

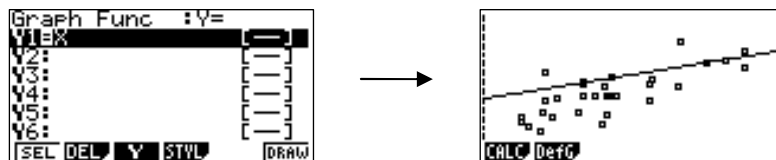


# Obesity – a global epidemic

## Checkpoints

5. Due to the generally linear shape of the scatter plot there seems to be some degree of linear correlation between percentage body fat and BMI. Whether or not this linear correlation represents *equality*, i.e. the linear relationship  $\text{percentage body fat} = \text{BMI}$ , is unclear from the graph above.

One very useful way to investigate this question further is to draw the line  $y=x$  on the scatter plot. This can be done using the DefG **F2** command



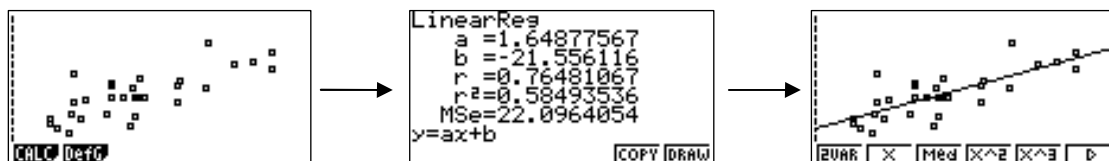
The fact that the line  $y=x$  does not represent the shape apparent in the scatter plot suggests that the relationship of equality does not exist between BMI and percentage body fat.

6. The number of points *beneath* the line  $y=x$  in the lower BMI region (left hand side of the graph) shows that, for individuals with a low BMI, BMI frequently *over predicts* percentage body fat. The closer proximity of points to the line  $y=x$  for larger BMI values suggests that, for individuals with larger BMI's, their BMI's are a better estimate of percentage body fat.


### Activity 3: Doing better than $\text{percentage body fat} = \text{BMI}$

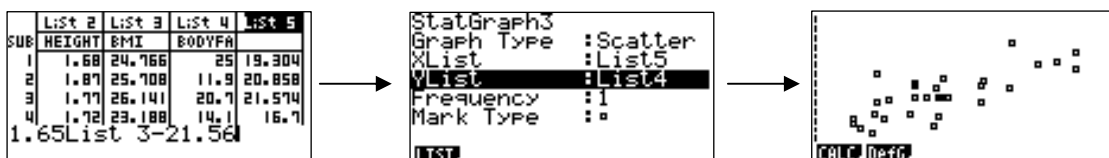
#### Answers

1. Choosing a linear algebraic model, because of the generally linear shape of our scatter plot, the co-efficients of this model can be found by pressing CALC **F1** then  $\times$  **F2** then DRAW **F5**, to confirm the model's fit.



This linear relationship,  $\text{percentage body fat} = 1.65 \times \text{BMI} - 21.56$ , fits the data that we have used much better than the idea that  $\text{percentage body fat} = \text{BMI}$ .

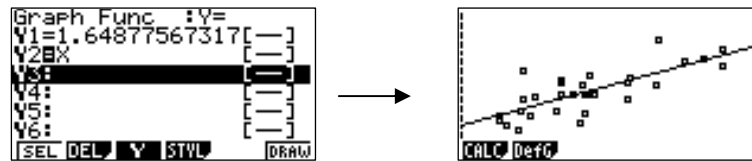
This can be confirmed in  mode by generating a series of values and by drawing a scatter plot of these new values against percentage body fat, as seen below



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This scatter plot is best understood by once again adding the line  $y=x$



The degree to which the shape of the new scatter plot follows the line  $y=x$  suggests that the new rule,  $\text{percentage body fat} = 1.65 \times \text{BMI} - 21.56$ , is the best rule linking percentage body fat and BMI. However, there is a significant degree of variation either side of the line  $y=x$ . In other words, there is a significant degree of variation in percentage body fat that cannot be attributed to the new rule. This variation could be caused by factors like fitness level and body type, factors that are not incorporated into the BMI calculation but obviously have a bearing on percentage body fat. It should be noted that this variation is less for individuals with higher percentage body fat, making judgments using BMI-based rules more appropriate in cases of excess weight and obesity. At best, however, a BMI-based calculation can only provide a warning sign of weight problems. A more detailed analysis of an individual's percentage body fat, and of the potential health implications, should then be undertaken by a health care professional.