

# 4.MD Who is the tallest?

Alignments to Content Standards: 4.MD.A.1

## Task

Mr. Liu asked the students in his fourth grade class to measure their heights. Here are some of the heights they recorded:

Student	Height
Sarah	50 inches
Jake	$4\frac{1}{4}$ feet
Andy	$1\frac{1}{2}$ yards
Emily	4 feet and 4 inches

List the four students from tallest to shortest.

## IM Commentary

This task provides a context for translating between different units. While there are in principle multiple approaches (using each of the different units for measurement), the 4.MD.1 standard calls for converting a larger unit to a smaller unit. Students who convert all of the heights to inches are meeting the expectations of the standard, and students solving it in other ways are exceeding the expectations of the standard.

The heights for Sarah and Emily are presented in the most familiar way. Jake's height

has not been listed in the usual way, but if he knows that  $\frac{1}{4}$  of a foot is three inches, he might list his height this way, especially if encouraged to do so. If the teacher prefers, Andy's height can be presented as 1 yard and 18 inches: the idea is that Andy used a yardstick to measure his height and he might record this as  $1\frac{1}{2}$  yards or as 1 yard and 18 inches (or even as 1 yard, 1 foot, and 6 inches!). The teacher may prefer one of these measurements or may wish to add more data to the list and use multiple representations of the same height.

Note that in Grade 4 students are not multiplying whole numbers by fractions. However, they can reason using a ruler or a number line that  $\frac{1}{4}$  a foot is three inches and that  $\frac{1}{2}$  a yard is 18 inches.

If the teacher wishes for a more interactive version of this task, students could be asked to measure each others' heights. It is unlikely that they would all report their heights using the same units, and if the teacher wishes to stress fractions, she could explicitly suggest or instruct some students to use this approach. The teacher can also encourage different ways of reporting measurements by providing students with different tools such as yard sticks, tape measures, and rulers.

One good aspect to using actual student heights is that then the students can readily check whether or not the answers they have gotten by converting are accurate. It is important at all ages for students to be able to relate the mathematics that they are doing to an explicit context. This is an important part of MP2, Reason Abstractly and Quantitatively.

[Edit this solution](#)

## Solution

To compare the measurements we convert them to inches. For this we need to know that there are 12 inches in a foot and 3 feet in a yard. So there are  $3 \times 12 = 36$  inches in a yard.

Sarah's height is already in inches. Jake's height is  $4\frac{1}{4}$  feet. This is the same as  $4 + \frac{1}{4}$  feet. Since there are 12 inches in a foot, there are  $4 \times 12 = 48$  inches in 4 feet, and 3 inches in a  $\frac{1}{4}$  foot. So Jake's height in inches is  $48 + 3 = 51$  inches.

For Andy we have seen that there are 36 inches in a yard, so there are 18 inches in half

a yard, so in inches Andy's height is  $36 + 18 = 54$ .

Finally Emily is 4 feet and 4 inches tall. There are  $4 \times 12 = 48$  inches in 4 feet, so Emily is  $48 + 4 = 52$  inches tall.

The table shows all the heights in inches, in decreasing order.

Student	Height in Inches
Andy	54
Emily	52
Jake	51
Sarah	50



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