

# MapReduce

## Classroom example

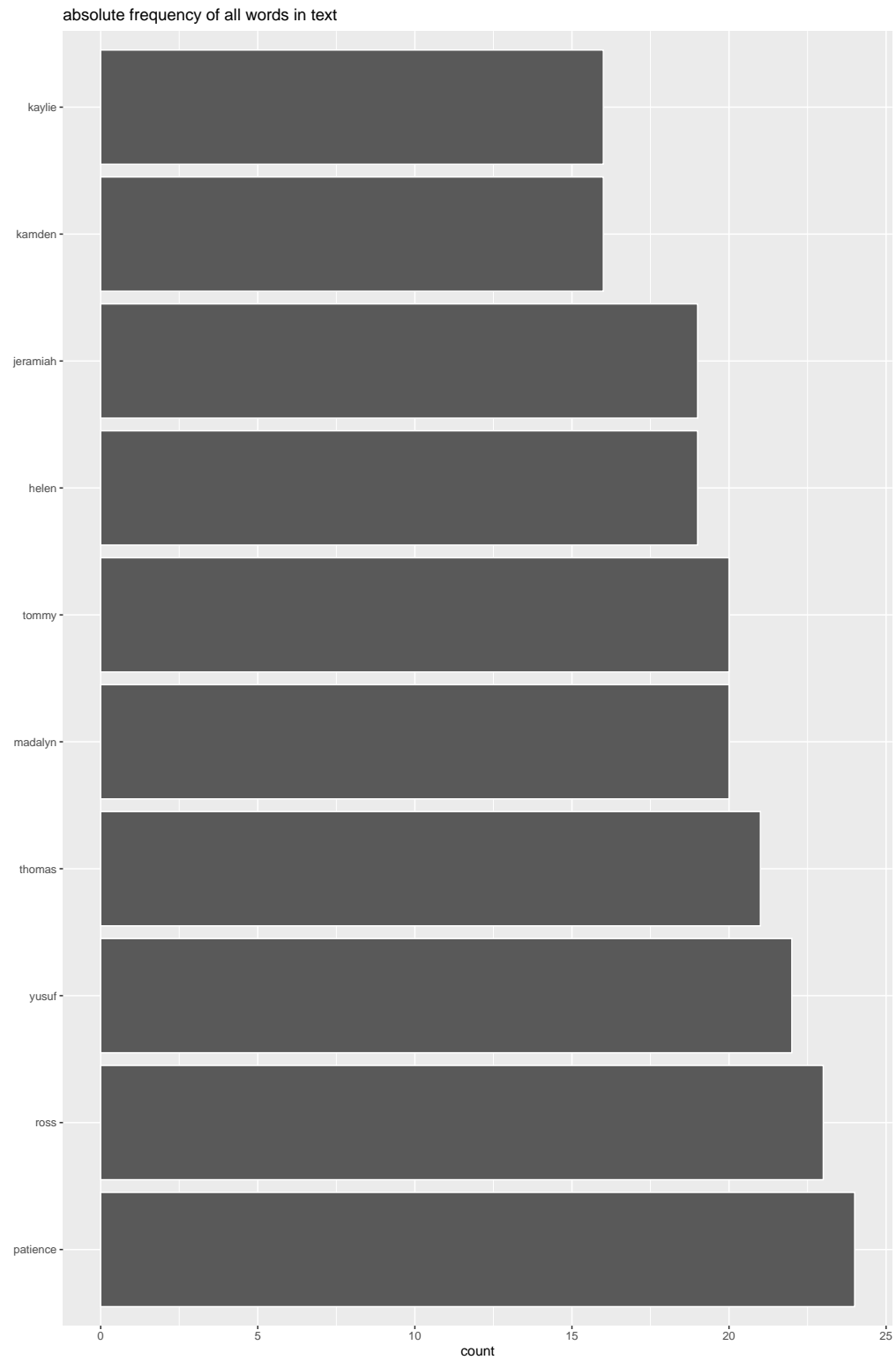
This is the file to create a map reduce classroom example. The setup is as follows

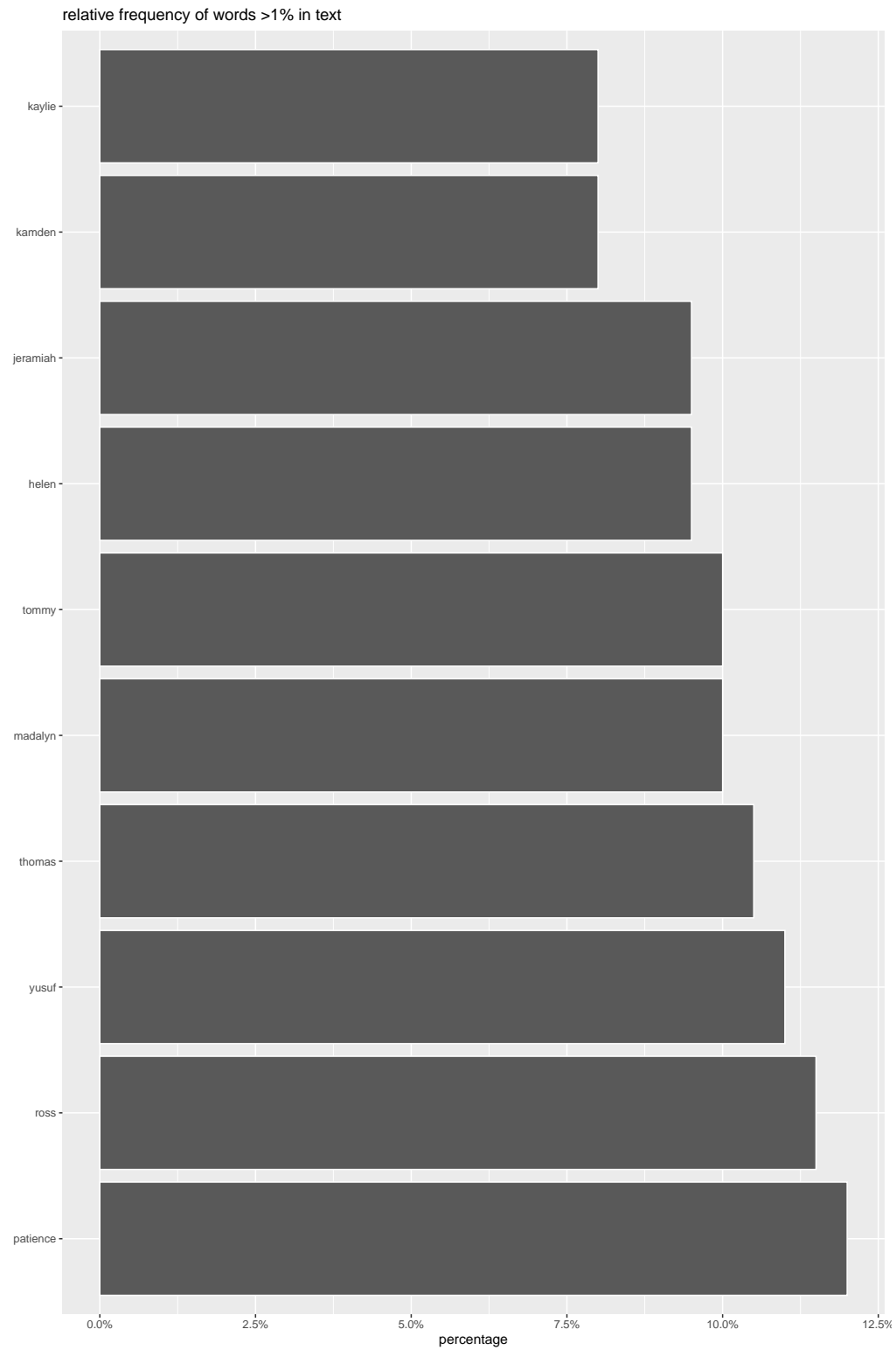
1. print this file
2. give the raw file to 1-4 students, they shall count the words. Measure the time. This is sequential processing.
3. give the chunked file to the respective number of students. There are  $n = 2, 4, 5, 10$  groups available. The number of students is the chunk server.
4. one student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

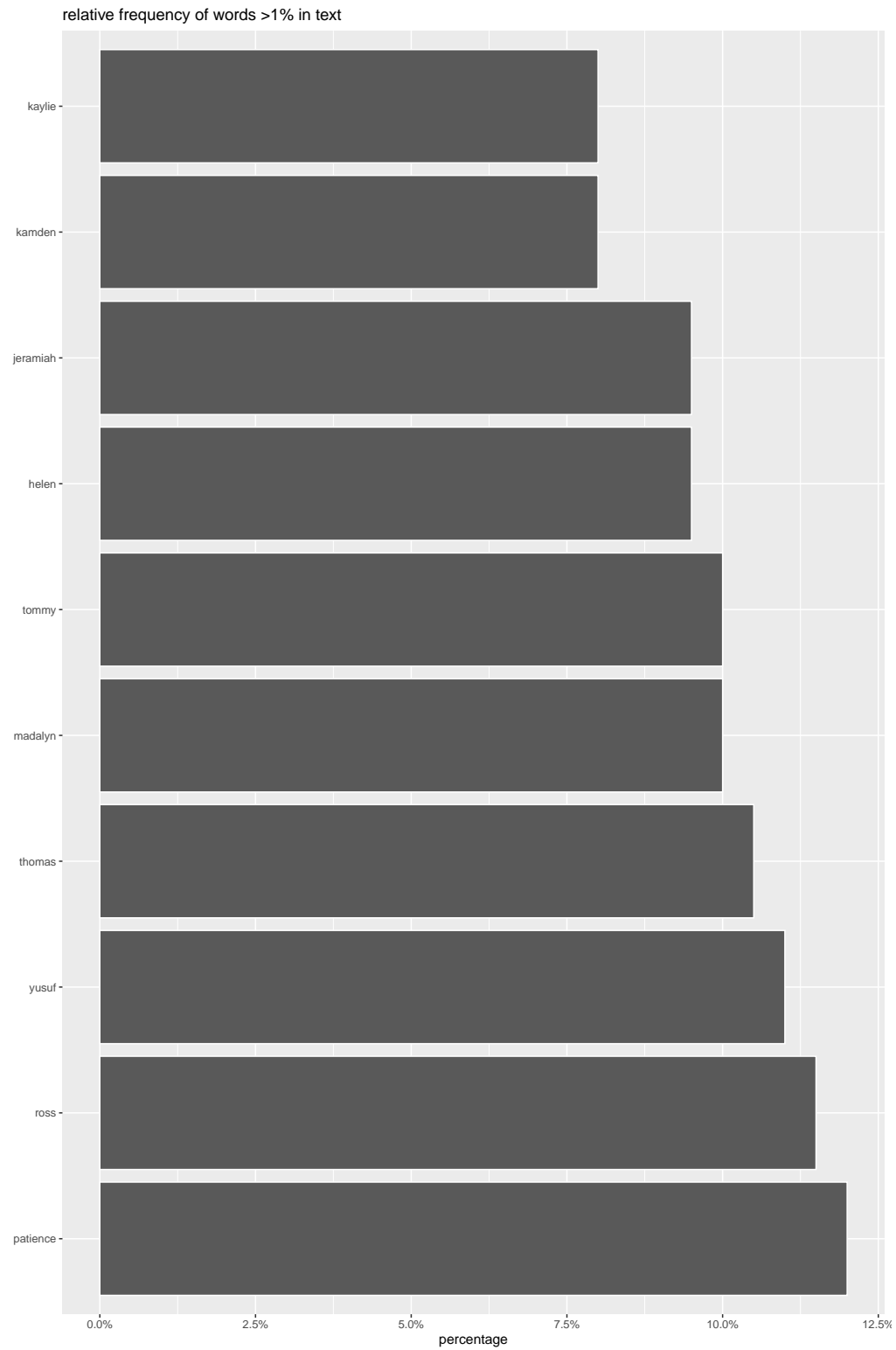
## some summary statistics on the raw data

In total there are 200 words available.

words	Freq	percentage	percentage_round
patience	24	12.00%	12.00%
ross	23	11.50%	11.50%
yusuf	22	11.00%	11.00%
thomas	21	10.50%	10.50%
madalyn	20	10.00%	10.00%
tommy	20	10.00%	10.00%
helen	19	9.50%	9.50%
jeramiah	19	9.50%	9.50%
kamden	16	8.00%	8.00%
kaylie	16	8.00%	8.00%







## The Raw data 01

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

## The Raw data 02

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

## The Raw data 03

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

## The Raw data 04

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



## Two Groups

### Part 1 of 2 (100 words)

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

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

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

## Four Groups

### Part 1 of 4 (50 words)

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

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

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

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

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

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

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

## Five Groups

### Part 1 of 5 (40 words)

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

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

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



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

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

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

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

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

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

## Ten Groups

### Part 1 of 10 (20 words)

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

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

yusuf kaylie helen patience tommy tommy tommy jeramiah jeramiah yusuf tommy jeramiah  
tommy helen helen yusuf yusuf helen patience ross

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

## Twenty Groups

### Part 1 of 20 (10 words)

helen thomas jeramiah patience thomas yusuf madalyn kamden thomas yusuf

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

yusuf helen tommy tommy jeramiah tommy tommy helen yusuf patience

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

yusuf ross kaylie yusuf kaylie jeramiah tommy jeramiah thomas thomas



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

kamden madalyn jeramiah madalyn tommy madalyn kaylie madalyn helen ross

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

kamden yusuf madalyn tommy patience patience patience madalyn tommy madalyn

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

ross helen madalyn thomas jeramiah ross ross ross kamden patience

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

helen ross kaylie kaylie thomas kamden jeramiah ross thomas tommy

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

jeramiah ross kamden yusuf jeramiah kamden patience yusuf yusuf thomas

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

kamden yusuf thomas helen patience madalyn patience kamden ross yusuf

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

helen tommy ross ross kamden ross kaylie jeramiah thomas kamden

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

madalyn patience patience madalyn thomas ross madalyn thomas yusuf madalyn



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

kaylie patience tommy jeramiah yusuf jeramiah helen yusuf helen ross

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

patience kaylie patience madalyn thomas tommy tommy patience kamden helen

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

patience thomas patience helen kaylie thomas tommy yusuf madalyn jeramiah

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

ross jeramiah helen jeramiah tommy ross jeramiah yusuf kamden patience

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

madalyn ross yusuf tommy thomas tommy kaylie patience jeramiah yusuf

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

thomas helen kamden madalyn helen yusuf jeramiah helen patience patience

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

tommy ross kaylie ross thomas madalyn thomas yusuf helen ross

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

jeramiah kaylie ross patience ross yusuf kaylie madalyn tommy patience



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

patience kamden kaylie helen thomas kaylie helen kaylie tommy kamden