

# FIFA World Cup 2010

## Teacher Answers



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TI-Nspire CAS



Investigation



Student



90min

## Aim

To compare the height, weight, age and field positions of all football players from the 32 teams which participated in the 2010 FIFA World Cup in South Africa.

## Equipment

For this activity you will need:

- TI-Nspire CAS
- TI-Nspire CAS file: FIFA World Cup 2010

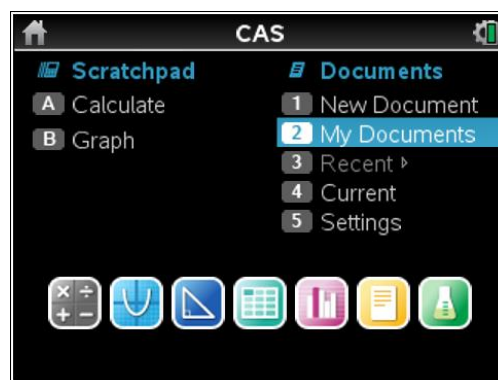
## Problem Description

The data consists of 32 teams and each team contains 23 players. Data includes country of origin, allocated group (A, B, C, D, E, F, G and H) player's position (forward, midfielder, defender and goalkeeper), weight in kilograms, height in centimetres and age in years. The data is contained in Lists & Spreadsheet page.

## Technology

This activity requires access to the "FIFA World Cup 2010" TI-Nspire document. This document should be loaded on your device before proceeding.

Once the document is on your handheld, press **home** and select **My Documents**. Locate the "FIFA World Cup 2010" document and press **enter** to open.



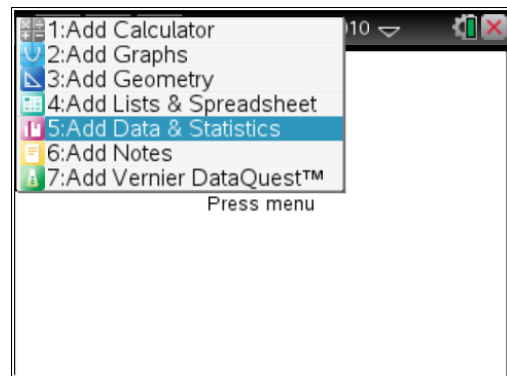
Navigate to page **1.3** (shown opposite). Use the arrow keys to scroll across to view the column headings or down to view the data.

A	B height	C weight
1		
2	uruguay	
3	Juan Castillo	181
4	Martin Silva	187
5	Néstor Muslera	190

## Drawing a boxplot

### Step 1

Press **home** or **ctrl + I** and select **Add Data & Statistics** to insert a new page.



All of the data points should appear on the screen.

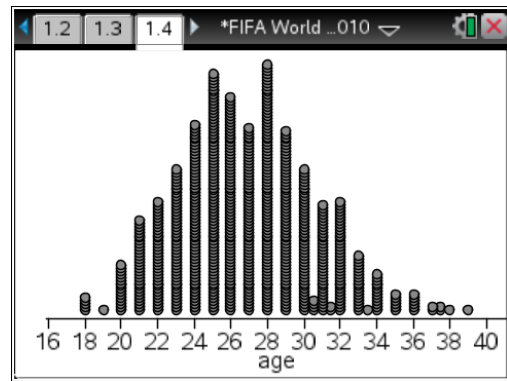


### Step 2

Press **tab** or use the **mouse** to highlight list of variables for the horizontal axis. Select **age**.

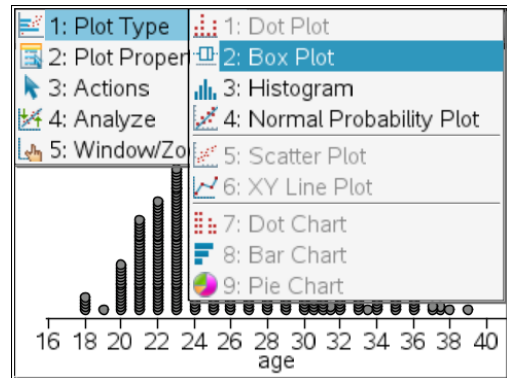


A dot plot of the data will appear.

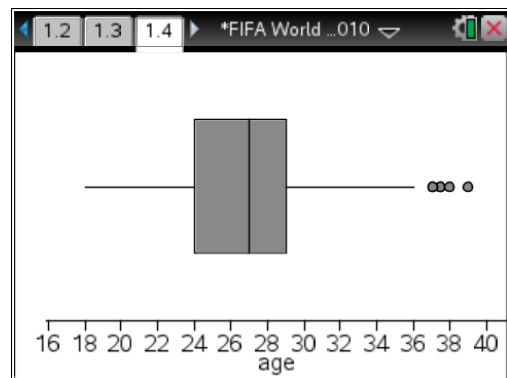


**Step 3**

Press **menu > Plot Type > Box Plot**.



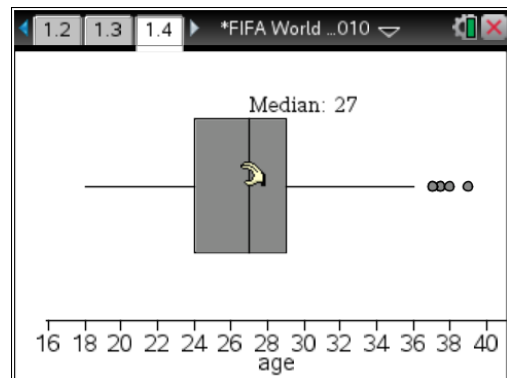
A box plot of the data will appear.



**Step 4**

Move the cursor over the box plot to determine the five summary points.

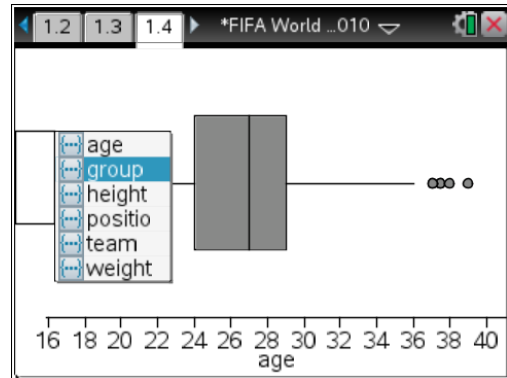
- $Q_1$  – minimum
- $Q_1$  – lower quartile
- $Q_2$  – median
- $Q_3$  – upper quartile
- $Q_5$  – maximum



## Drawing multiple boxplots

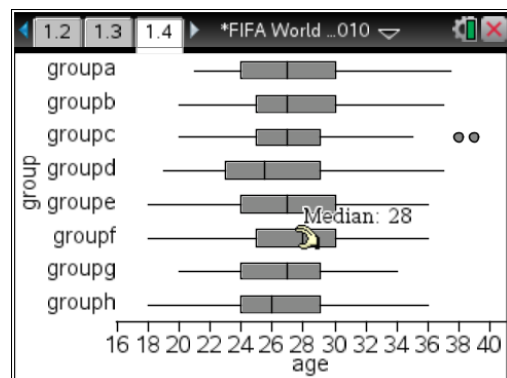
### Step 1

Press **tab** or use the mouse to display the variables for the vertical axis. Select **group**.



### Step 2

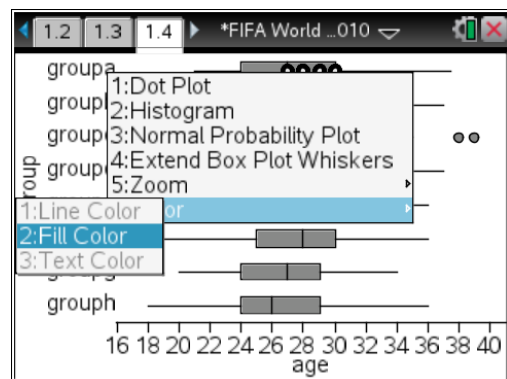
Multiple box plots for the groups will appear. To determine a median for a group, move the mouse and hover over the middle of the box for that group. For example group F has a median age of 28 years.



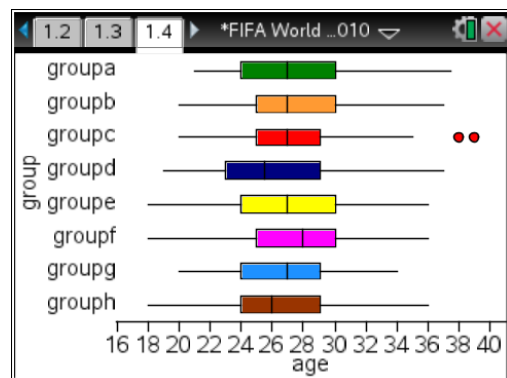
### Optional

To display a box plot in colour on a CX, place the cursor over the box plot and press **ctrl + menu > Color > Fill Color\***. Select a colour from the palette.

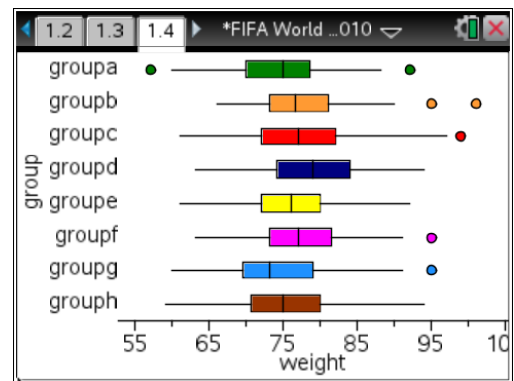
\* On a Clickpad or Touchpad, this command provides a range of grey scale options to select from.



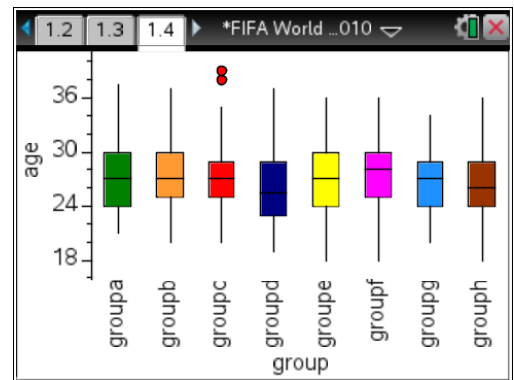
For the remainder of this activity, we will use coloured box plots. In black and white, these will appear in grey scale.



To compare the weight for each group, select **weight** on the horizontal axis.



To display the box plots vertically, change the vertical axis to **age** (or **weight**) and the horizontal axis to **group**. If the box plots don't automatically change, press **menu > Plot Type > Box Plot** again.

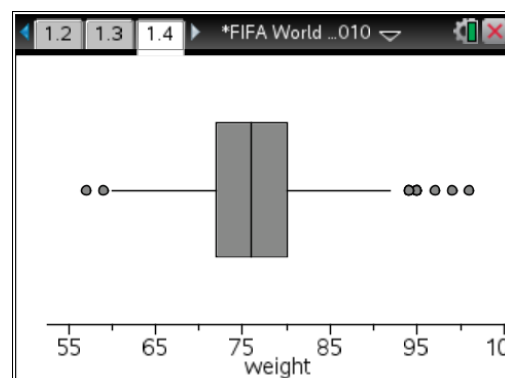


Note – There are six categories available in the Lists & Spreadsheet page 1.3. Three are numerical lists (height, weight and age) and three are categorical lists (position, team and group). To draw multiple box plots, select from the numerical list for one axis and select from the categorical list for the other axis.

### Questions

1. Draw a boxplot which represents the weight of all footballers in the FIFA World Cup.
  - a. What is the median weight?
  - b. What is the interquartile range for the data?
  - c. There are a number of outliers (shown as dots) in the data. Which position would you expect the heavier outliers to be (forwards, defenders, midfielders or goalkeepers)?

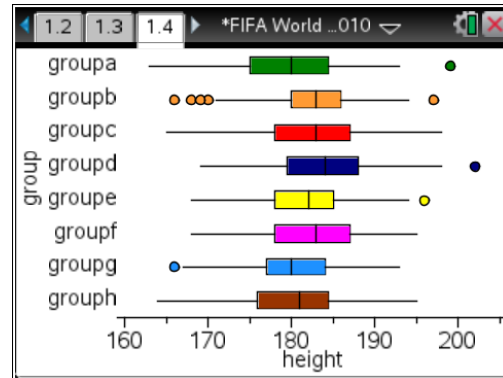
- a. 76 kg
- b.  $80 - 72 = 8$  kg
- c. Goalkeepers represent the outliers



2. Draw boxplots comparing the height of each group (choose **group** for the vertical axis and **height** for the horizontal axis). Colouring the box plots is optional.
  - a. Which group has the highest median height? What is the highest median height?
  - b. Which group has the lowest interquartile range? What is the IQR?
  - c. Which group has the most outliers? How many outliers?

- a. Group d, 184 cm
- b. Group b,  $186 - 180 = 6$  cm
- c. Group b, 5 outliers

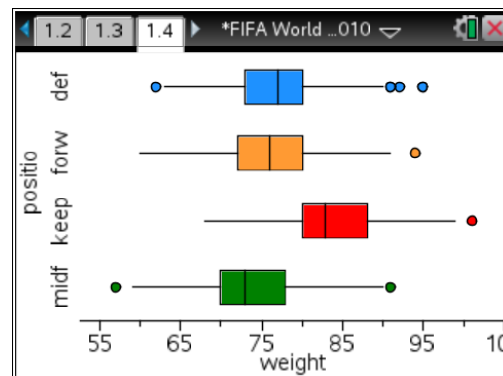
One reason why this group has the highest median weight is due to two outliers from the Nigerian team (95 kg and 101 kg).



3. Draw boxplots comparing the weight and the positions (choose **position** for the vertical axis and **weight** for the horizontal).
  - a. Which position (defender, forward, goalkeeper or midfielder) has the greatest median weight? What is the median weight?
  - b. Which two positions appear to be evenly matched?
  - c. Which position has the lowest interquartile range? What is the IQR?

- a. Goalkeeper, 83 kg
- b. Forwards and defenders
- c. Defenders,  $80 - 73 = 7$  kg

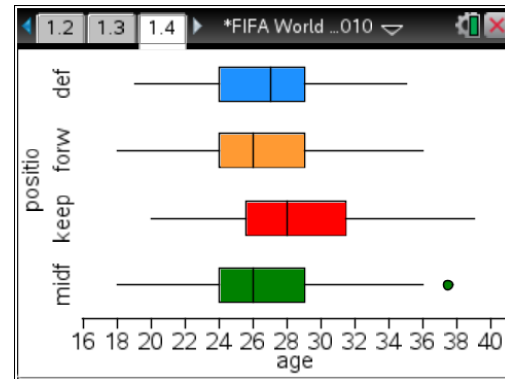
Goalkeepers are generally heavier since they are taller than the average footballer. A tall goalkeeper is able to handle reach the high balls better than a short goalkeeper.



4. Draw boxplots comparing the ages and the positions of footballers (choose **position** for the vertical axis and **age** for the horizontal).
- Which position (forward, midfielder, defender or goalkeeper) has the highest median age? What is the median age?
  - Which position has the lowest median age? What is the lowest median age?
  - Which position has the greatest interquartile range? What is the IQR?
  - Which positions appear to be similar in their distribution of ages?

- Goalkeepers, 28 years
- Midfielders and forwards, 26 years
- Goalkeepers,  $31.5 - 25.5 = 6$  years
- Defenders, forwards and midfielders

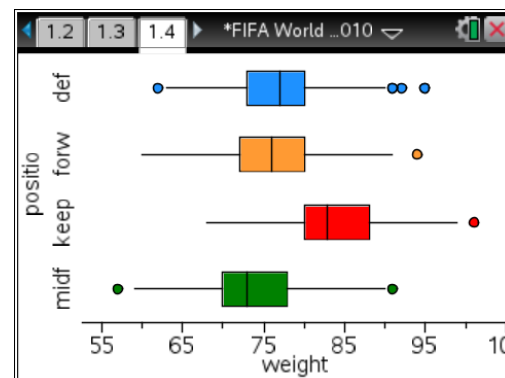
Goalkeepers are older on average as their fitness requirements are not as demanding as outfield players and they can consequently last longer in their career choice.



5. Draw boxplots comparing the weights and the positions of footballers (choose **position** for the vertical axis and **weight** for the horizontal).
- Which position (forward, midfielder, defender or goalkeeper) has the highest median weight? What is the median weight?
  - Which position has the lowest median weight? What is the lowest median weight?
  - Which position has the lowest interquartile range? What is the IQR?
  - Which positions appear similar in their distribution?

- Goalkeepers, 83 kg
- Midfielders, 73 kg
- Defenders,  $80 - 73 = 7$  kg
- Defenders and forwards are very similar in their distribution. Defenders range from 62 kg to 95 kg and forwards range from 60 kg to 94 kg.

Goalkeepers are heavier in general since they are taller on average. Tall goalkeepers have an obvious advantage over shorter players, especially with high balls.



6. Draw boxplots comparing the ages of the players from each team (choose **age** for the vertical axis and **team** for the horizontal).
- Which team has the lowest median age? What is the lowest median age?
  - Which team has the lowest interquartile range? What is the IQR?

a. Ghana, 23 years

b. Netherlands,  $28 - 26 = 2$  years

