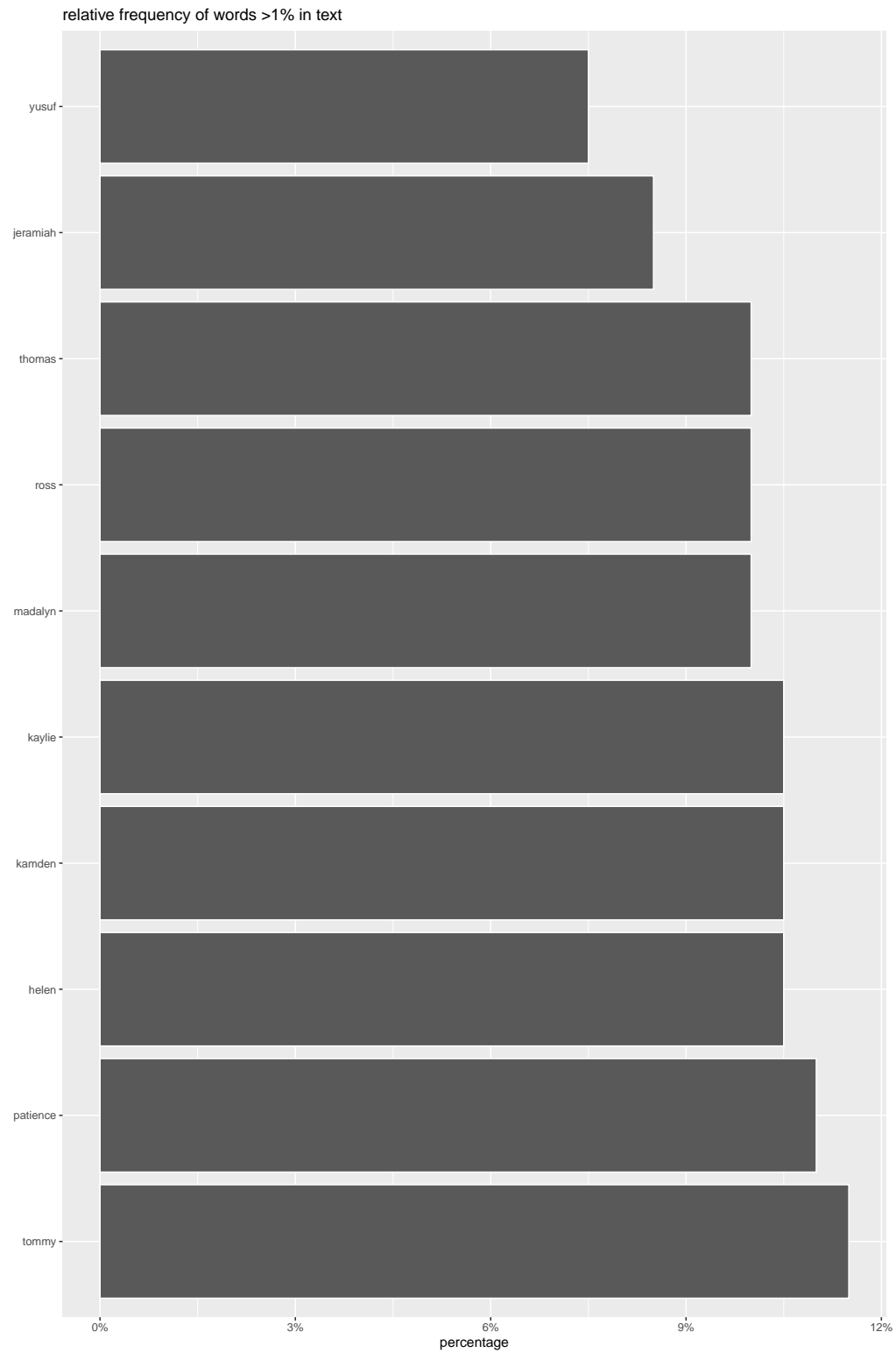
## some summary statistics on the raw data

In total there are 200 words available.

words	Freq	percentage	percentage_round
tommy	23	11.50%	11.50%
patience	22	11.00%	11.00%
helen	21	10.50%	10.50%
kamden	21	10.50%	10.50%
kaylie	21	10.50%	10.50%
madalyn	20	10.00%	10.00%
ross	20	10.00%	10.00%
thomas	20	10.00%	10.00%
jeramiah	17	8.50%	8.50%
yusuf	15	7.50%	7.50%







## The Raw data 01

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

## The Raw data 02

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

## The Raw data 03

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

## The Raw data 04

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



## Two Groups

### Part 1 of 2 (100 words)

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

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

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

## Four Groups

### Part 1 of 4 (50 words)

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

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

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

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

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

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

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

## Five Groups

### Part 1 of 5 (40 words)

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

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

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



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

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

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

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

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

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

## Ten Groups

### Part 1 of 10 (20 words)

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

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

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

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

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

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

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

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

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



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

jeramiah jeramiah kaylie kamden ross yusuf kaylie kamden kaylie jeramiah yusuf ross kaylie  
jeramiah kamden kamden ross jeramiah ross yusuf

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

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

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

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

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

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

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

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

## **Twenty Groups**

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

yusuf madalyn yusuf thomas madalyn kaylie thomas kamden tommy yusuf

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

yusuf kaylie thomas patience helen tommy patience kamden thomas helen

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

ross patience ross kamden patience madalyn ross kaylie tommy helen



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

jeramiah tommy kaylie ross jeramiah kamden thomas kamden thomas kaylie

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

jeramiah tommy madalyn thomas kamden thomas madalyn thomas ross kaylie

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

jeramiah kaylie ross kaylie kaylie yusuf kaylie kamden ross ross

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

kamden kamden patience helen helen madalyn ross tommy kaylie yusuf

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

thomas jeramiah tommy kamden kaylie tommy tommy ross jeramiah patience

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

thomas patience madalyn tommy madalyn tommy thomas ross jeramiah tommy

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

kamden jeramiah tommy patience yusuf madalyn helen patience patience kaylie

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

tommy tommy ross helen yusuf madalyn thomas madalyn yusuf madalyn



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

helen patience kamden kaylie helen jeramiah kaylie thomas madalyn patience

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

tommy patience ross madalyn thomas kaylie kaylie helen helen kaylie

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

helen patience thomas ross kaylie madalyn patience helen patience kamden

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

ross kamden tommy ross patience helen yusuf helen kamden ross

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

jeramiah kamden yusuf kamden jeramiah ross jeramiah kamden jeramiah yusuf

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

jeramiah madalyn helen jeramiah tommy kamden tommy thomas madalyn patience

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

patience helen tommy patience ross kamden kamden helen helen madalyn

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

kaylie ross thomas jeramiah thomas tommy helen yusuf helen kaylie



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

tommy patience yusuf thomas tommy jeramiah madalyn patience yusuf madalyn