

# MapReduce

## Classroom example

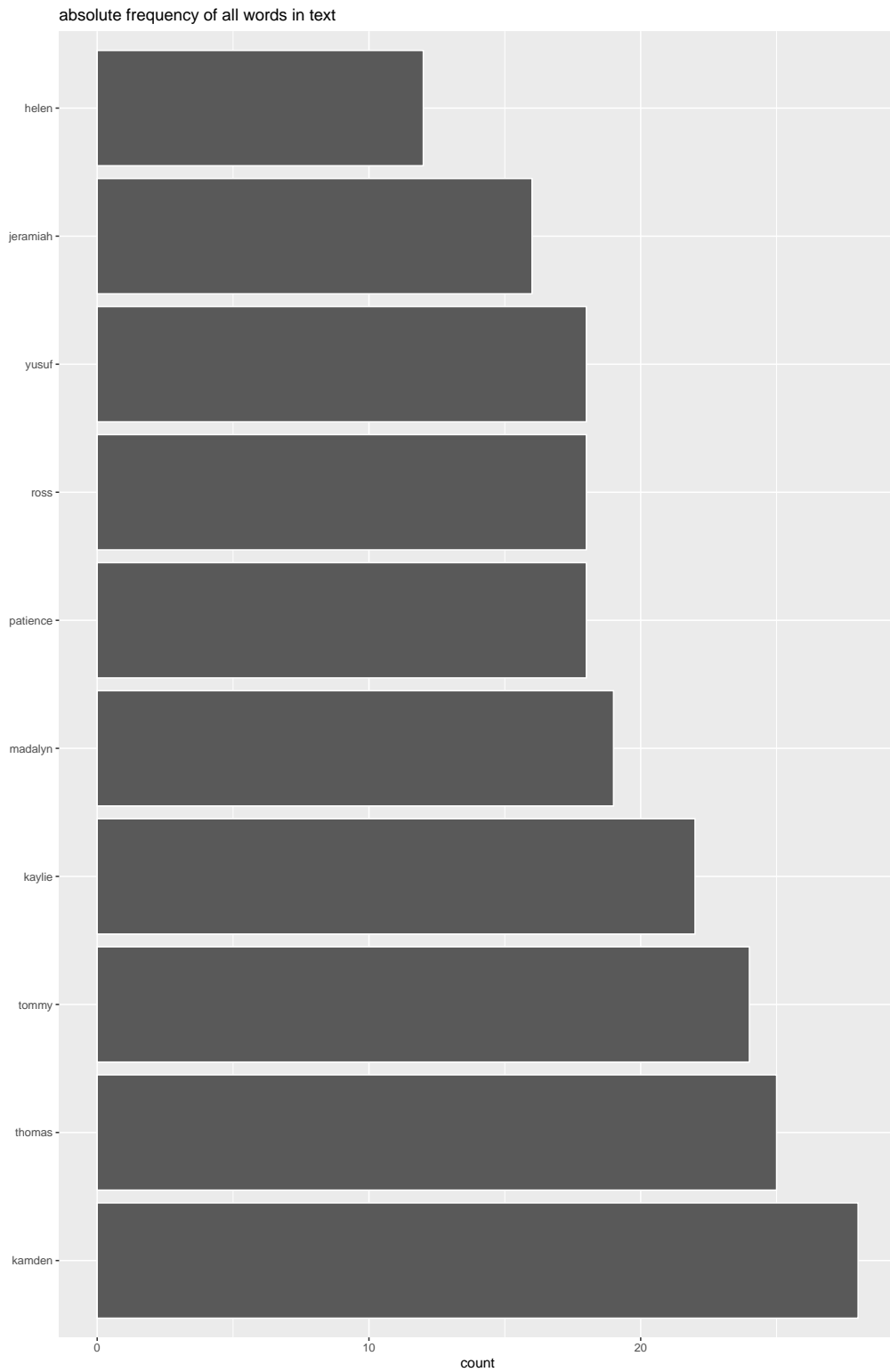
This is the file to create a map reduce classroom example. The setup is as follows

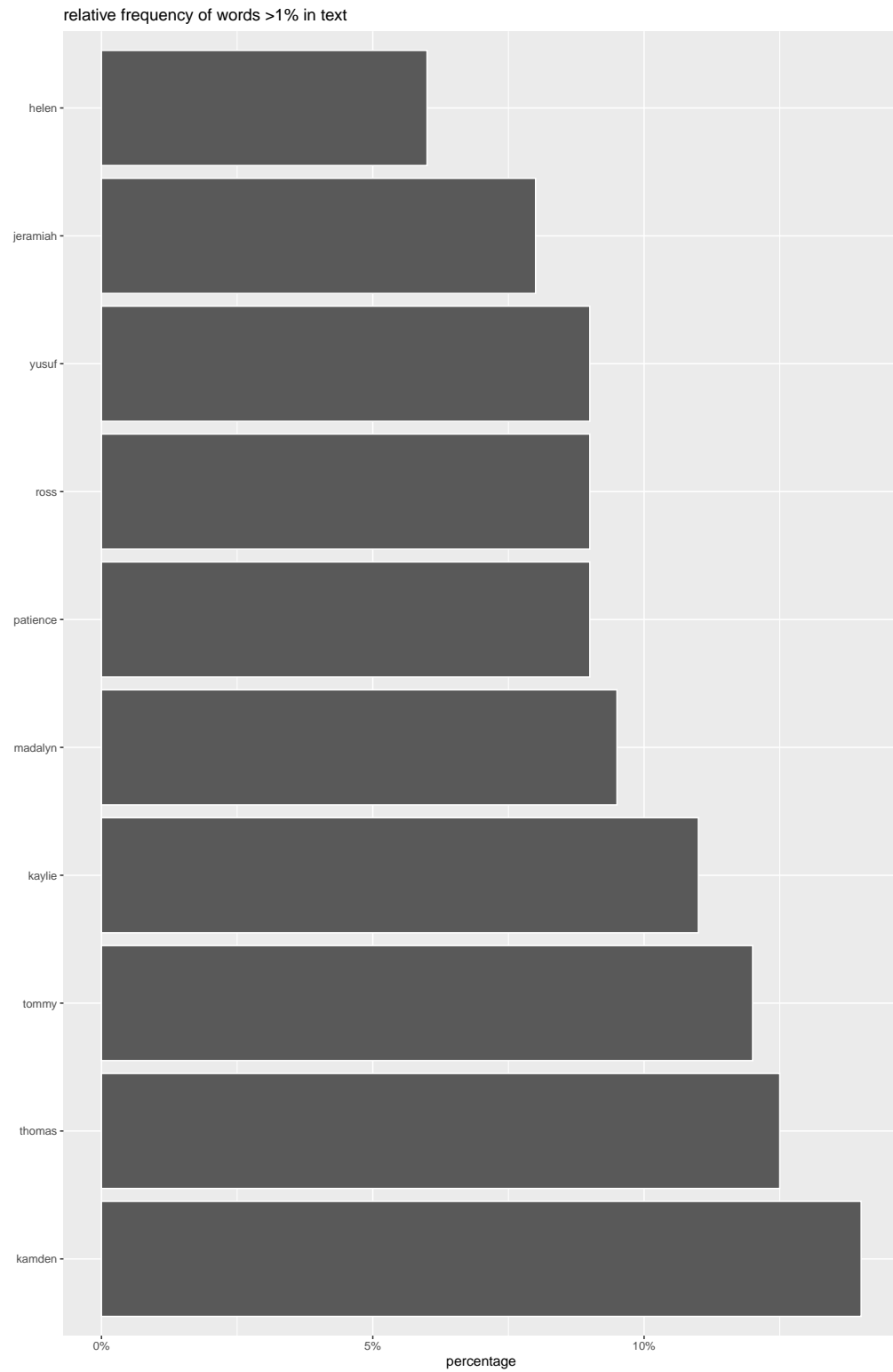
1. print this file
2. give the raw file to 1-4 students, they shall count the words. Measure the time. This is sequential processing.
3. give the chunked file to the respective number of students. There are  $n = 2, 4, 5, 10$  groups available. The number of students is the chunk server.
4. one student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

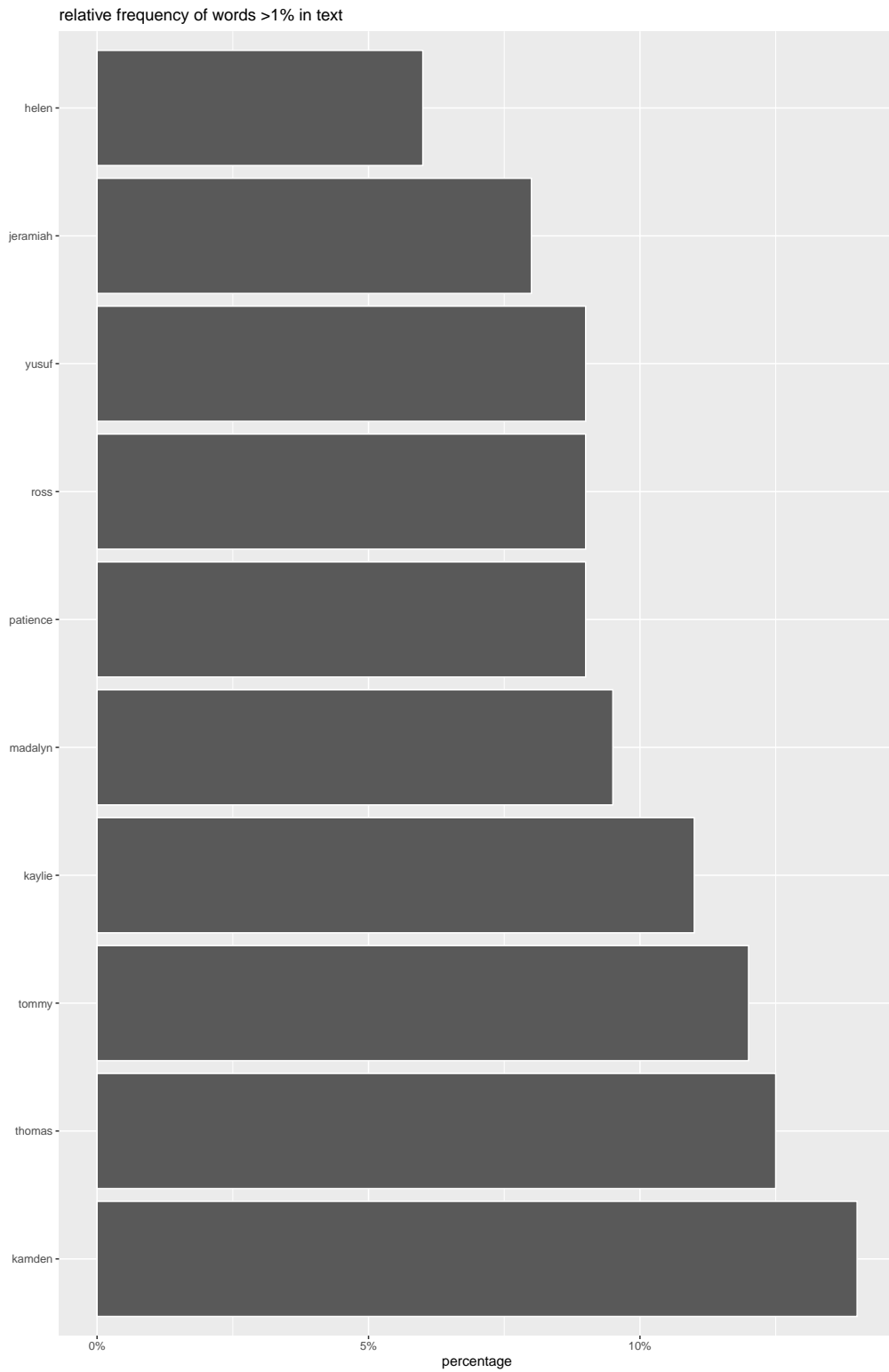
## some summary statistics on the raw data

In total there are 200 words available.

words	Freq	percentage	percentage_round
kamden	28	14.00%	14.00%
thomas	25	12.50%	12.50%
tommy	24	12.00%	12.00%
kaylie	22	11.00%	11.00%
madalyn	19	9.50%	9.50%
patience	18	9.00%	9.00%
ross	18	9.00%	9.00%
yusuf	18	9.00%	9.00%
jeramiah	16	8.00%	8.00%
helen	12	6.00%	6.00%







## The Raw data 01

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

## The Raw data 02

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

## The Raw data 03

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

## The Raw data 04

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



## Two Groups

### Part 1 of 2 (100 words)

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

## Part 2 of 2 (100 words)

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

## Four Groups

### Part 1 of 4 (50 words)

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

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

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

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

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

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

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

## Five Groups

### Part 1 of 5 (40 words)

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

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

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



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

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

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

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

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

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

## Ten Groups

### Part 1 of 10 (20 words)

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

## Twenty Groups

### Part 1 of 20 (10 words)

kaylie ross jeramiah thomas madalyn jeramiah jeramiah yusuf patience thomas

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

helen yusuf kamden ross jeramiah tommy thomas madalyn helen tommy

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

tommy kamden ross jeramiah yusuf yusuf kaylie jeramiah helen tommy



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

kamden kaylie madalyn kamden thomas kaylie kamden kamden yusuf ross

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

thomas madalyn thomas helen helen kaylie tommy kamden tommy kaylie

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

ross kamden tommy yusuf kamden kaylie tommy madalyn tommy thomas

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

jeramiah tommy patience ross kamden patience madalyn helen tommy jeramiah

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

kamden kamden helen patience thomas kaylie tommy kamden kamden yusuf

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

ross kamden thomas thomas patience jeramiah yusuf kamden jeramiah kaylie

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

thomas ross tommy kaylie kamden kamden patience madalyn kamden tommy

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

ross ross madalyn yusuf ross thomas tommy kamden thomas thomas



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

kamden patience patience kamden ross madalyn kaylie kaylie thomas patience

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

kaylie helen jeramiah kaylie madalyn ross thomas madalyn yusuf tommy

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

yusuf tommy tommy patience patience madalyn madalyn kaylie thomas madalyn

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

madalyn helen tommy kamden patience ross yusuf patience kamden jeramiah

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

kaylie thomas kamden thomas tommy yusuf patience ross madalyn madalyn

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

thomas helen kaylie patience thomas jeramiah yusuf ross thomas thomas

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

ross jeramiah jeramiah helen kaylie kamden helen madalyn kamden yusuf

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

kaylie thomas kaylie kaylie yusuf tommy thomas jeramiah patience tommy



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

yusuf patience kamden kaylie yusuf ross tommy madalyn tommy patience