

African City Coordinates and Pronunciations

| City | Pronunciation | Country | Latitude/Longitude |
|-----------|------------------|---------|--------------------|
| Accra | | Ghana | 6° N, 0° |
| Bamako | | Mali | 13° N, 8° W |
| Dakar | | Senegal | 15° N, 17° W |
| Khartoum | kahr TOOM | Sudan | 16° N, 33° E |
| Kisangani | KEE suhn GAYN ee | Congo | 1° N, 25° E |
| N'Djamena | Ehn JAHM uh nuh | Chad | 12° N, 15° E |
| Timbuktu | | Mali | 17° N, 2° W |

Journey to Africa: Rainfall or Drought
Tables of monthly temperature and precipitation data for seven cities in Africa.

| ACCRA | | | | | |
|--|---------------------------|-----------------|----------------|----------------|-----------------------------|
| Based on readings for 17 years at 5°33' N, 0°12' W, altitude 27m/88ft. | | | | | |
| Month | Average Temperature in °C | | | | Average Precipitation in mm |
| | Average Maximum | Average Minimum | Record Minimum | Record Maximum | |
| January | 23 | 31 | 15 | 34 | 15 |
| February | 24 | 31 | 17 | 38 | 33 |
| March | 24 | 31 | 20 | 38 | 33 |
| April | 24 | 31 | 19 | 34 | 81 |
| May | 24 | 31 | 21 | 35 | 142 |
| June | 23 | 29 | 20 | 33 | 178 |
| July | 23 | 27 | 19 | 32 | 46 |
| August | 22 | 37 | 18 | 32 | 15 |
| September | 23 | 27 | 20 | 32 | 36 |
| October | 23 | 29 | 19 | 32 | 64 |
| November | 24 | 31 | 21 | 33 | 36 |
| December | 24 | 31 | 17 | 34 | 23 |

| BAMAKO | | | | | |
|--|---------------------------|-----------------|----------------|----------------|-----------------------------|
| Based on readings for 11 years at 12°39' N, 7°58' W, altitude 340m/1116ft. | | | | | |
| Month | Average Temperature in °C | | | | Average Precipitation in mm |
| | Average Maximum | Average Minimum | Record Minimum | Record Maximum | |
| January | 16 | 33 | 9 | 42 | 0 |
| February | 19 | 36 | 11 | 47 | 0 |
| March | 22 | 39 | 14 | 43 | 3 |
| April | 24 | 39 | 18 | 44 | 15 |
| May | 24 | 39 | 19 | 46 | 74 |
| June | 23 | 34 | 18 | 41 | 137 |
| July | 22 | 32 | 18 | 39 | 279 |
| August | 22 | 31 | 17 | 36 | 348 |
| September | 22 | 32 | 17 | 36 | 206 |
| October | 22 | 34 | 15 | 40 | 43 |
| November | 18 | 34 | 12 | 43 | 15 |
| December | 17 | 33 | 8 | 40 | 0 |

DAKAR

Based on readings for 16 years at 14°42' N, 17°29' W, altitude 40m/131ft.

| Month | Average Temperature in °C | | | | Average Precipitation in mm |
|-----------|---------------------------|-----------------|----------------|----------------|-----------------------------|
| | Average Maximum | Average Minimum | Record Minimum | Record Maximum | |
| January | 18 | 26 | 13 | 39 | 0 |
| February | 17 | 27 | 14 | 38 | 0 |
| March | 18 | 27 | 15 | 43 | 0 |
| April | 18 | 27 | 16 | 38 | 0 |
| May | 20 | 29 | 16 | 38 | 0 |
| June | 23 | 31 | 18 | 38 | 18 |
| July | 24 | 31 | 21 | 37 | 89 |
| August | 24 | 31 | 21 | 37 | 254 |
| September | 24 | 32 | 21 | 38 | 132 |
| October | 24 | 32 | 21 | 38 | 38 |
| November | 23 | 30 | 18 | 37 | 3 |
| December | 19 | 27 | 12 | 35 | 8 |

KHARTOUM

Based on readings for 46 years at 15°37' N, 32°33' E, altitude 390m/1279ft.

| Month | Average Temperature in °C | | | | Average Precipitation in mm |
|-----------|---------------------------|-----------------|----------------|----------------|-----------------------------|
| | Average Maximum | Average Minimum | Record Minimum | Record Maximum | |
| January | 15 | 32 | 5 | 40 | 0 |
| February | 16 | 34 | 7 | 44 | 0 |
| March | 19 | 38 | 9 | 45 | 0 |
| April | 22 | 41 | 12 | 47 | 0 |
| May | 25 | 42 | 16 | 47 | 3 |
| June | 26 | 41 | 19 | 48 | 7 |
| July | 25 | 38 | 18 | 47 | 53 |
| August | 24 | 37 | 18 | 43 | 71 |
| September | 25 | 39 | 16 | 45 | 18 |
| October | 24 | 40 | 17 | 45 | 5 |
| November | 20 | 36 | 13 | 42 | 0 |
| December | 17 | 33 | 7 | 40 | 0 |

KISANGANI

Based on readings for 9 years at 0°26' N, 25°14' E, altitude 418m/1370ft.

| Month | Average Temperature in °C | | | | Average Precipitation in mm |
|-----------|---------------------------|-----------------|----------------|----------------|-----------------------------|
| | Average Maximum | Average Minimum | Record Minimum | Record Maximum | |
| January | 21 | 31 | 17 | 36 | 53 |
| February | 21 | 31 | 18 | 36 | 84 |
| March | 21 | 31 | 17 | 36 | 178 |
| April | 21 | 31 | 18 | 35 | 158 |
| May | 21 | 31 | 18 | 34 | 137 |
| June | 21 | 30 | 18 | 34 | 114 |
| July | 19 | 29 | 17 | 33 | 132 |
| August | 20 | 28 | 17 | 33 | 165 |
| September | 20 | 29 | 17 | 34 | 183 |
| October | 20 | 30 | 18 | 34 | 218 |
| November | 20 | 29 | 18 | 35 | 198 |
| December | 20 | 30 | 16 | 35 | 84 |

N'DJAMENA

Based on readings for 5 years at 12°07' N, 15°02' E, altitude 295m/968ft.

| Month | Average Temperature in °C | | | | Average Precipitation in mm |
|-----------|---------------------------|-----------------|----------------|----------------|-----------------------------|
| | Average Maximum | Average Minimum | Record Minimum | Record Maximum | |
| January | 14 | 34 | 8 | 42 | 0 |
| February | 16 | 37 | 11 | 43 | 0 |
| March | 21 | 40 | 13 | 44 | 0 |
| April | 23 | 42 | 16 | 46 | 3 |
| May | 25 | 40 | 17 | 44 | 31 |
| June | 24 | 38 | 18 | 43 | 66 |
| July | 22 | 33 | 18 | 41 | 170 |
| August | 22 | 31 | 19 | 36 | 320 |
| September | 22 | 33 | 19 | 37 | 119 |
| October | 21 | 36 | 14 | 39 | 36 |
| November | 17 | 36 | 11 | 40 | 0 |
| December | 14 | 33 | 8 | 38 | 0 |

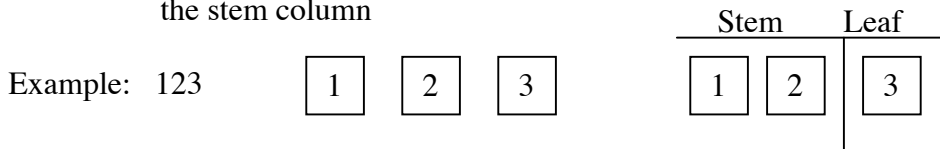
TIMBUKTU

Based on readings for 13 years at 16°46' N, 3°01' W, altitude 301m/988ft.

| Month | Average Temperature in °C | | | | Average Precipitation in mm |
|-----------|---------------------------|-----------------|----------------|----------------|-----------------------------|
| | Average Maximum | Average Minimum | Record Minimum | Record Maximum | |
| January | 13 | 31 | 5 | 39 | 0 |
| February | 14 | 34 | 6 | 42 | 0 |
| March | 19 | 38 | 9 | 46 | 3 |
| April | 22 | 42 | 14 | 48 | 0 |
| May | 26 | 43 | 19 | 48 | 5 |
| June | 27 | 43 | 20 | 48 | 23 |
| July | 25 | 39 | 19 | 48 | 79 |
| August | 24 | 36 | 19 | 44 | 81 |
| September | 24 | 39 | 20 | 46 | 38 |
| October | 23 | 40 | 17 | 45 | 3 |
| November | 18 | 37 | 8 | 43 | 0 |
| December | 13 | 32 | 6 | 39 | 0 |

Stem-and-leaf Instructions

- Explain to students that a stem-and-leaf chart is designed to show the actual data in the most condensed way possible. Tens and hundreds values are not repeated in the chart, but ones digits are. When writing a stem-and-leaf chart by hand, students do not need to put commas between digits.
- Students place post-it notes on stem-and-leaf chart.
- They should go to the chart in the order of the month they were assigned, but should try to place their numbers in ascending order.
- The digit in the ones place is placed in the leaf column. The tens and hundreds digits go in the stem column.



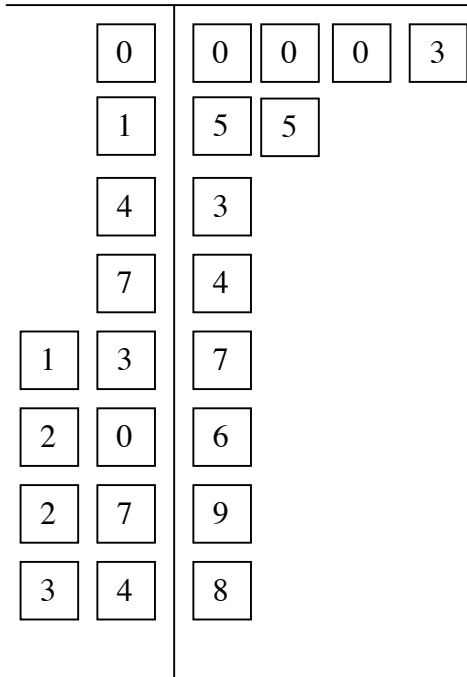
A. The first “draft” of the stem-and-leaf chart for Bamako’s rainfall data should look like this:

| Stem | | Leaf |
|------|---|------|
| 0 | 0 | 0 |
| 0 | 0 | 0 |
| 0 | 0 | 0 |
| 0 | 0 | 3 |
| 0 | 1 | 5 |
| 0 | 1 | 5 |
| 0 | 4 | 3 |
| 0 | 7 | 4 |
| 1 | 3 | 7 |
| 2 | 0 | 6 |
| 2 | 7 | 9 |
| 3 | 4 | 8 |

B. Next have a student for each group remove placeholder zeros in the hundreds place. It will look like this:

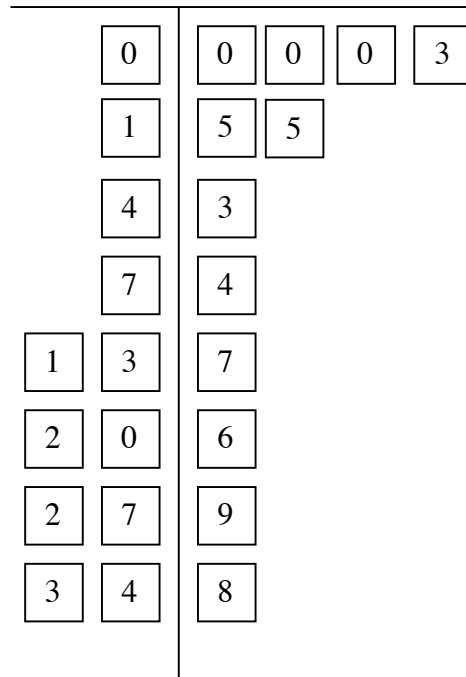
| | |
|---|---|
| 0 | 0 |
| 0 | 0 |
| 0 | 0 |
| 0 | 3 |
| 1 | 5 |
| 1 | 5 |
| 4 | 3 |
| 7 | 4 |
| 1 | 3 |
| 2 | 0 |
| 2 | 7 |
| 2 | 9 |
| 3 | 4 |

C. Have another volunteer move all ones digits for a given stem value onto the same line. The digits need to be in ascending order. Remove duplicate stems. The chart should look like this:



D. The final step is to make a key and title for the chart. Students can use any numbers they like for the key.

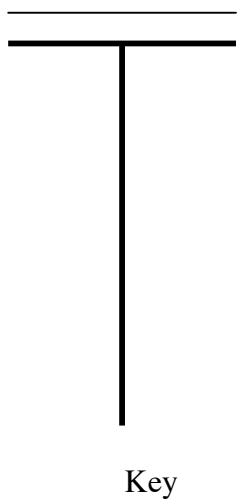
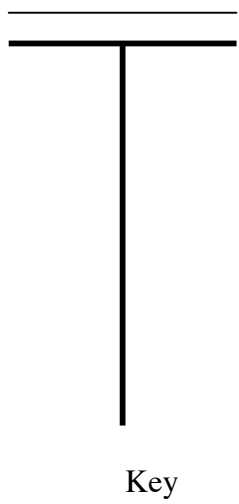
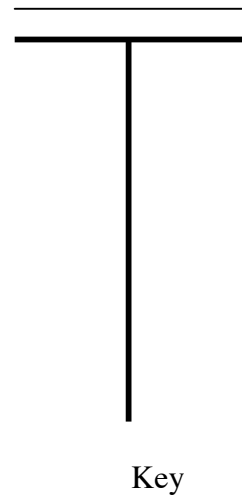
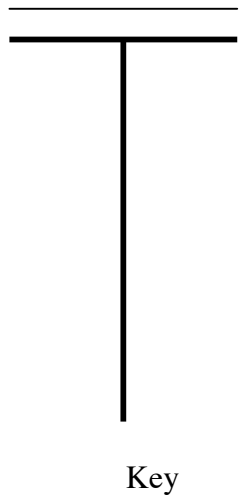
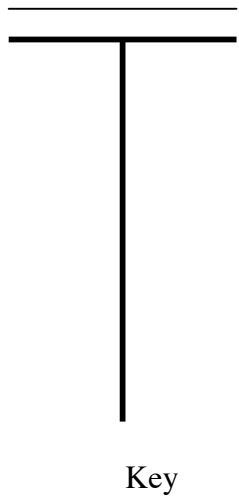
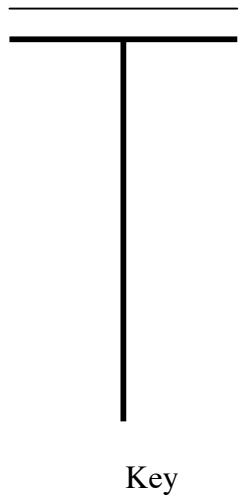
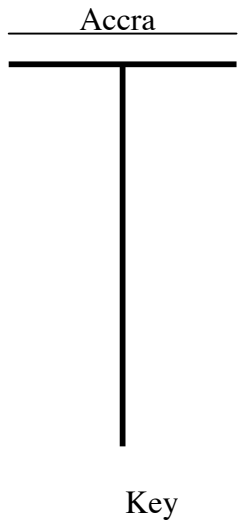
Bamako's Average Rainfall
over a 12 month period



Key 25 | 4 = 254

Name _____

Journey to Africa: Stem-and-Leaf Diagrams



Journey to Africa: Teacher Key to Stem-and-Leaf Diagrams

Accra

| | |
|----|---------|
| 1 | 5 5 |
| 2 | 3 |
| 3 | 3 3 6 6 |
| 4 | 6 |
| 5 | 6 |
| 6 | 4 |
| 8 | 1 |
| 14 | 2 |
| 17 | 8 |

Key 17|8 = 178

Bamako

| | |
|----|---------|
| 0 | 0 0 0 3 |
| 1 | 5 5 |
| 4 | 3 |
| 7 | 4 |
| 13 | 7 |
| 20 | 6 |
| 27 | 9 |
| 34 | 8 |

Key 34|8 = 348

Dakar

| | |
|----|---------------|
| 0 | 0 0 0 0 0 3 8 |
| 1 | 8 |
| 3 | 8 |
| 8 | 9 |
| 13 | 2 |
| 25 | 4 |

Key 1|8 = 18

Khartoum

| | |
|---|-------------------|
| 0 | 0 0 0 0 0 0 3 5 7 |
| 1 | 8 |
| 5 | 3 |
| 7 | 1 |

Key 5|3 = 53

Kisangani

| | |
|----|-----|
| 5 | 3 |
| 8 | 4 4 |
| 11 | 4 |
| 13 | 2 7 |
| 15 | 8 |
| 16 | 5 |
| 17 | 8 |
| 18 | 3 |
| 19 | 8 |
| 21 | 8 |

Key 2|18 = 218

N'Djamena

| | |
|----|-------------|
| 0 | 0 0 0 0 0 3 |
| 3 | 1 6 |
| 6 | 6 |
| 11 | 9 |
| 17 | 0 |
| 32 | 0 |

Key 6|6 = 66

Timbuktu

| | |
|---|-----------------|
| 0 | 0 0 0 0 0 3 3 5 |
| 2 | 3 |
| 3 | 8 |
| 7 | 9 |
| 8 | 1 |

Key 7|9 = 79

Questions and Answers about the Stem-and-Leaf Charts

Have students compare the stem-and-leaf charts for Khartoum, Kisangani, and N'Djamena.

Q: What is the range of monthly rainfall for these 3 cities?

Note: Range is the spread of the data. It can be reported as 2 numbers listed in a statement like 0 to 71 or it can be given as the difference of the 2 numbers (71).

A: Khartoum 0 to 71 (or 71)
Kisangani 53 to 218 (or 165)
N'Djamena 0 to 320 (or 320)

Q: Each line in a stem-and-leaf is an **interval**. The interval is named by the value in the stem column. What interval is represented the most for each of the 3 cities?

A: Khartoum: Ones (often called units in math terminology)
Kisangani: 80's and 130's
N'Djamena: Ones (often called units in math terminology)

Q: What are some observations they can make about the rainfall in these 3 cities?

A: Khartoum experiences 9 months with almost no rainfall. This is a dry place. Most of the rainfall occurs in 2 months, but even so, the wettest months in Khartoum are about equal to the driest months in Kisangani.

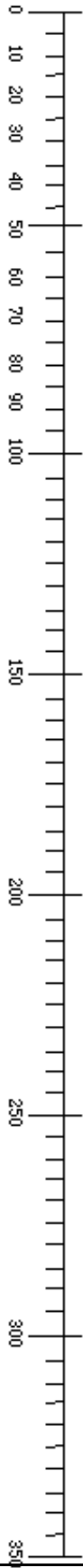
Kisangani gets some rainfall every month of the year. However, its wettest month is less than that of N'Djamena.

N'Djamena has 6 months with almost no rainfall and then a month where it gets more than Kisangani.

Q: Do students find these types of charts easier to use for comparing data than the original data table? Why? Why not?

A: Answers will vary.

Accra



Bamako



Dakar



Khartoum



Kisangani



N'Djamena



Timbuktu



Box-and-Whisker Answer Keys

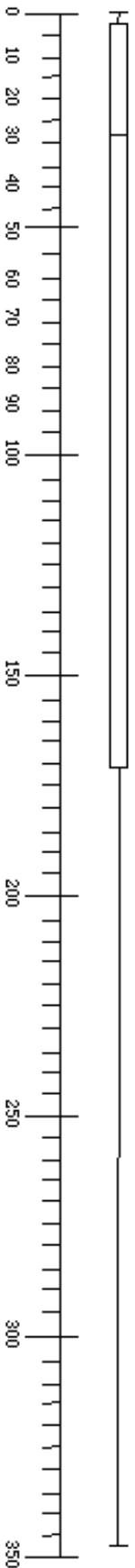
Accra

15, 15, 23, 33, 33, 36, 36, 46, 64, 81, 142, 178
 $LE = 15$, $LQ = (23 + 33)/2 = 28$, $M = 36$, $UQ = (64 + 81)/2 = 72.5$, $UE = 178$



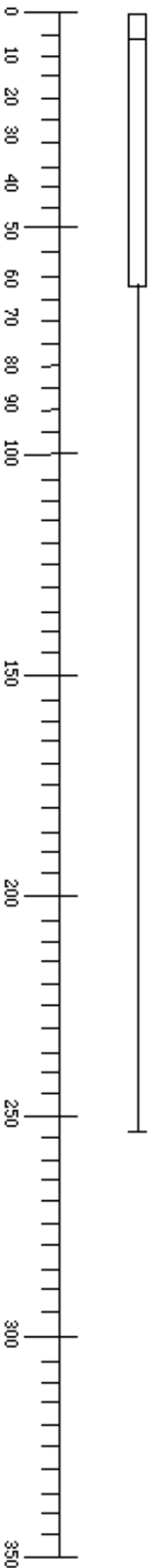
Bamako

0, 0, 0, 3, 15, 15, 43, 74, 137, 206, 279, 348
 $LE = 0$, $LQ = (0 + 3)/2 = 1.5$, $M = (15 + 43)/2 = 29$, $UQ = (137 + 206)/2 = 171.5$, $UE = 348$



Dakar

0, 0, 0, 0, 3, 8, 18, 38, 89, 132, 254
 $LE = 0$, $LQ = 0$, $M = (3 + 8)/2 = 5.5$, $UQ = (38 + 89)/2 = 63.5$, $UE = 254$



Khartoum

0, 0, 0, 0, 0, 3, 5, 7, 18, 53, 71
 $LE = 0$, $LQ = 0$, $M = (0 + 3)/2 = 1.5$, $UQ = (7 + 18)/2 = 12.5$, $UE = 71$



Kisangani

53, 84, 84, 114, 132, 137, 158, 165, 178, 183, 198, 218

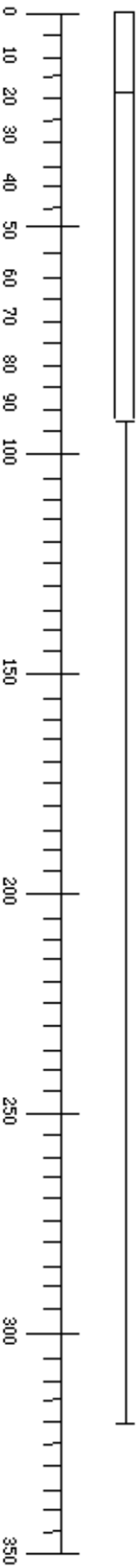
LE = 53, LQ = $(84 + 114)/2 = 99$, M = $(137 + 158)/2 = 147.5$, UQ = $(178 + 183)/2 = 180.5$, UE = 218



N'Djamena

0, 0, 0, 0, 0, 3, 31, 36, 66, 119, 170, 320

LE = 0, LQ = 0, M = $(3 + 31)/2 = 17$, UQ = $(66 + 119)/2 = 92.5$, UE = 320



Timbuktu

0, 0, 0, 0, 0, 3, 3, 5, 23, 38, 79, 81

LE = 0, LQ = 0, M = 3, UQ = $(23 + 38)/2 = 30.5$, UE = 81



Analysis Questions on Box Plot

1. Which city shows the greatest range of precipitation in mm?
2. Which city has the highest median?
3. A. Which four cities have the driest months?

B. The 4 cities in question 3 with the driest months are located in what latitudes?
4. Which cities have no whisker at all on lower quartile?
5. Which cities have a large whisker on the upper quartile?
6. Which city is closest to the equator?
7. Which city is the farthest away from the equator?
8. Compare the city nearest the equator and farthest away from the equator. What can you say about the rainfall?
9. Which cities are located in the Sahel?

Analysis Questions on Box Plot KEY

1. Which city shows the greatest range of precipitation in mm? *Bamako*

2. Which city has the highest median? *Kisangani*

3. A. Which four cities have the driest months?

N'djamena, Dakar, Khartoum, and Timbuktu

B. The 4 cities in question 3 with the driest months are located in what latitudes?

12N, 15 N, 16 N, 17N

4. Which cities have no whisker at all on lower quartile?

N'djamena, Dakar, Khartoum, and Timbuktu

5. Which cities have a large whisker on the upper quartile?

N'djamena, Bamako, Dakar

6. Which city is closest to the equator? *Kisangani*

7. Which city is the farthest away from the equator? *Timbuktu*

8. Compare the city nearest the equator and farthest away from the equator. What can you say about the rainfall?

The equator has more rainfall all year around.

9. Which cities are located in the Sahel?

N'djamena, Bamako, Dakar, Khartoum, and Timbuktu