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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
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QUALIFY FOR THE FUTURE WORLD
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Level 1 Mathematics and Statistics, 2016

91037 Demonstrate understanding of chance and data

9.30 a.m. Thursday 17 November 2016
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of chance and data.	Demonstrate understanding of chance and data, justifying statements and findings.	Demonstrate understanding of chance and data, showing statistical insight.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–20 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

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THE OLYMPIC GAMES

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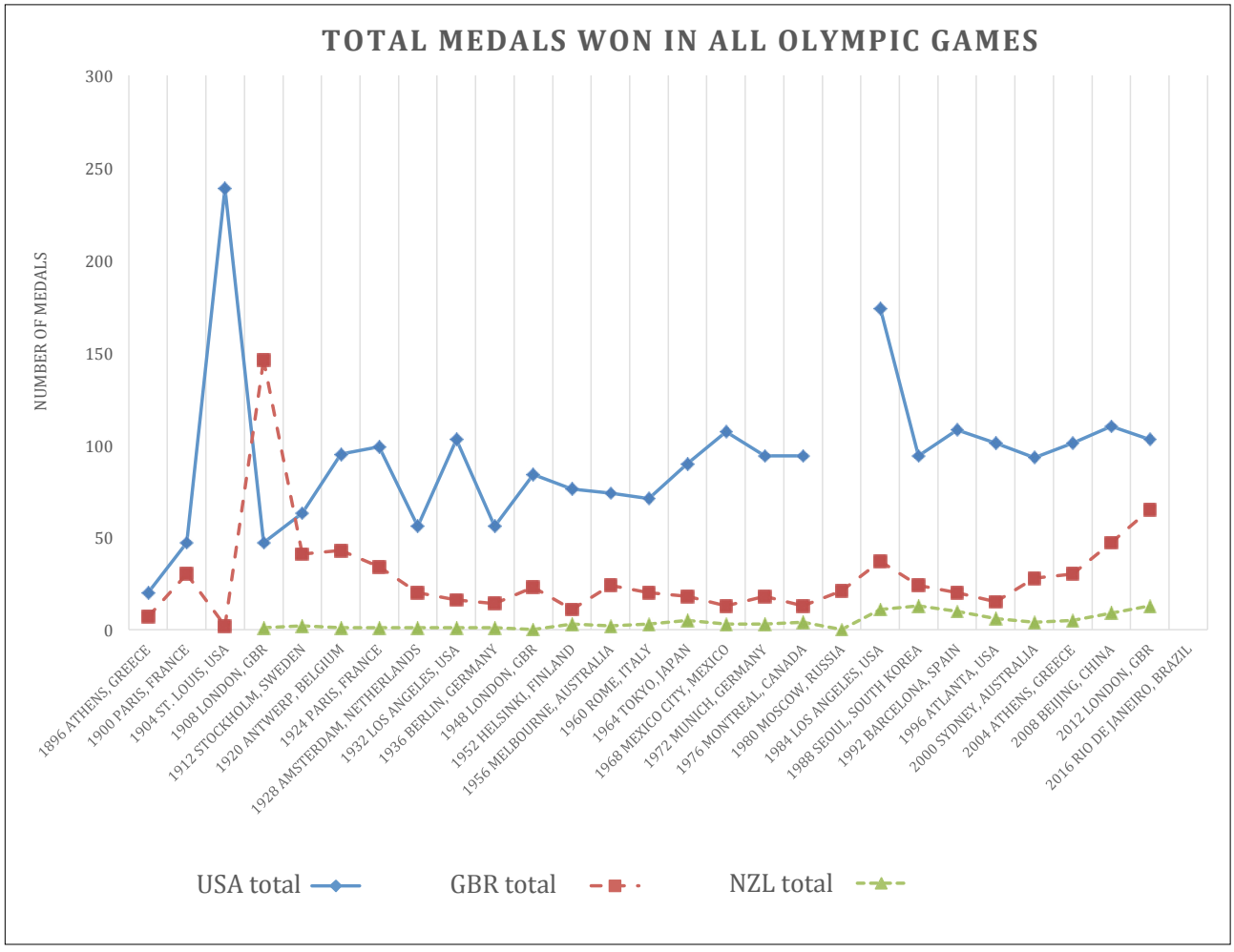
QUESTION ONE

The graph below shows the total number of medals won by the United States of America (USA), Great Britain (GBR) and New Zealand (NZL) in Olympic Games.



(a) (i) USA did not participate in the 1980 Moscow Olympics.

Using information presented in the graph, predict how many medals the USA could have been expected to win if they had participated in 1980.

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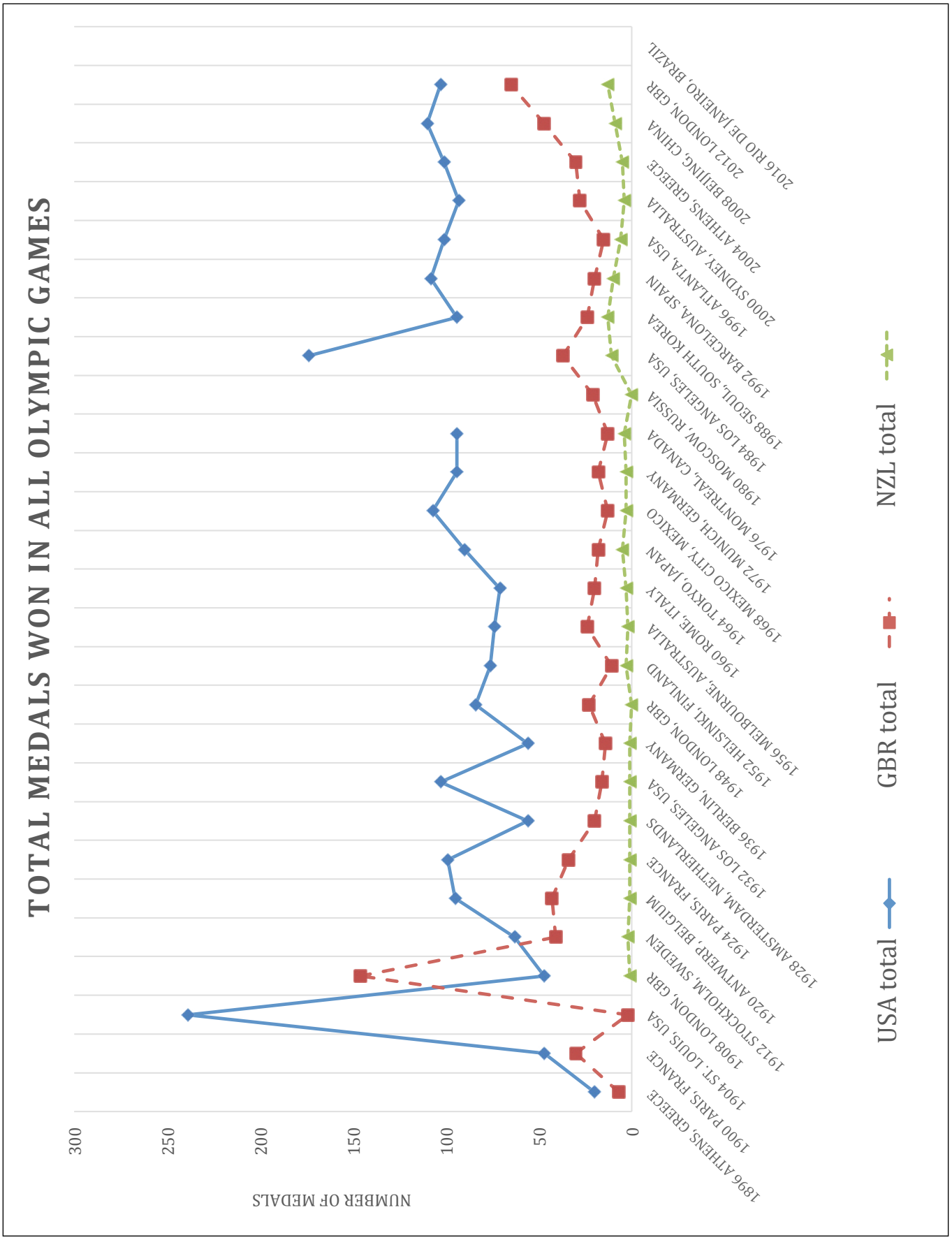
(ii) Justify your decision for your prediction in (a)(i) using statistical reasons.

(iii) Describe any unusual features in this graph.

(iv) Compare the trends of USA, GBR and NZL over the 27 Olympic Games.

This graph is repeated from Page 2.



(v) Both the United States of America and Great Britain have hosted Olympic Games in their country.

Do countries perform better when they host the games?

Give statistical evidence for your answer.

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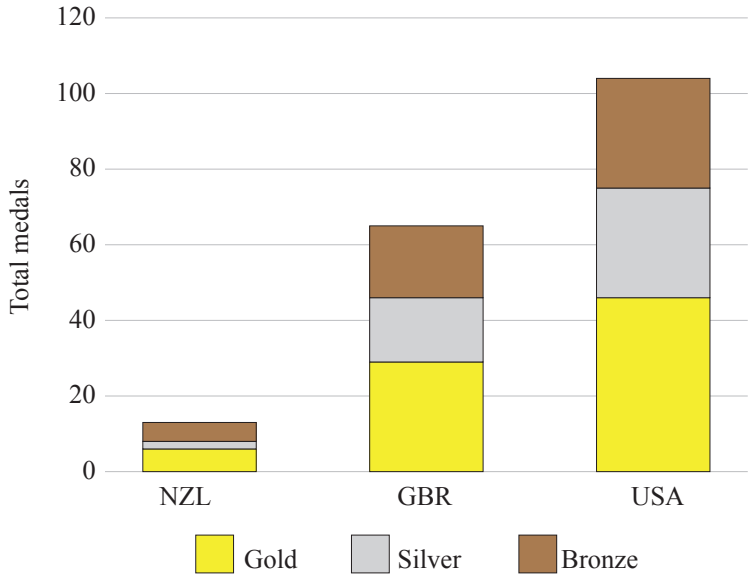
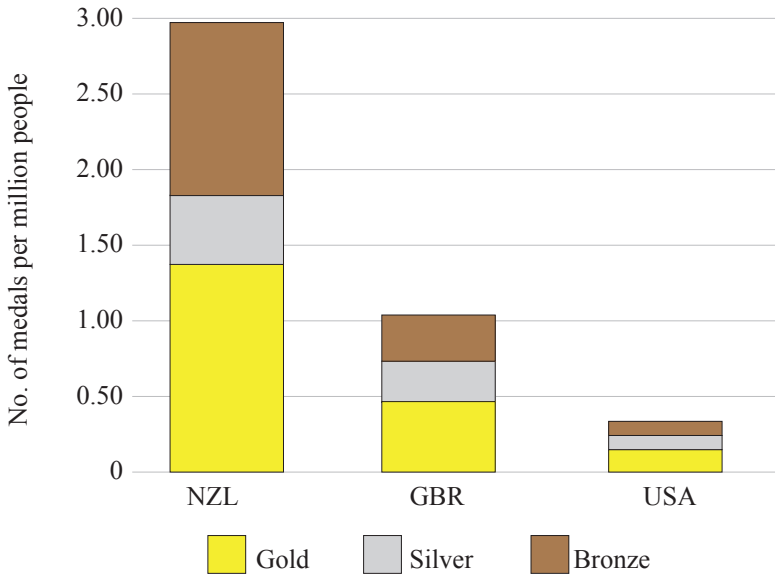
(b) The medals won by the United States of America, Great Britain and New Zealand at the 2012 London Olympic Games are shown below, along with their populations at the time.

Country	Gold	Silver	Bronze	Total	Population (millions)
NZL	6	2	5	13	4.37
GBR	29	17	19	65	62.23
USA	46	29	29	104	309.35

The proportions of each type of medal are shown in the graph below:



When a medal count is calculated as **medals per million of their population**, the relative success of a country can change, as shown in the graph below



Make a statement about the relative successes of the United States of America, Great Britain and New Zealand, using the graphs given on the previous page.

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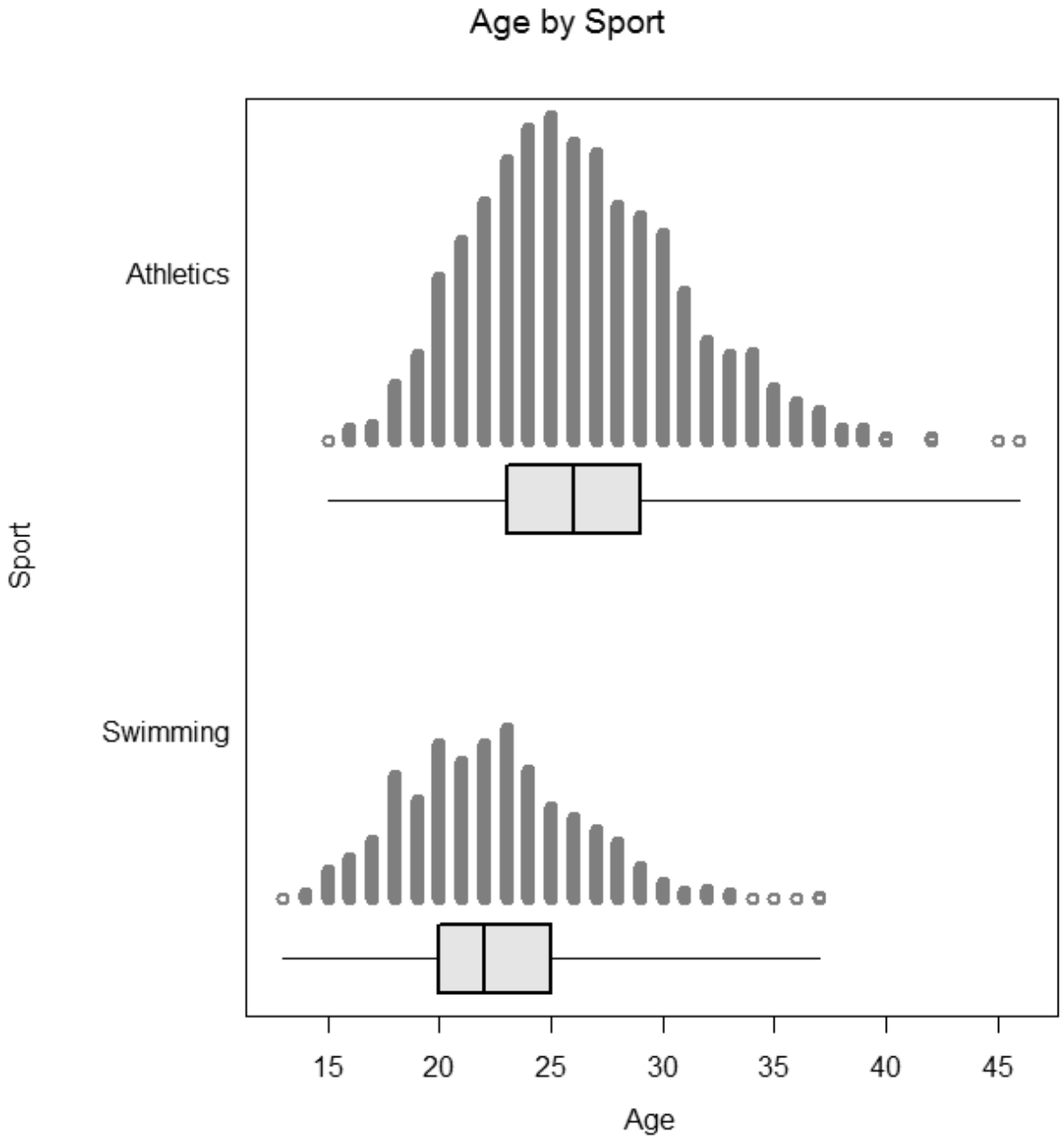
QUESTION TWO

In the 2012 London Olympics, the ***ages*** of the competitors participating in Athletics and the competitors participating in Swimming are shown below.



Sport	Minimum	Lower Quartile	Median	Mean	Upper Quartile	Maximum
Athletics	15	23	26	26.17	29	46
Swimming	13	20	22	22.35	25	37

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(a) (i) From the information opposite, explain which of the sports shown had the greatest number of competitors.

Justify your answer.

(ii) Compare any significant features of the graphs.

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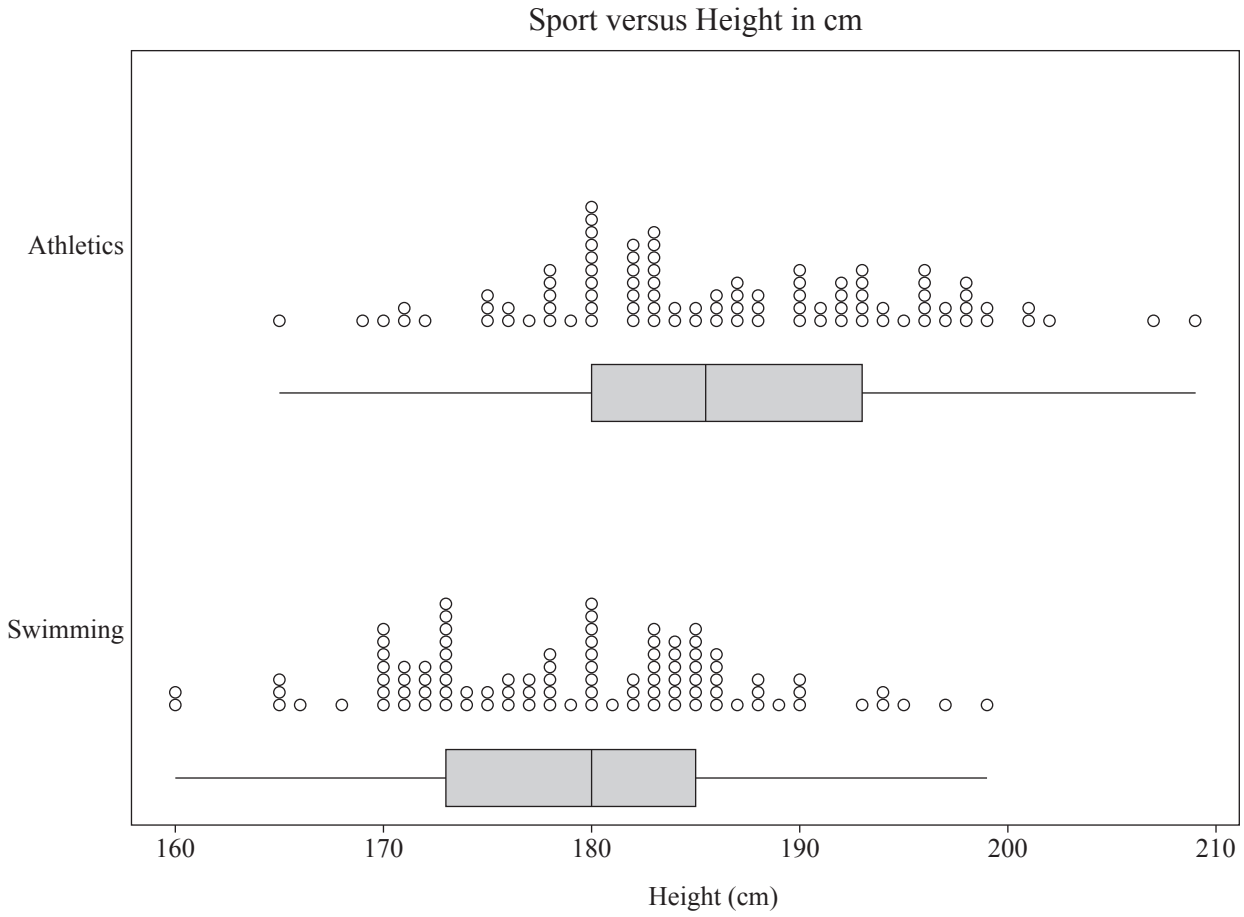
(iii) A **random sample** of 94 competitors participating in Athletics and a **random sample** of 99 competitors participating in Swimming were taken. The results are shown below.



Sport	Minimum	Lower Quartile	Median	Mean	Upper Quartile	Maximum
Athletics	165	180	185.5	186.4	193	209
Swimming	160	173	180	179.1	185	199

This table has been corrected from that used in the examination.

From this sample, is it possible to conclude that there was a difference in heights of competitors participating in Athletics, and heights of competitors participating in Swimming at the 2012 London Olympics?

Give statistical reasons for your answer.

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(b) The weights (in kilograms) and heights (in centimetres) of competitors can be plotted against one another and a comparison made between competitors who participated in Athletics and competitors who participated in Swimming in the 2012 London Olympics.

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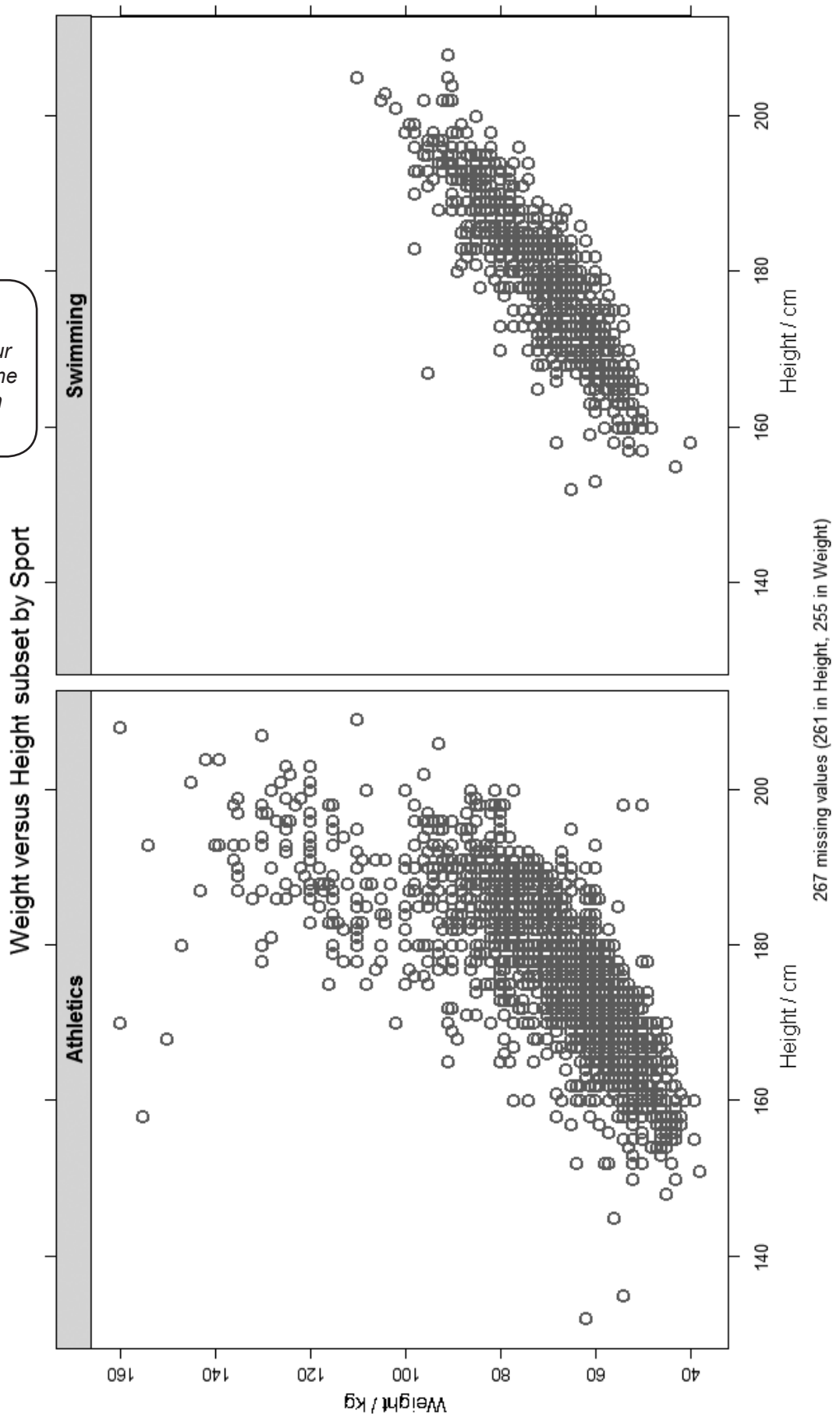

If you need to redraw your lines, use the graphs on page 18.

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(i) In which sport is a competitor more likely to weigh more than 100 kg?

Justify your answer.

(ii) On the graphs opposite, draw a line which best approximates the relationship between height and weight for each graph; one for Athletics and one for Swimming.

Comment on their appropriateness and whether some other model would best fit.

This graph is repeated from Page 12.

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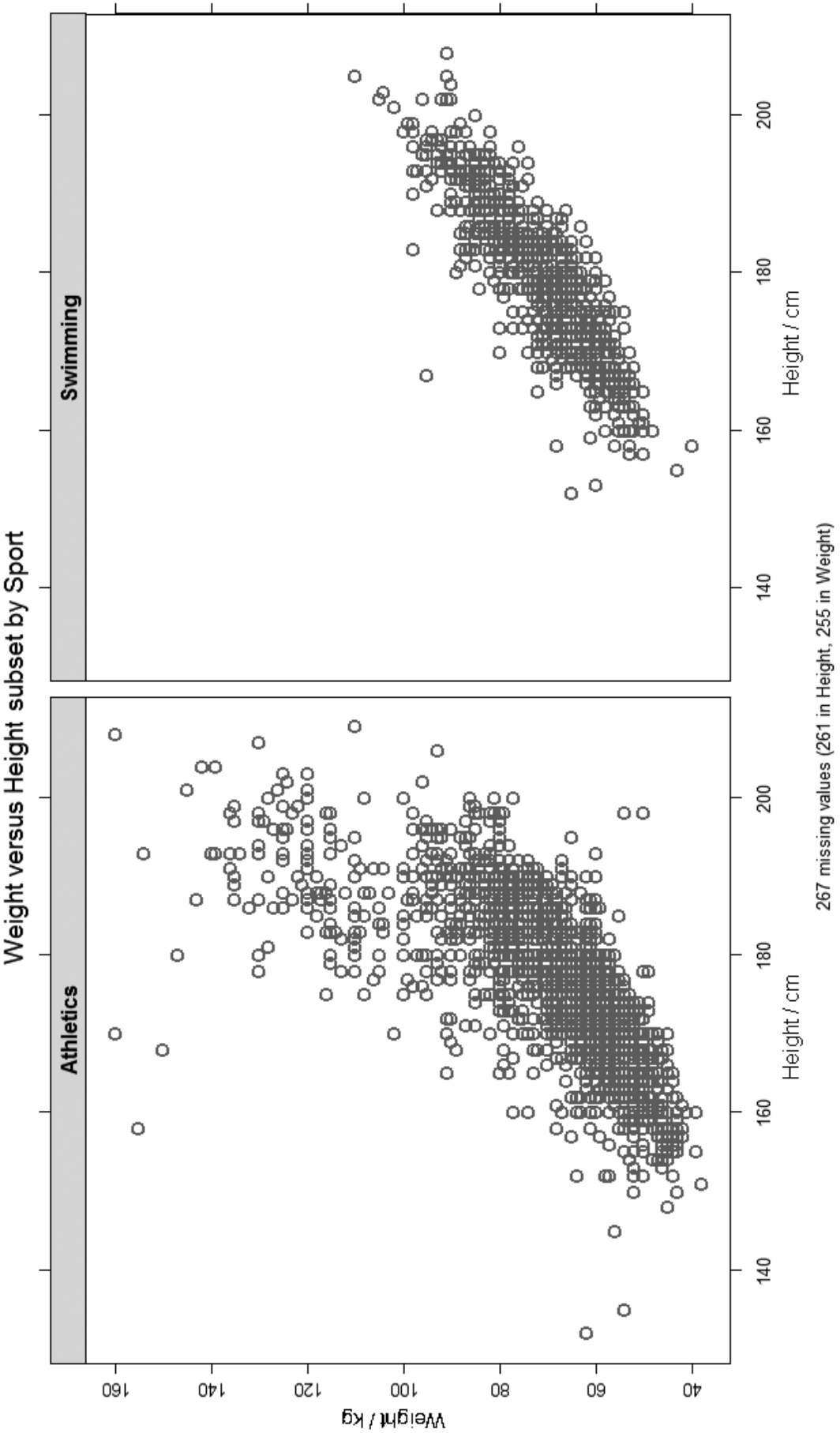

(iii) Which sport has the strongest relationship between height and weight?
Justify your answer with statistical reasoning.

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QUESTION THREE

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(a) The 3026 competitors who participated in Athletics and Swimming in the 2012 London Olympics can be grouped together according to their ages (in years) as shown in the table below:

Ages / Sport	Younger than 15	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 and older
Athletics	0	107	715	818	379	92	8
Swimming	6	213	448	202	31	7	0

(i) What is the probability that a competitor, chosen at random, was 15 – 19 years old?

(ii) Given that a competitor in the 25 – 29 age group was chosen at random, what is the probability they were competing in Athletics?

(iii) What is the probability that a competitor chosen at random was a 20 – 24-year-old competing in Athletics or a 30 – 34-year-old competing in Swimming?

(iv) If two competitors were randomly selected, what is the probability the first one competed in Athletics and the second one competed in Swimming?

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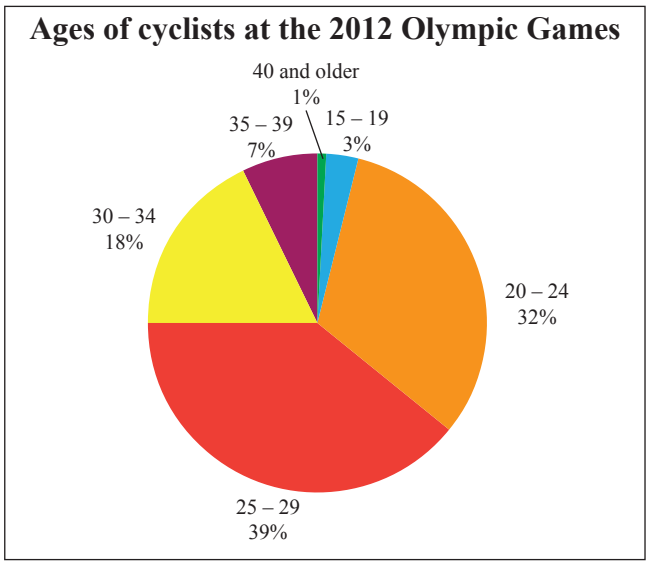
(b) The organisers of the 2016 Rio de Janeiro Olympics had the information on ages of the 489 cyclists from the 2012 London Olympics.

They were presented with the information below:



(i) How many cyclists at the 2016 Rio de Janeiro Olympics could be expected to be 30 years old or more?

(ii) The organisers of the 2016 Rio de Janeiro games needed to be able to predict accommodation, transport and the number of different heats and finals at each different cycling event.

How useful would the information presented in the graph above have been to the organisers of the 2016 Rio de Janeiro Olympics to make these predictions?

Explain your answer using statistical ideas.

If you need to redraw your graphs from Question Two (b), draw them on the graph below. Make sure it is clear which graphs you want marked.

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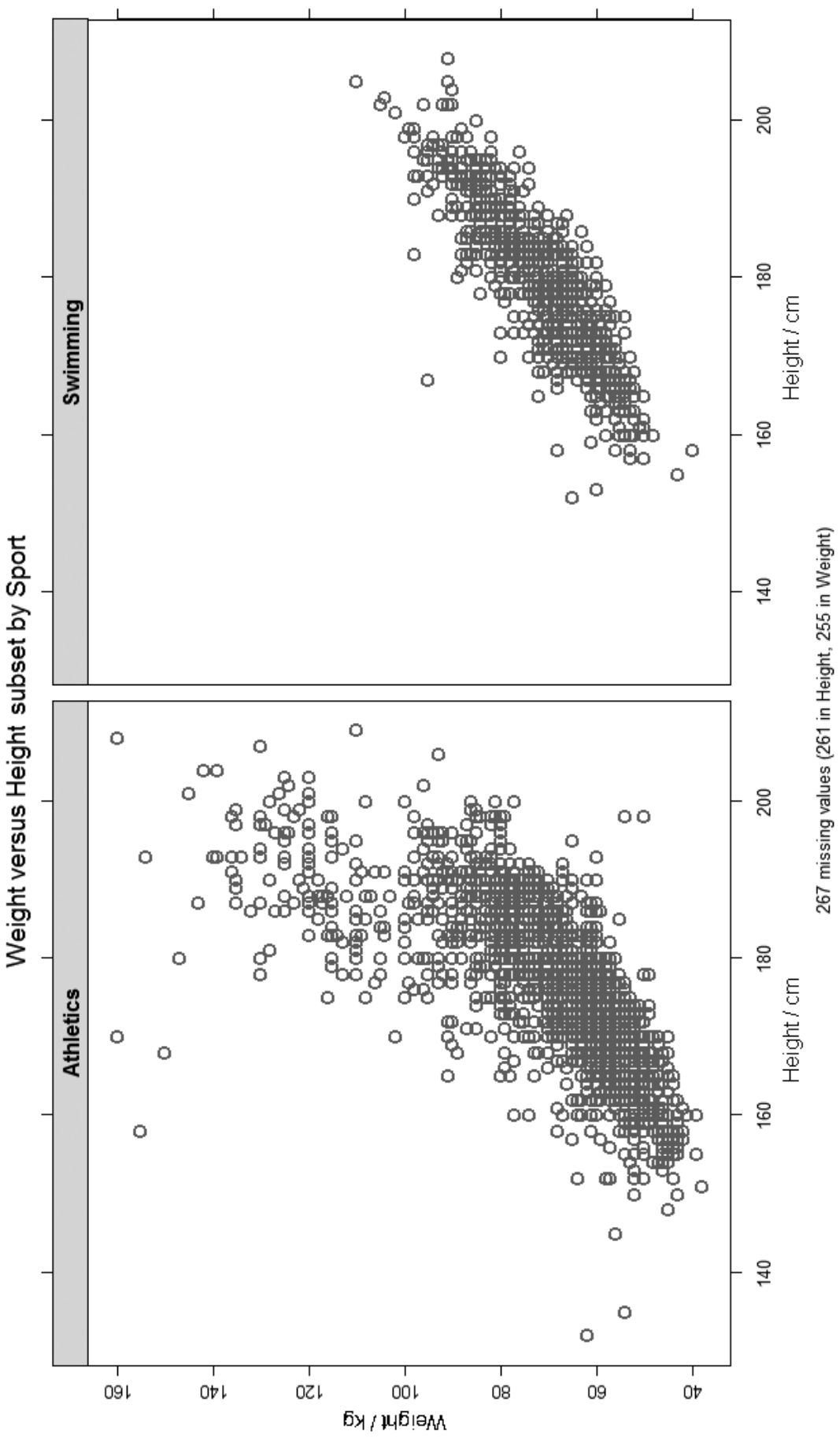

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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