

# Teacher Instructions: Wrist Circumference

**Grade Level:** K - 2

**Task:** Wrist Circumference

**Standard:** Data Analysis, Statistics, and Probability

**Task Scenario:** Students will be instructed to measure and record the circumference of their own wrists. They will then record the measurements of five other students' wrists. Students will then make a graph of the five wrist measurements. They will use this data to predict the circumference of that of a peer's wrist. Students will then ask three more students for their measurements and record them. They will then compare their prediction to these results.

➤ See Student Task for student pages.

## Teacher Notes:

- With very young students, the teacher can modify this task by having the students complete Steps 1 and 2. During the student presentations, the teacher can extend the task by having students making the predictions in Steps 3 and 4.
- Choose centimeter graph paper for students to record their data. Students may see a connection between the length of the bar graph and the actual length of the student's wrist. As a task extension, have students verify the relationship.

**Context – From the Task Author:** Our class had only done non-standard measurement up to this point. It was an opportunity to pre-assess students' ability to use a tape measure, their understanding of measurement, and familiarity with numbers.

## What the task accomplishes...

- This activity highlighted each student's understanding of measurement, average, number direction, and place value. I was made aware of their comfort with numbers in the teens.
- Each student's ability to make and justify a reasonable prediction, compare and contrast, reason and communicate became clear.

## What students will do...

- Some students will:
  - ❑ Have difficulty with place value and number formation.
  - ❑ Be reversed (direction and order).
  - ❑ Struggle to organize the recording of initials, numbers, and information on the graph.
  - ❑ Be able to record all of the information in the right places on the graph and lines in a clear and organized manner.
  - ❑ Interpret largest and smallest as "highest" and "lowest" on the page.
  - ❑ Use a variety of ways to record their information on the graph (color in the block, make check marks, dots and/or designs).
  - ❑ Forget to write "cm" after each number.
  - ❑ Not understand the connection between measurements of wrists and the numbers on the y - axis of the graph.
  - ❑ Base their prediction on their own measurement.

- ❑ See a trend in the results and base their prediction on that.
- ❑ Be able to describe the idea of average in their own words.
- ❑ Randomly give a number.
- ❑ Choose a name of some student they know in our class or another class and make a random guess about her/his wrist.
- ❑ Be able to guess without being influenced by their own result and focus more on the majority of the results so far.

**Time Required:** This task should take about an hour, which can be done over two days. One day to collect and record the data and one day to present their results and graphs to the class.

**Interdisciplinary Links:**

**Social Studies** - Measuring could be extended to other body parts including weight and height. The results could be compared to other cultures with different eating habits, resources, and values. The required interaction for students gives them the opportunity to learn the first and last names of all the children in the group. Because they are required to interact, they are all more tolerant and receptive to others.

**Reading** - Rereading directions I have read to them reinforces word and letter recognition, and sound/letter connection for initial consonants.

**Writing** - Recording numbers and initials. Sound/letter connection. They listen to themselves say the first and last names, hear the initial sound and record the letter. Using the abbreviation "cm" for centimeter.

**Science** - This could be linked to a study of the human body and to growth and development.

**Teaching Tips...**

- Briefly discuss the idea of measurement (inches, feet, miles, kilometers, centimeters, pounds, etc.) Show them the tape measure and one centimeter. Compare it to the inch on the other side.
- My students have had experience with whole class graphs made horizontally and vertically.
- Before they started, we measured, recorded and graphed the circumference of several kids' other body parts to show different ways to record centimeters (check marks, color the square, draw stars, or anything else they can come up with). After they watched how I measured, each one read the centimeters measured on the measuring tape.
- I recommend working with 8-12 kids at a time. It would be ideal if there is a way to have some or half of your students go to recess and/or do another special activity while you work with the remaining students.
- Originally I planned to have students find the circumference of their heads, but the lice issue that has been a problem in the past scared me off. It worked out well to do wrists since it gave students practice with reading, writing and saying numbers in the teens.
- The biggest surprise, and the best part of this problem for me, was to see a wide variety of children speaking directly to one another, looking one another in the eye, and listening to one another so respectfully. It reminded me of how important it is to

have activities that require students to ask each other questions, as well as respond to questions. The practice with their names and initials required lots of checking and rechecking with one another. The bonds deepened in our class that day, which improved student respect for each other.

**Suggested Materials:** One tape measure for 1-3 students, worksheets, graph paper and pencils.

**Possible Solution...**

Results vary depending on measurement results. Most children will measure between 12-20 cm. The highest measurement in our class was 17 cm and the lowest was 13 cm. More people had 13 cm.

**Teacher Note:** The worksheets were reformatted for this task, so the student work presented here looks slightly different.

**Benchmark Descriptors:**

- The benchmark descriptors and rubric are designed to help the teacher analyze student thinking and understanding at each of the four performance levels.
- The descriptors are generalizations of what student work could look like.
- It is not possible to anticipate every answer a student can give, so in scoring student work the teacher must use these generalizations to come to their own conclusions as to where a student is performing on the assessment.
- It is recommended that teachers create their own task specific rubric by listing the specific math skills that would make up each section of the four performance levels.

**Novice**

- ✓ There is no evidence of mathematical reasoning in these students' predictions and explanations.
- ✓ The explanations were unrelated to the problem.
- ✓ They gave random numbers as predictions and didn't seem to understand the idea of guessing without knowing who would provide the next measurement.

**Apprentice**

- ✓ These students didn't understand all of the steps of this problem.
- ✓ Some weren't able to record the data on the graph. Some students were able to make a reasonable guess, but couldn't explain why they chose the numbers they did.
- ✓ There is some evidence of mathematical reasoning, but these students could not completely carry out mathematical procedures. Some parts of the problem are not understood, but some of the steps reflect some understanding and some correct use of mathematical representation.

**Practitioner**

- ✓ These solutions show that the students have a broad understanding of all the steps to the problem.
- ✓ Their graphs were accurate and their predictions reasonable and clearly justified.
- ✓ There is a clear explanation and evidence of effective mathematical reasoning.

**Expert**

- ✓ These solutions show that the students fully understand the problem.

- ✓ These students' explanations reflect their refined reasoning skills.
- ✓ They initiate connections to other problems and/or explore the concepts of the problem beyond what the task required.
- ✓ The explanations detail the reason for the student's prediction so that the reader does not need to infer how and why decisions were made.

### **APS Mathematical Standards...**

- ❖ **The math standards stated for this task are aligned to the APS Draft Standards 2000.**

**Data Analysis, Statistics, and Probability:** Learners will identify patterns and special features of data and events of chance through experiences with meaningful mathematical problems while focusing on comparing, predicting, representing data, and making decisions to communicate mathematical understanding.

#### **Kindergarten:**

Statistics: Organize and make sense of data.

- **Collect** information through counting and tallying.
- **Describe, sort, and classify** objects or information using representations.
- **Organize and represent** categorical data.
- **Answers questions and interprets** information based on simple graphs and surveys prepared by students.

Probability: Explore and make predictions based on patterns.

- **Make** predictions based on familiar situations and relate to the concept of chance.

#### **First Grade:**

Statistics: Collect and use data from classroom situations.

- **Conduct** simple statistics experiments.
- **Compare** different ways of sorting, organizing, and representing the same data.

Probability: Explore, describe, and make predictions based on patterns.

- **Describe** regularly occurring patterns in nature and in daily routines.

#### **Second Grade:**

Statistics: Collect, organize, and use data from classroom situations.

- **Conduct** a simple experiment which includes **identification** of a problem, **planning** data analysis, **collecting** and **recording** data using pictorial and symbolic graphs and charts, **describing** and **interpreting** data, and **developing** hypotheses and theories based on the data.
- **Identify** range and unusual data points.

# Benchmark Papers

NOVICE

## Circumference Problem November, 1996

Name: \_\_\_\_\_

1. The circumference of my wrist is 13cm.
2. The **largest** wrist is 14cm.
3. The **smallest** wrist is 17cm.
4. Here is a graph to show your results.

Student confuses "largest" and "smallest"

# NOVICE

## Circumference

Name: \_\_\_\_\_

Record the circumference of five people's wrists:

Name	Circumference
CK	14 cm
HL	14 cm
MSG	11 cm
GA	13 cm
KH	13 cm

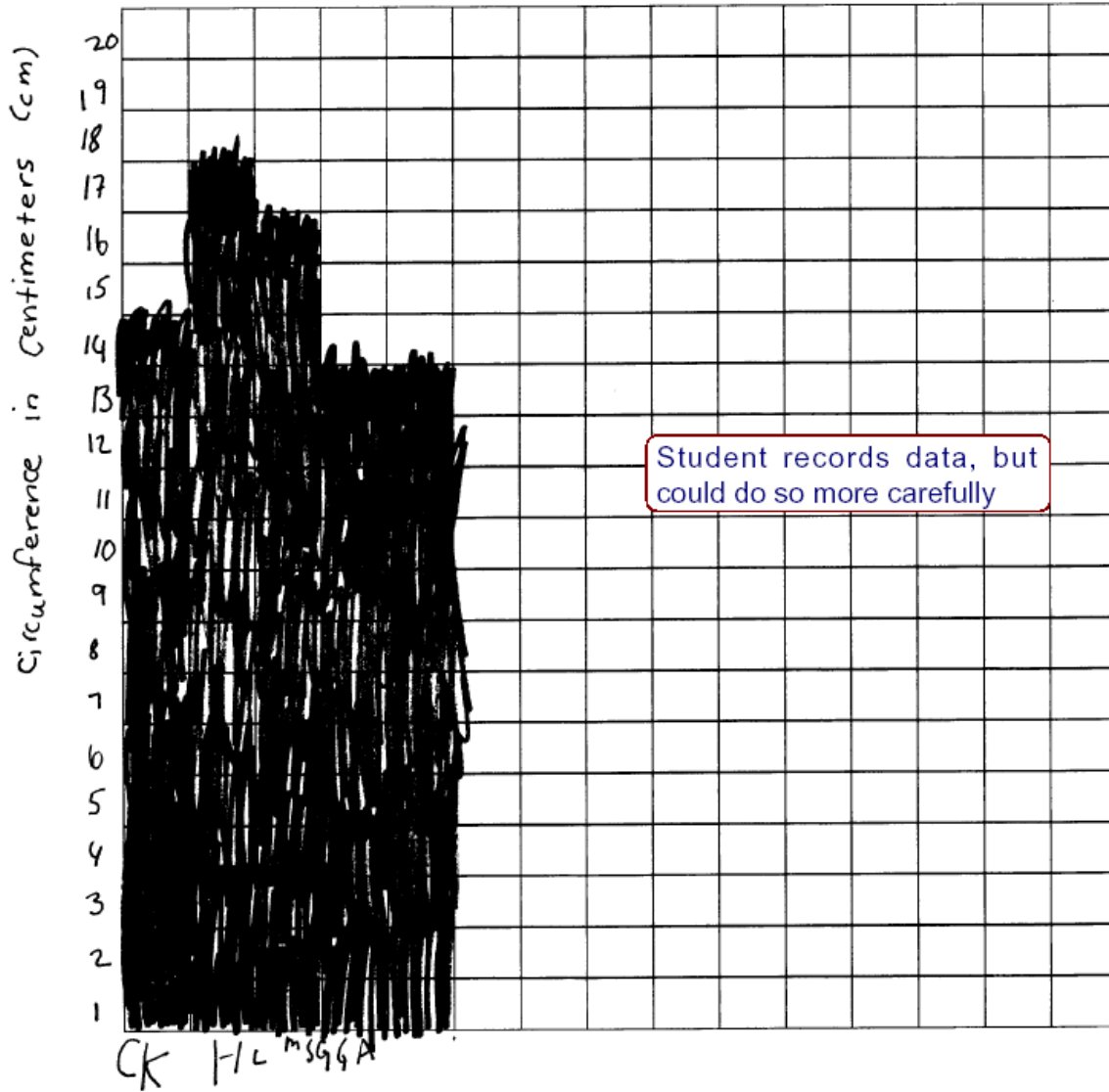
The next three

Student does not complete this part of the task

RKH / AI  
LMI

Student accurately records data here with correct labels

# NOVICE



## NOVICE

### Circumference Problem November, 1996

Name: \_\_\_\_\_

1. The circumference of my wrist  
is 14CM.

This conclusion is not reasonable based on data collected

2. The **largest** wrist is 11CM.

3. The **smallest** wrist is 13CM.

4. Here is a graph to show your  
results.

Student lacks mathematical reasoning

# APPRENTICE

## Circumference

Name: \_\_\_\_\_

After measuring and recording the wrist circumference of some children in the class, I predict that one of the next three wrists I measure will be 22cm because

Will's arm is 22 because he is big.

T: What if I didn't choose Will?

B: 6cm

Student accurately summarizes data. Student has difficulty writing 7's

# APPRENTICE

Student labels work and organizes information

Circumference

Name: \_\_\_\_\_

Record the circumference of five people's wrists:

Name

H L	X
B G	X
M S G	X
A B	X
G A	X

Circumference

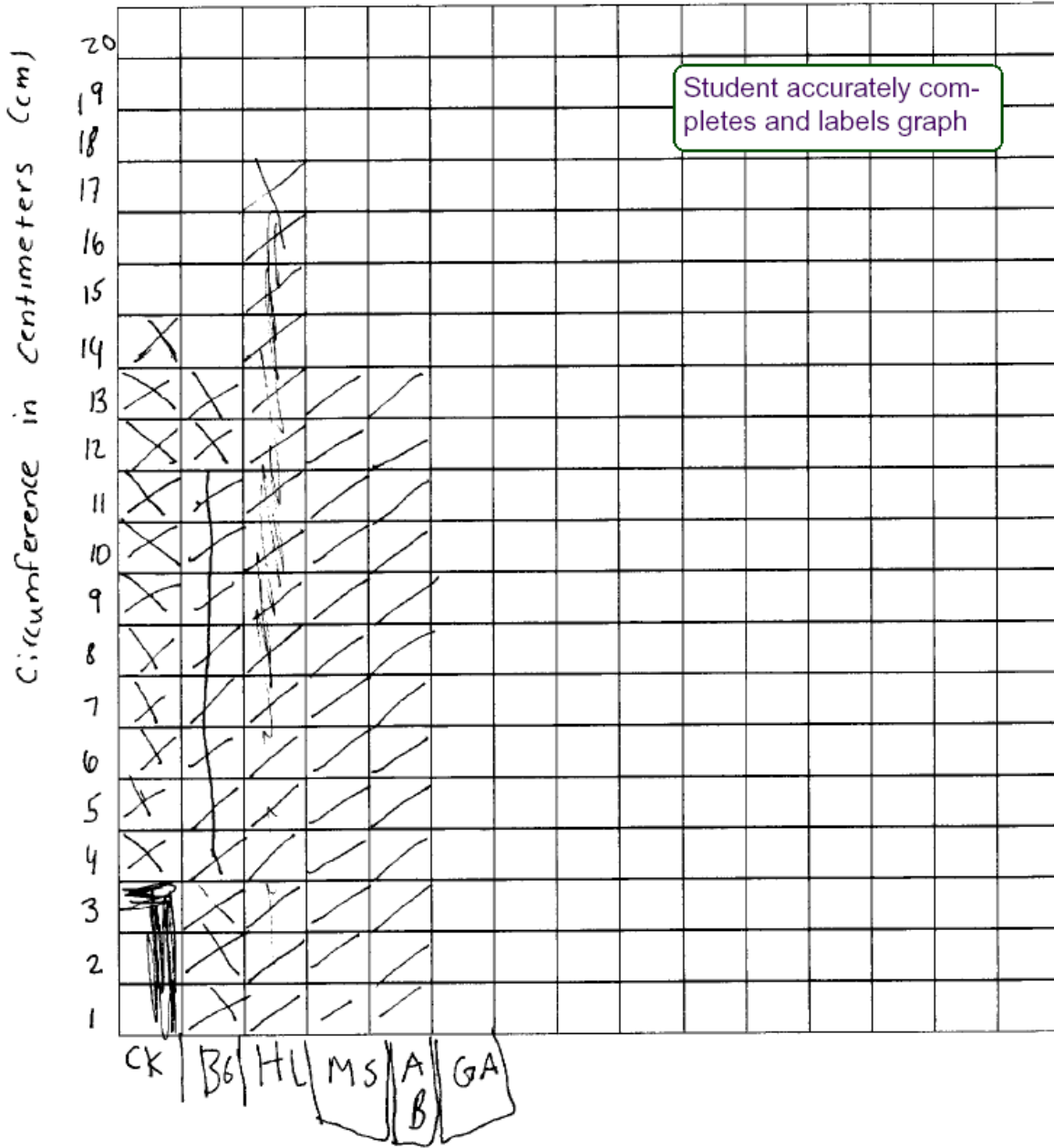
11 CM	X
13 CM	X
16 cm	X
13 CM	X
13 CM	X

The next three

R J	X
S O	X
M F	X

13 CM	X
13 cm	X
14	X

# APPRENTICE



## APPRENTICE

### Circumference

Name: \_\_\_\_\_

After measuring and recording the wrist circumference of some children in the class, I predict that one of the next three wrists I measure will be

13cm because

I wouldn't exactly know.

That's what it looks like to  
me. When people were making  
game bags. I looked at their  
wrists.

Student is unable to use results to base conclusion

# PRACTITIONER

## Circumference Problem November, 1996

Name: \_\_\_\_\_

1. The circumference of my wrist is 14 CM.
2. The **largest** wrist is 17 CM.
3. The **smallest** wrist is 13 CM.
4. Here is a graph to show your results.

Student accurately summarizes data

# PRACTITIONER

## Circumference

Student has difficulty organizing and recording data

Name: \_\_\_\_\_

Record the circumference of five people's wrists:

Name

Circumference

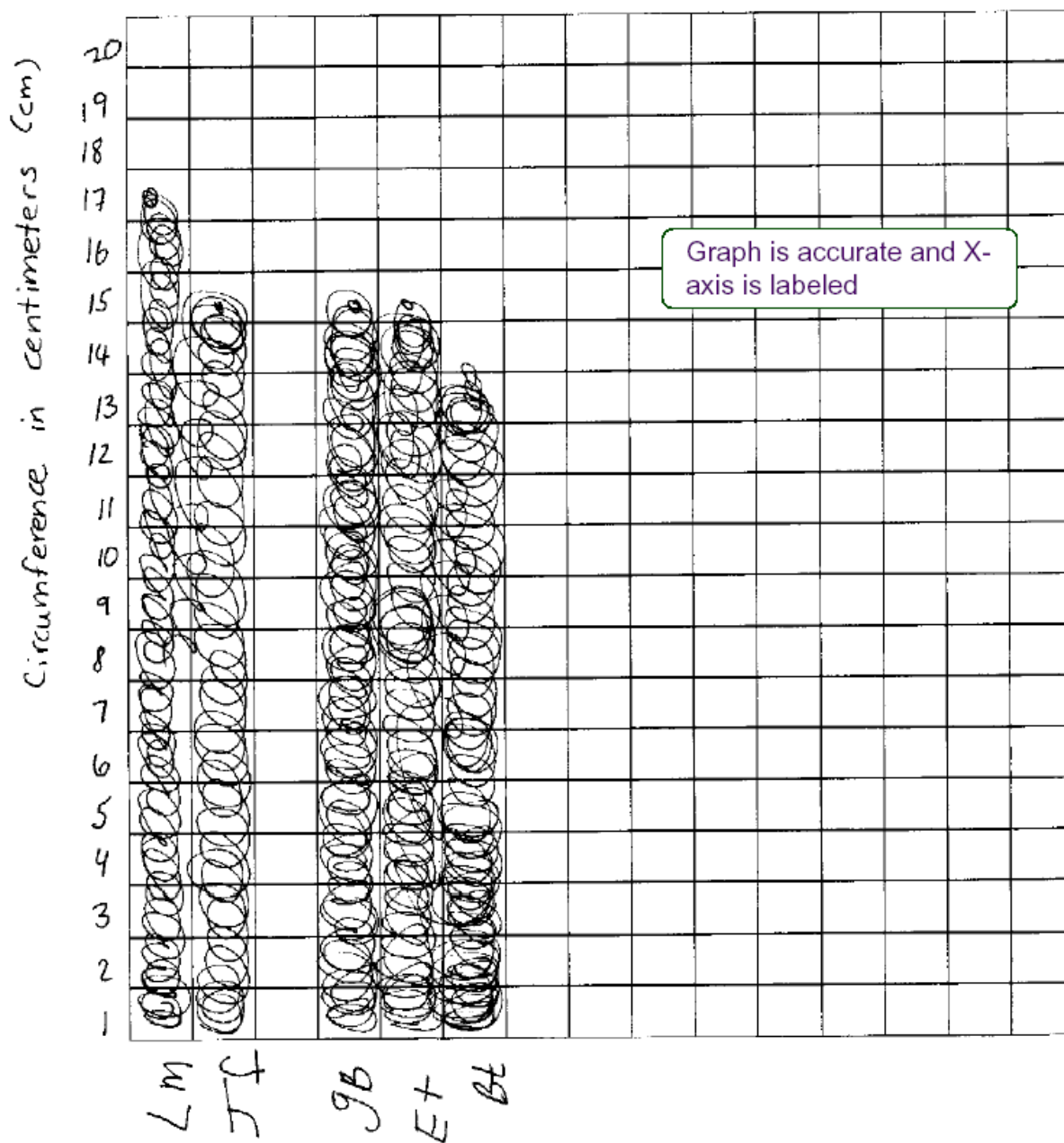
grace 14 cm	
JEL 14 cm	L 4 17 CM
BETH 13 cm	
_____	_____
_____	_____

The next three

Jo 13 cm	
R + 13 cm	RS 13
_____	_____
_____	_____

Student uses abbreviation for centimeter

# PRACTITIONER



# PRACTITIONER

## Circumference

Name: \_\_\_\_\_

After measuring and recording the wrist circumference of some children in the class, I predict that one of the next three wrists I measure will be 13 cm because

a lot of people had 13

Student makes a basic and accurate mathematical conclusion based on the mode

## EXPERT

### Circumference Problem November, 1996

Name: \_\_\_\_\_

1. The circumference of my wrist is   81   CM.
2. The **largest** wrist is   71   CM.
3. The **smallest** wrist is   51   CM.
4. Here is a graph to show your results.

Student has difficulty  
writing numbers correctly

# EXPERT

## Circumference

Name: \_\_\_\_\_

Record the circumference of five people's wrists:

Name	Circumference	
41 A BBKCM	41 CM	AB
IT CM Luke	17 CM	LM
Robbie	51 CM	RS
<sup>RT</sup>	81 CM	RT
ABBY	41 CM	AB

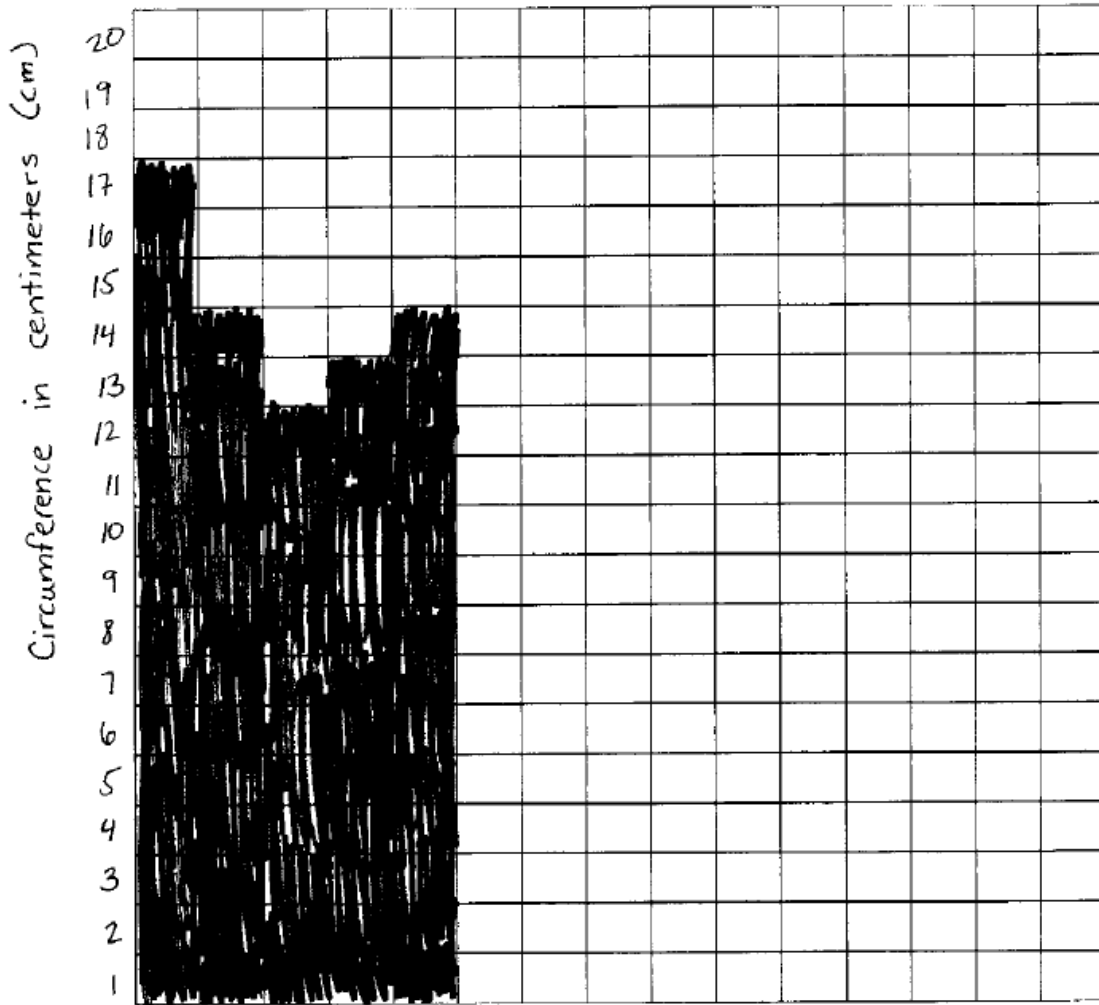
## The next three

BG	CM
CK	41 CM
BG	81 CM

Student labels measurements with abbreviations

Student accurately records information

# EXPERT



A B L M R

Student accurately completes graph and labels X-axis

## EXPERT

### Circumference

Name: \_\_\_\_\_

After measuring and recording the wrist circumference of some children in the class, I predict that one of the next three wrists I measure will be

at least 14 cm because

14 or less

mine was 13 AB was 13.

LM was 17 so somewhere

in between. It would be in the

teen unless it was a teacher.

Student makes a mathematically relevant comment

Student makes a conclusion based on data gathered