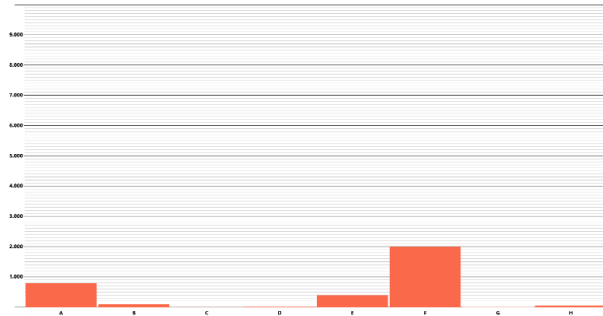


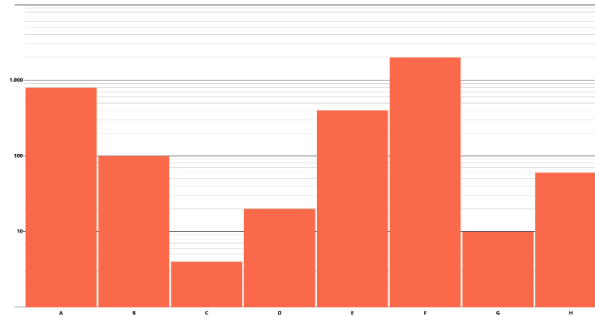
Additional explanations

- In the following, we show the entire study as screenshots
- The order of the screenshots is the same as the order in the online study
- For all participants, the order of the questions resp. information and the used datasets were the same throughout the entire study
- Only the screenshots changed to vary the visualization designs within the between-subject study
 - We show all used visualization designs on the next slide

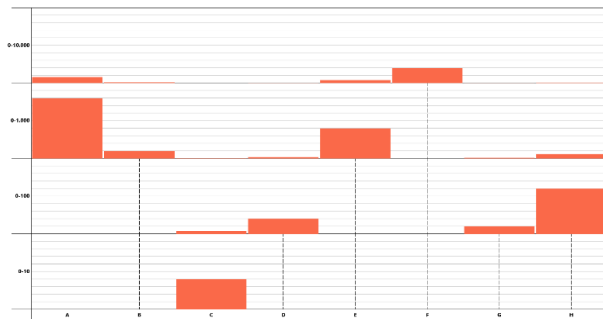
Used designs



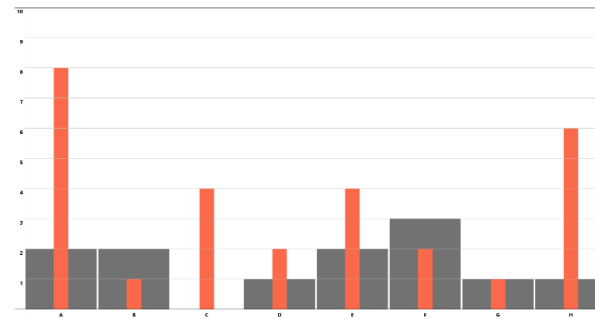
Linear bar chart



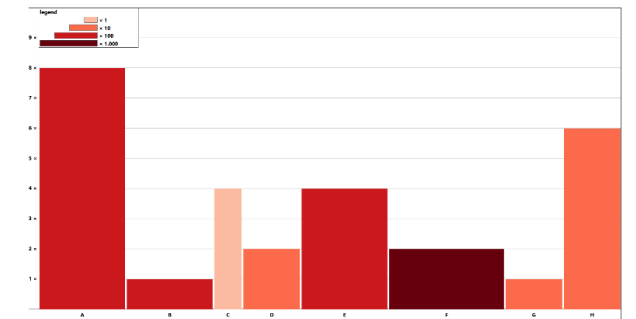
Logarithmic bar chart



Scale-stack bar chart



Order of magnitude markers



Width-scale bar chart

Thank you for your interest in participating in this study!

The aim of the study is to test a newly developed design for bar charts that shows data of large value range (e.g. from 1 to 10000).

During the study, we will show you several charts with questions to answer. This requires sufficient screen space of 13" or more.

It is therefore strongly recommended that you conduct this study on a computer screen (no smartphone, no tablet, no smart watch or other handheld device with screen size less than 13").

Please remove any external influences on your study participation (e.g. radio, television, phone ring, conversations, etc.).

Participation in the study is voluntary and you can stop at any time at your own request. In this case, your data will be deleted and not included in the evaluation.

The data collected during the study is stored, evaluated and reported in a privacy-preservation manner. We guarantee that your collected data will only be used for evaluations by the study team, and will not be passed on to third parties.

Declaration of consent



Please give your consent to study participation and data collection and processing via the buttons below.

The option "Yes, I agree" confirms your volunteer study participation. You give consent to anonymous storage of the data collected during the study. You understand that you can terminate the study at any time without consequences or without giving reasons.

By selecting the option "No, I do not agree and would like to cancel the study", you do not agree with the modalities of data storage, and neither do you agree that you voluntarily participate in the study and you are aware that you may terminate the study at any time without giving any reason. Therefore, clicking on these options will immediately terminate your participation in this study.

- Yes, I agree
- No, I do not agree and would like to cancel the study

Next

0% completed

Thank you for your support!

The study will show bar charts with questions to be answered using the chart. There are four types of questions:

1. Name the value of a bar (always an integer between 1 and 10.000)
2. Sort the bars according to their value in ascending order
3. Determine the ratio of two values (a number, always divide the larger value by the smaller value)
4. Name the trend shown in the data (linear, logarithmic, exponential or none)

Each question will be asked six times using different data. Altogether you will have to give 24 answers. Please answer all the questions. It is important that you answer carefully but as quickly as you can.

First you will see an example to get familiar with the bar chart design and the structure of the study.

Click on the "Next" button at the bottom right to start the study.

Back

Next

3% completed

general information about your person

Please specify your sex.

- male
- female
- prefer not to say

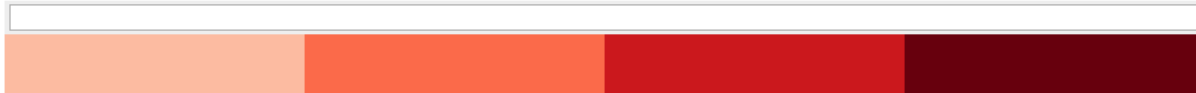
How old are you?

- < 20
- 20 – 30
- 30 – 40
- 40 – 50
- 50 – 60
- 60+
- prefer not to say

Do you have a defective vision (ametropia) that you compensate for by wearing a visual aid (glasses, contact lenses, etc.)?

- yes
- no

How many different brightness levels do you see in the picture below?



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Next

5% completed

How to read width scale bar chart design

The value is split into two parts: the order of magnitude and its representation in this order of magnitude, aka mantissa.

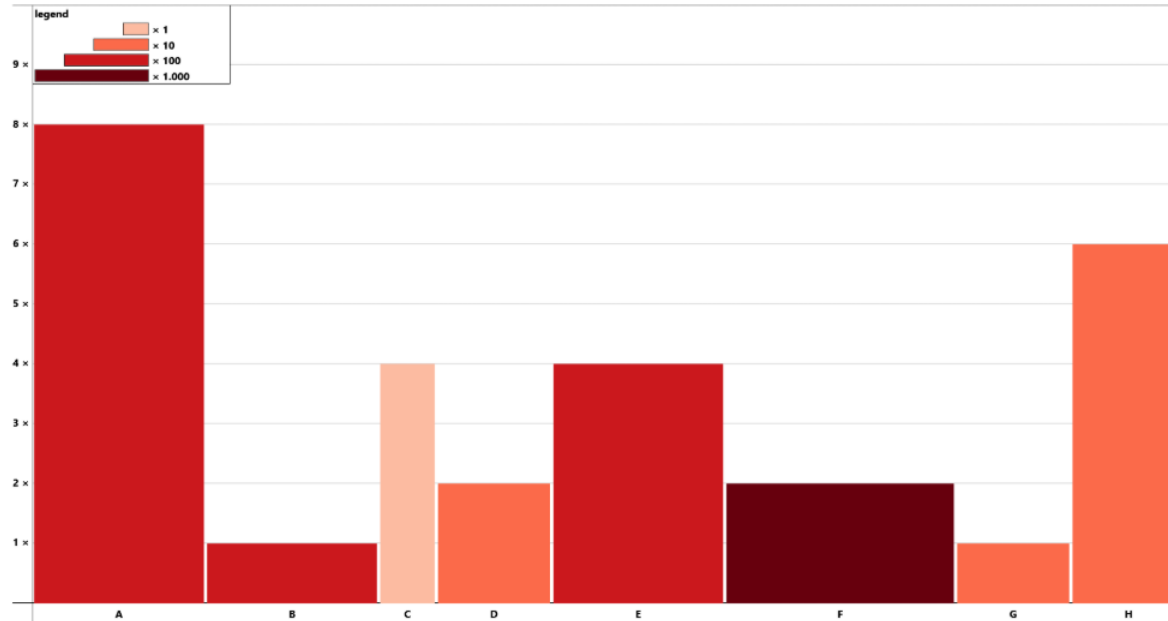
- The height of the thin red bar indicates the MANTISSA on a scale of 0 to 10
- The MAGNITUDE is shown in both the width of a bar and the hue of the reddish colour; the darker the colour, the higher the order of magnitude

The legend shows the correspondence of colors and width with MAGNITUDE multiplier.

To determine the value of the bar A, you have to execute the following steps:

- look up the magnitude multiplier on the legend: 100
- read the value of the mantissa: 8
- multiply the value by the multiplier: 8×100

Bar A represents the value 800.



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8% completed

Example

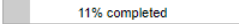
You will see four examples: one for each task. Accordingly, the following four pages are intended for exercise purposes. Take as long time as you want to and answer honestly.

For your verification, the correct answer is located below the intended input option.

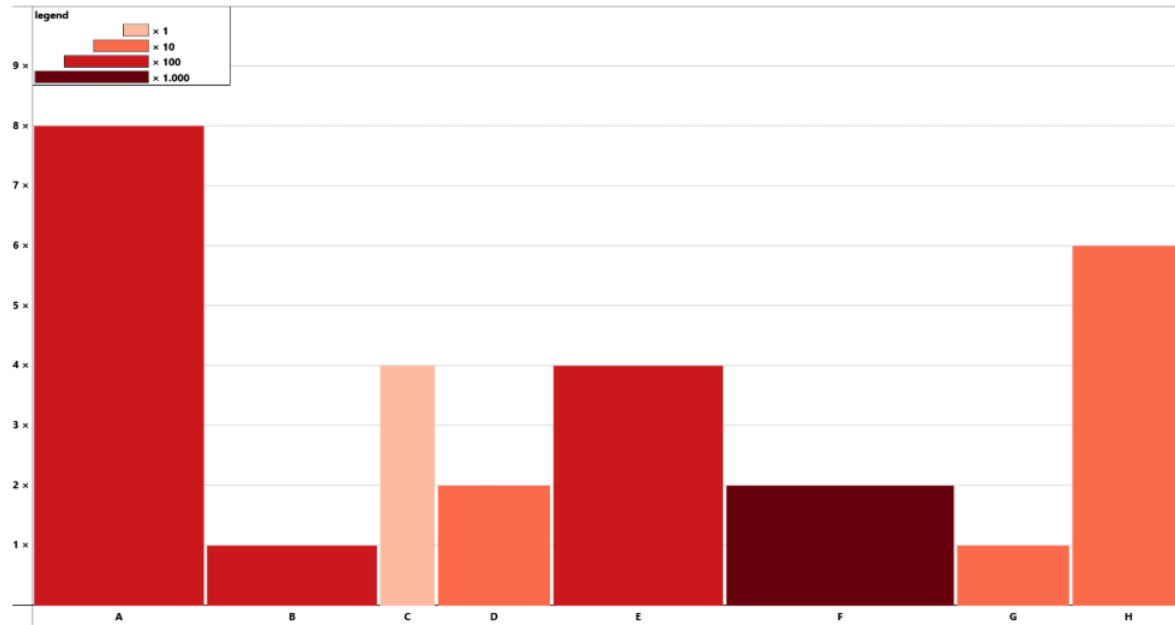
The study will then start on a separate page.

[Back](#)

[Next](#)

 11% completed

Example



Read the value of a bar

Please enter the value of a given bar mentioned below into the text box.

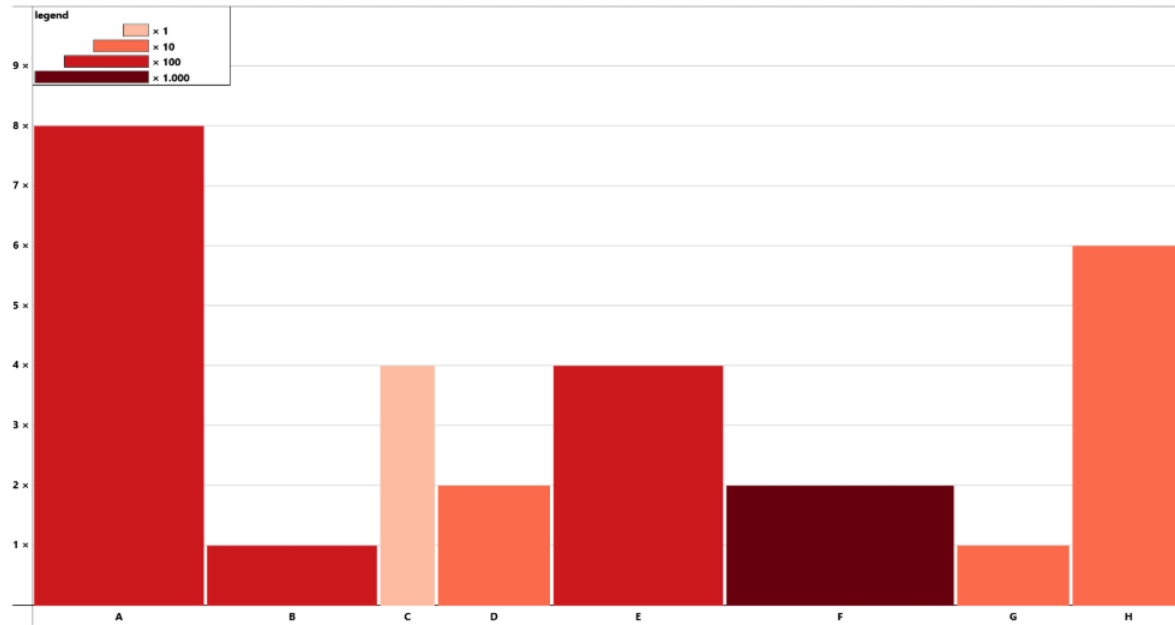
The value is always an integer between 1 and 10 000.

E

The answer should be 400.

13% completed

Example



Sort the values

Please sort the represented values in an ascending order.

Start with the smallest value. To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.) To change your answer, you can reorder the grey boxes or move them back to the white area (via drag and drop).

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

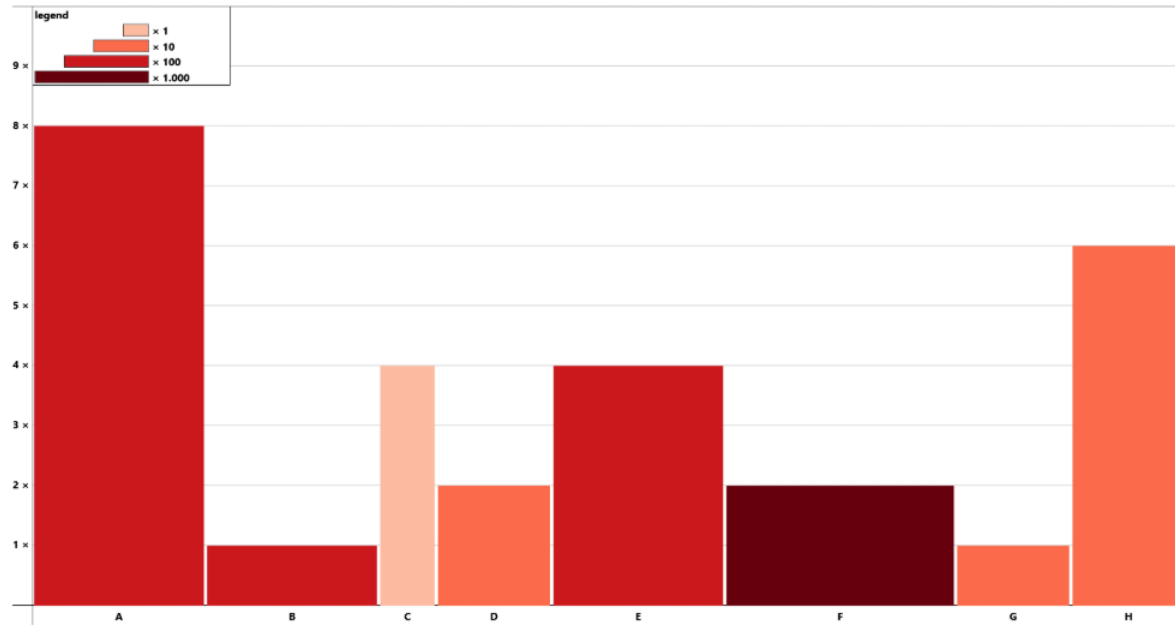
The answer should be: "C, G, D, H, B, E, A, F".

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Next

16% completed

Example



Estimate the ratio

Please enter the ratio of two given bars into the text box. Always divide the larger value by the smaller value. The ratio is a number.

A & E

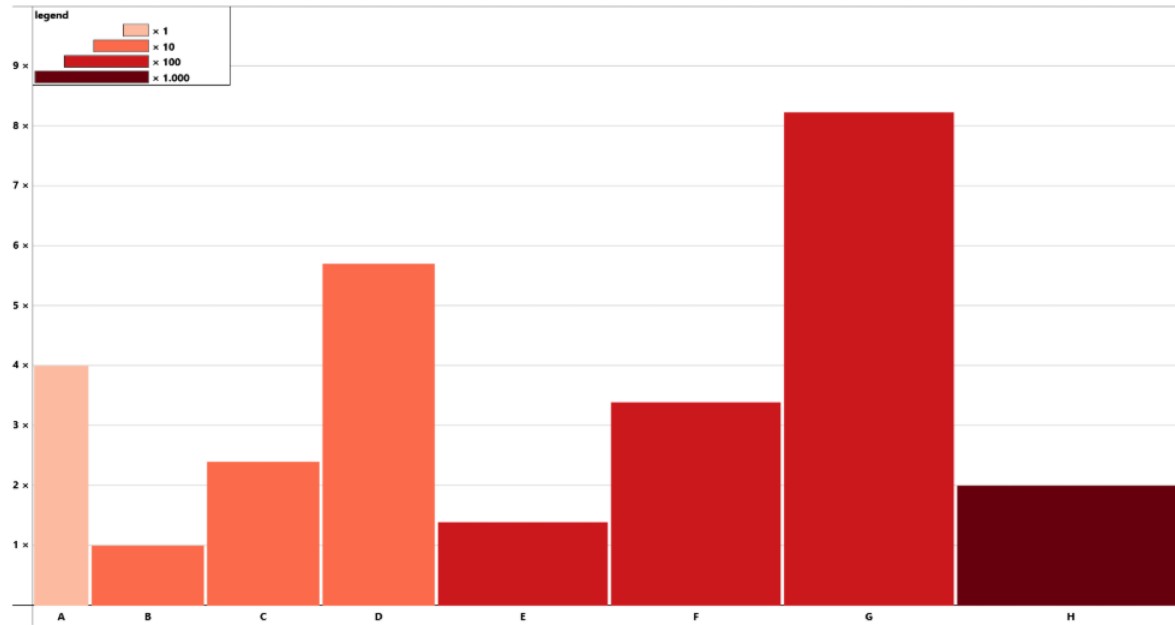
The answer should be 2.

Back

Next

18% completed

Example



Trend analysis

Please identify the trend type in the chart:

- exponential
- linear
- logarithmic
- none

The answer should be "exponential".

Back

Next

21% completed

Start

Now you are prepared to start the study.

Remember to read the value(s) as quickly as possible.

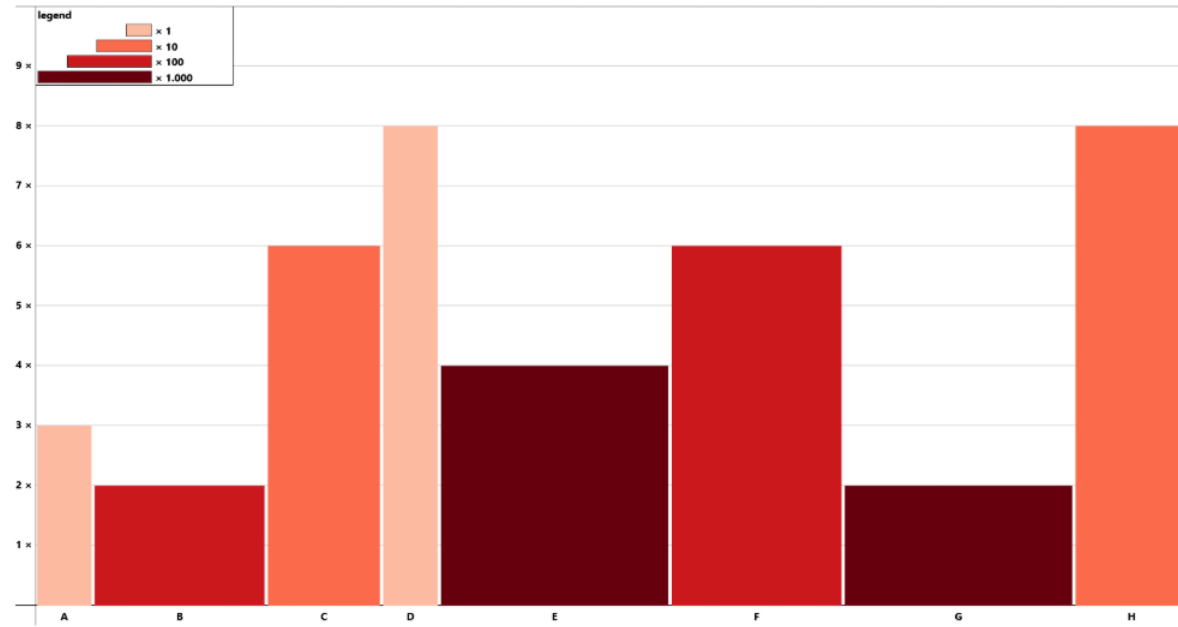
Click on the "Next" button at the bottom right to start the study.

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Next

24% completed

Page 1



1. Please read the value of bar E.

Enter the value into the text box.

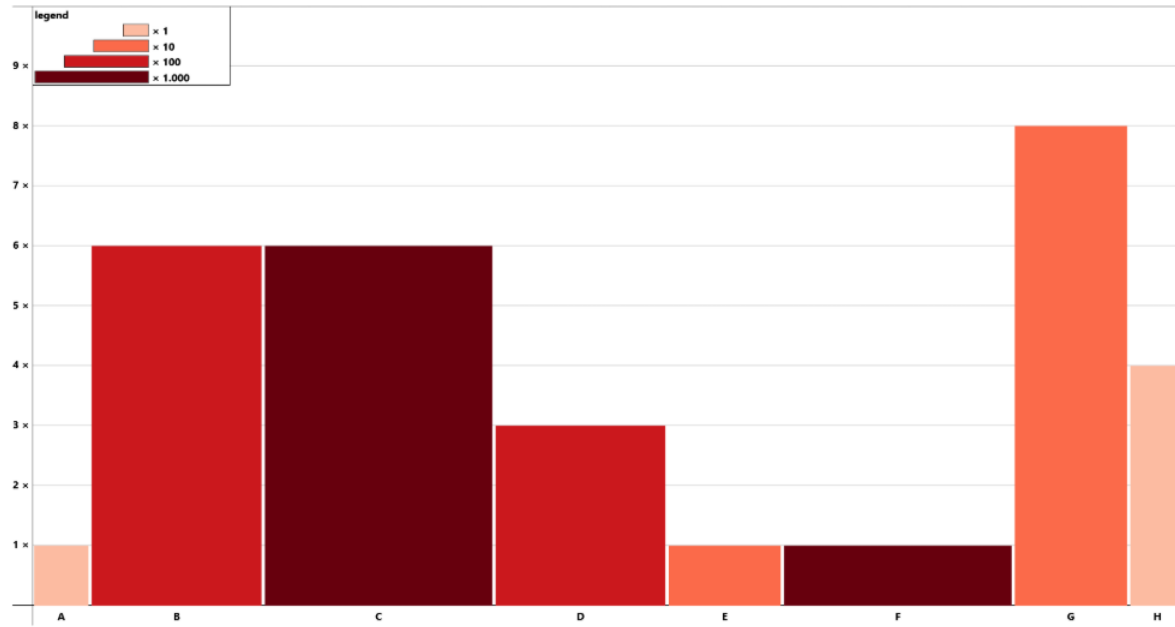
E

Back

Next

26% completed

Page 2



2. Please read the value of bar G.

Enter the value into the text box.

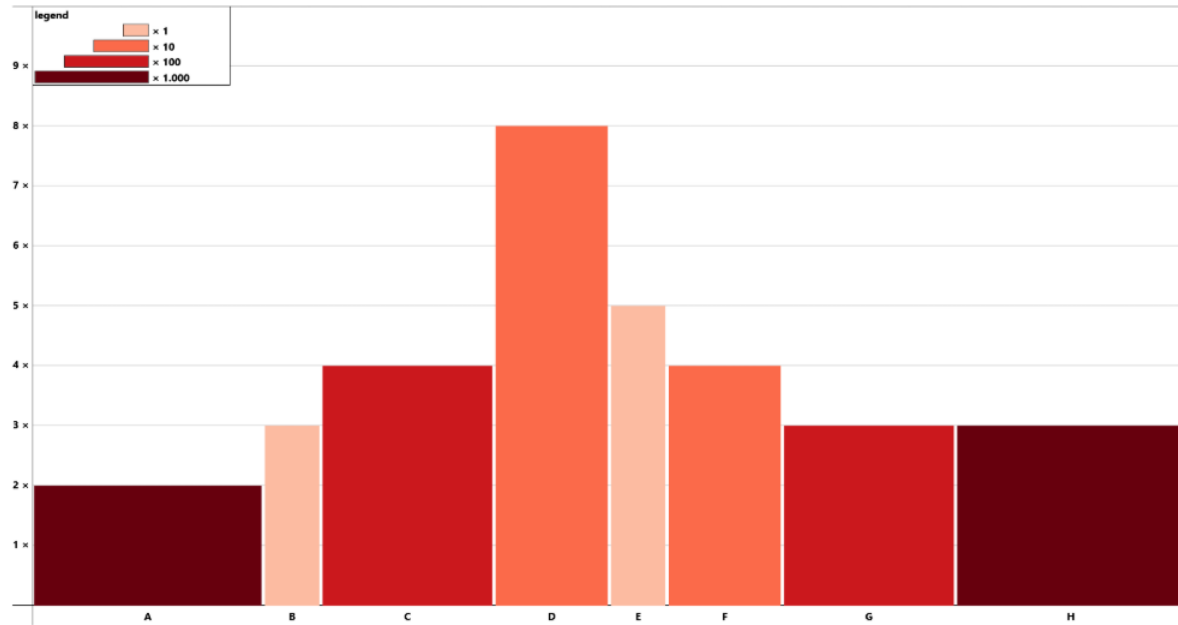
G

Back

Next

29% completed

Page 3



3. Please read the value of bar B.

Enter the value into the text box.

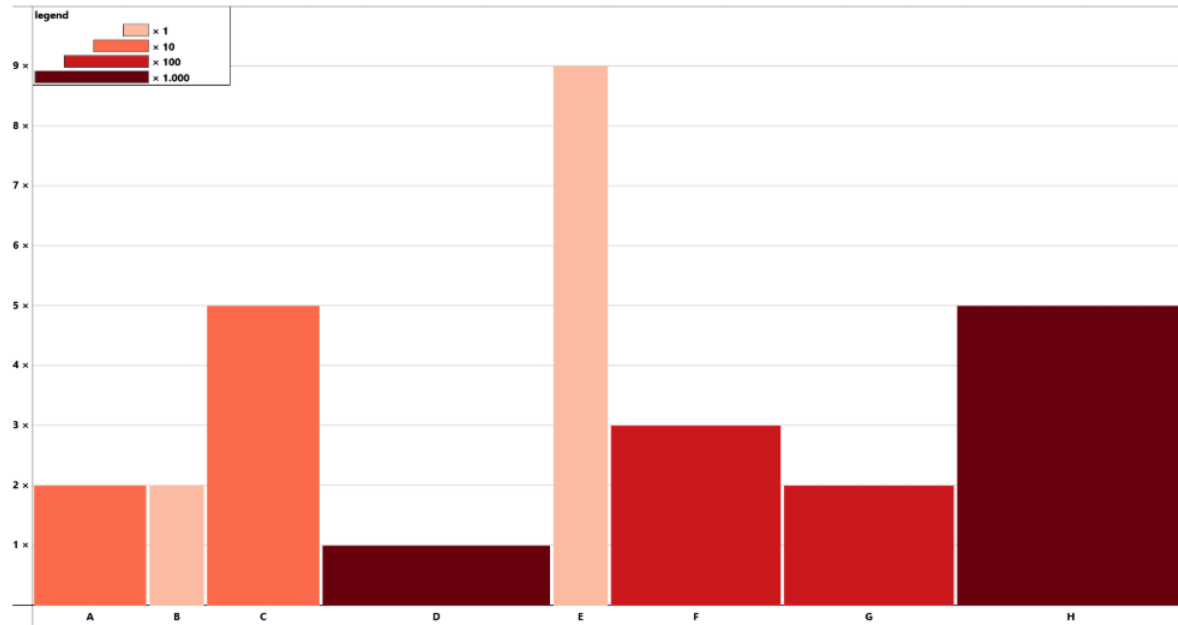
B

Back

Next

32% completed

Page 4



4. Please read the value of bar A.

Enter the value into the text box.

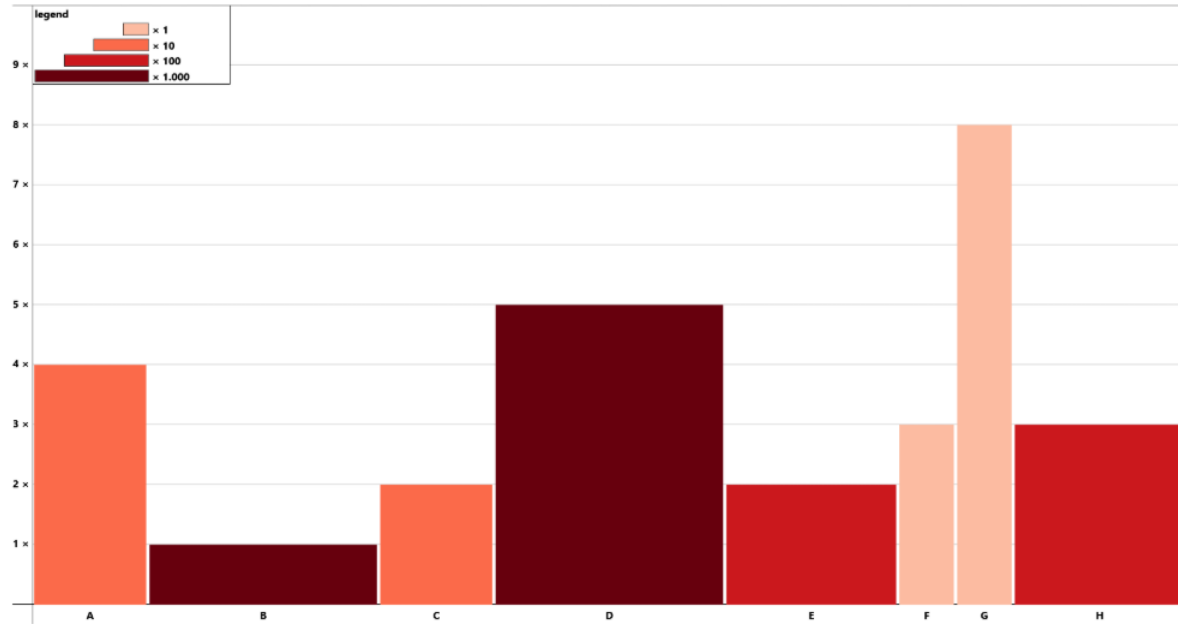
A

Back

Next

34% completed

Page 5



5. Please read the value of bar D.

Enter the value into the text box.

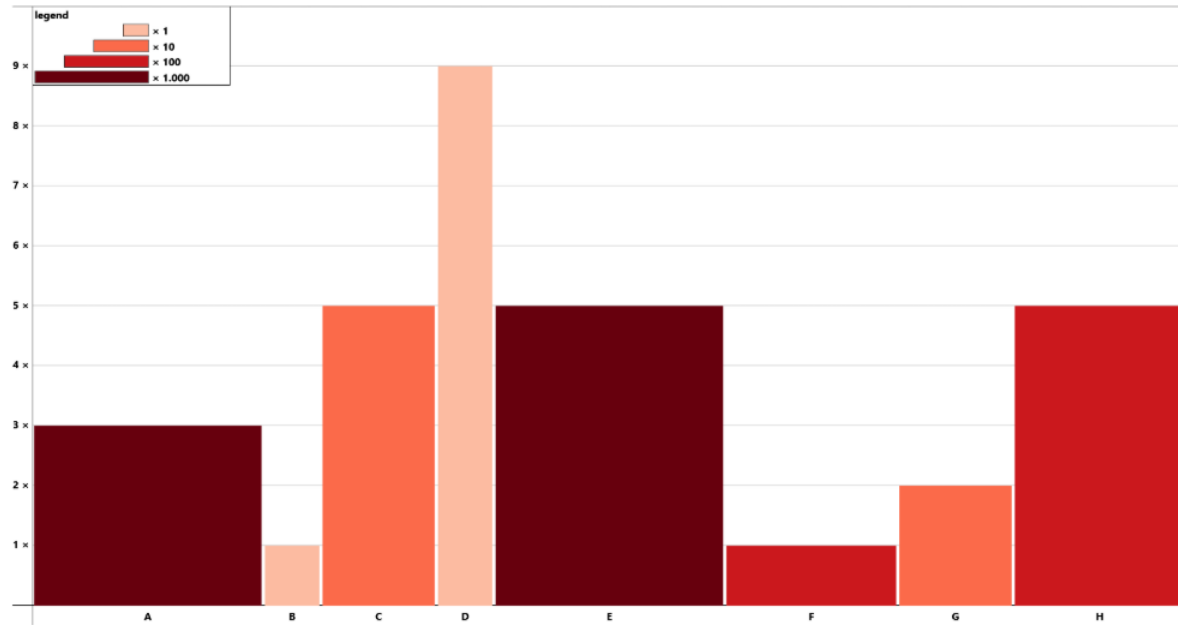
D

Back

Next

37% completed

Page 6



6. Please read the value of bar H.

Enter the value into the text box.

H

Back

Next

39% completed

Break

This is a short break. Calm down and answer one question, please.
Take as long time as you want to and answer honestly.

Please determine the ratio of 10 and 5.

Write down your answer into the textbox.

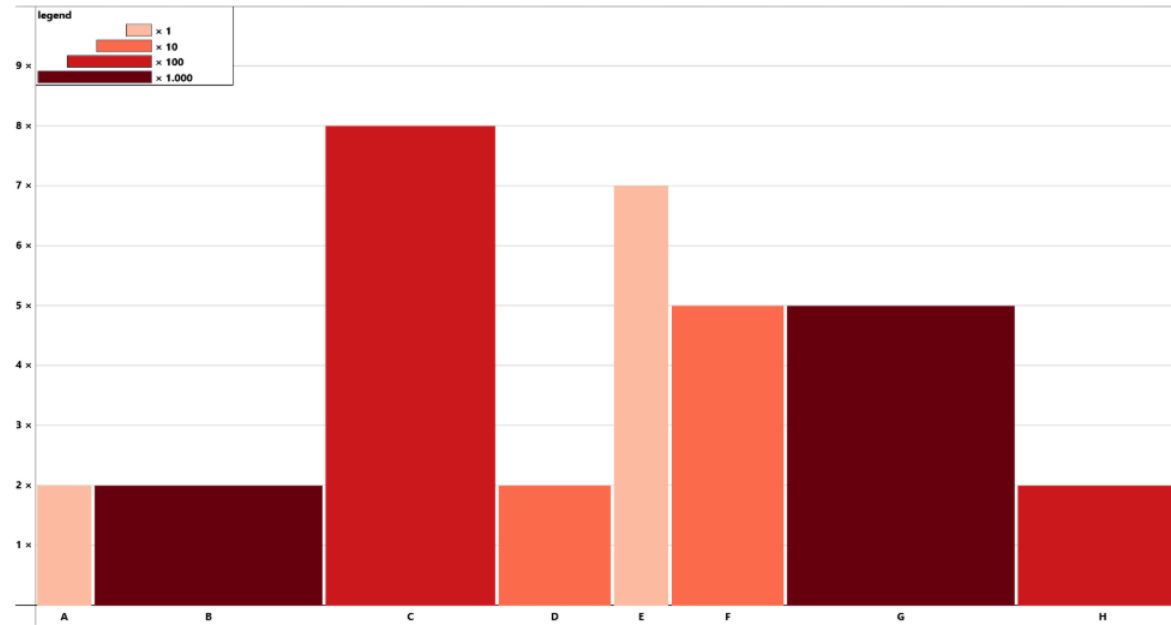
If you are ready to continue the study, please click on the "Next" button.

Remember to read the value(s) carefully but as quickly as you can.

Back

Next

42% completed



7. Please sort the represented values in an ascending order.

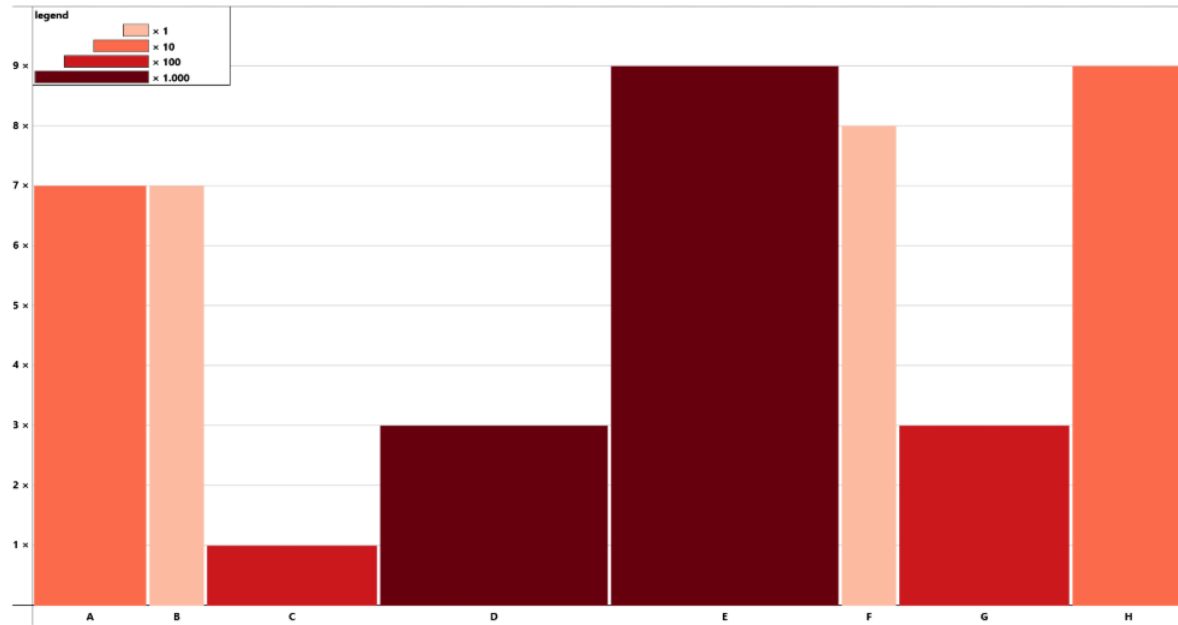
Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop.

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

Back

Next



8. Please sort the represented values in an ascending order.

Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)

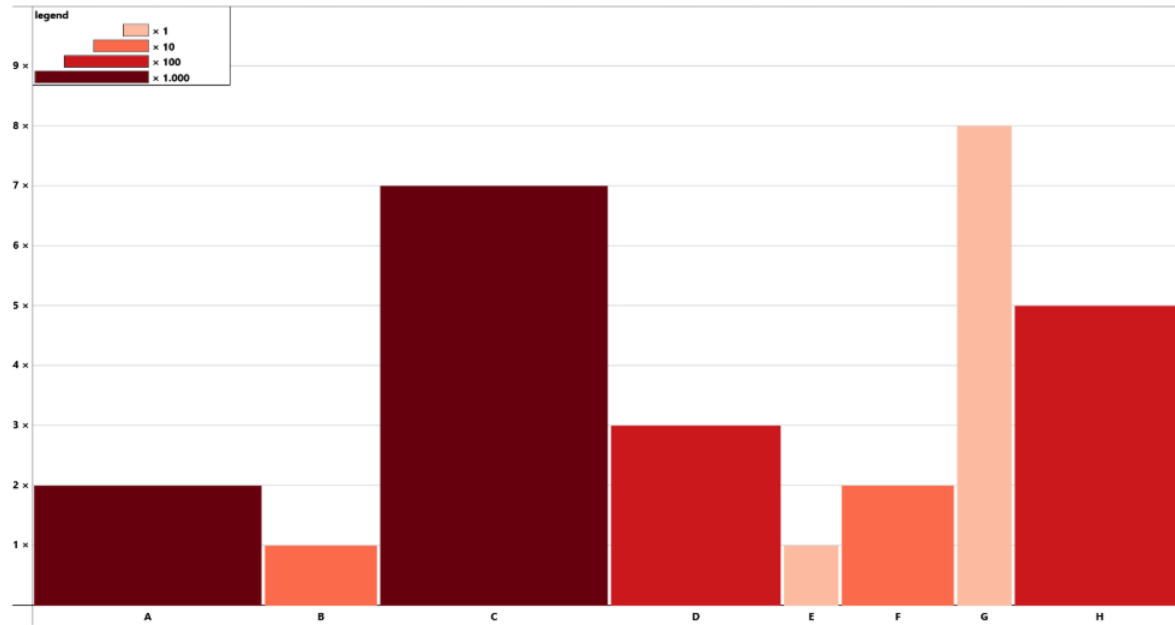
A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

Back

Next

47% completed

Page 9



9. Please sort the represented values in an ascending order.

Start with the smallest value.

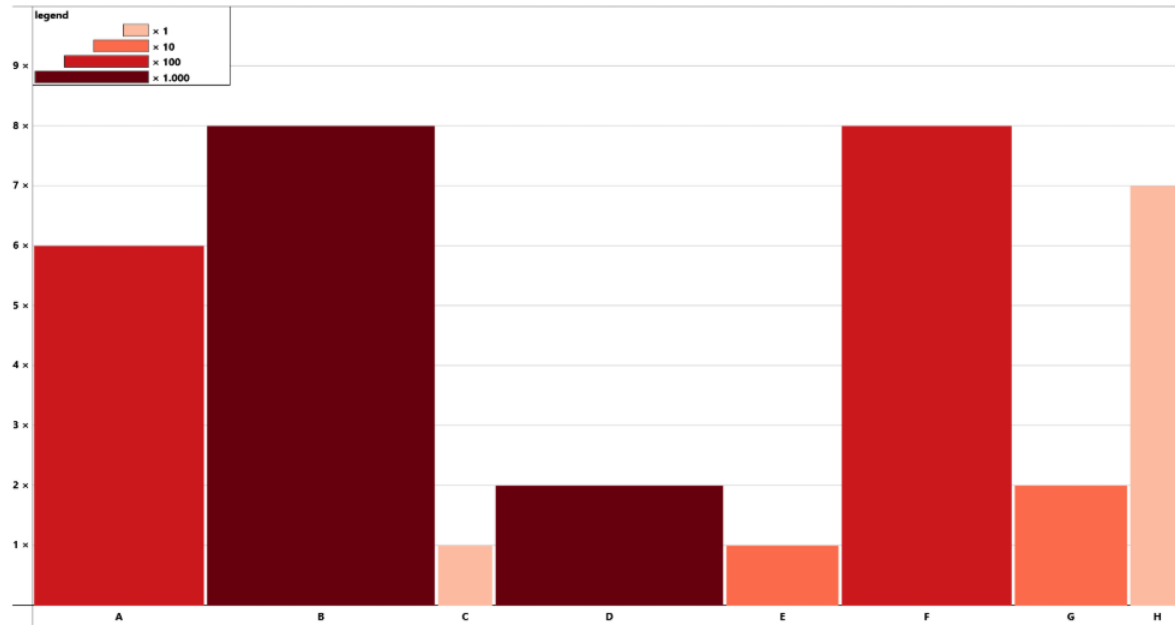
To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

Back

Next

50% completed



10. Please sort the represented values in an ascending order.

Start with the smallest value.

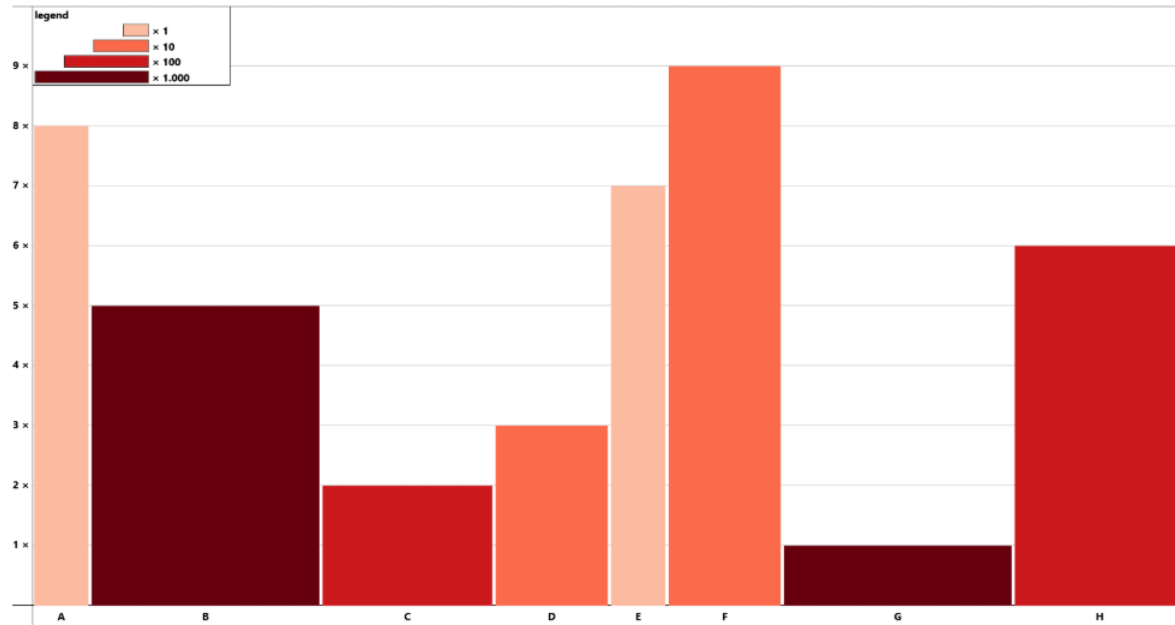
To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

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Next

53% completed



11. Please sort the represented values in an ascending order.

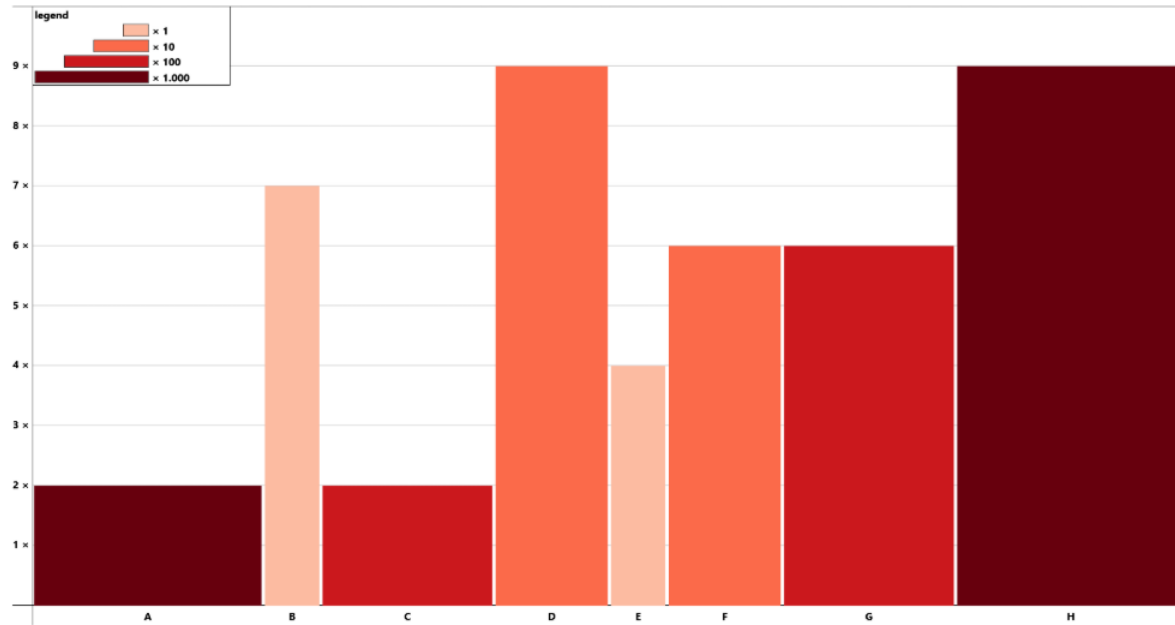
Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

Back

Next



12. Please sort the represented values in an ascending order.

Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double as well.)

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

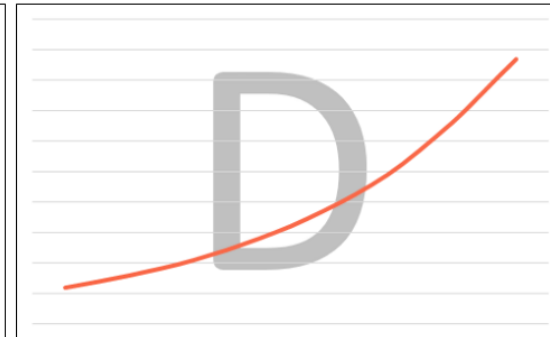
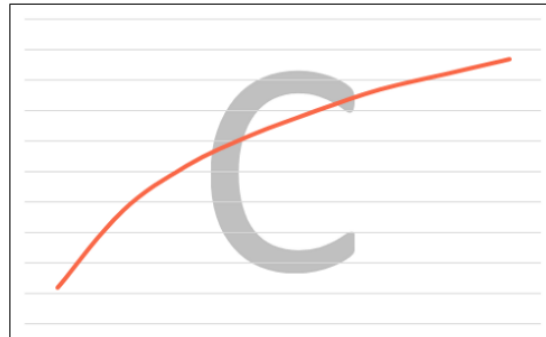
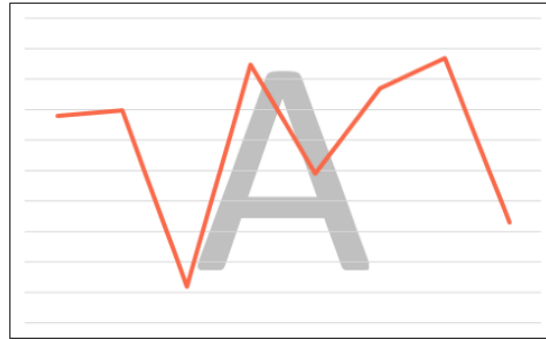
Back

Next

58% completed

Break

This is a short break. Calm down and answer one question, please.
Take as long time as you want to and answer honestly.



Please assign a trend to the shown charts.

Use drag and drop to place the boxes on the slots.

A

B

C

D

exponential

linear

logarithmic

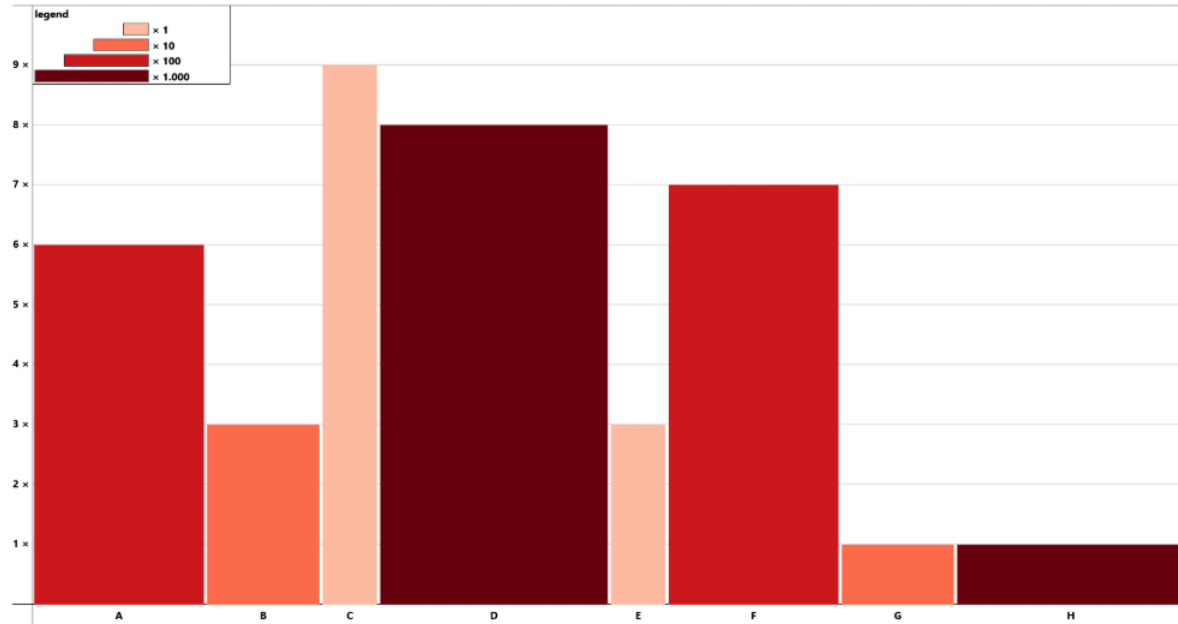
none

If you are ready to continue the study, please click on the "Next" button.

Remember to read the value(s) carefully but as quickly as you can.

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Next



13. Please enter the ratio of two given bars into the text box.

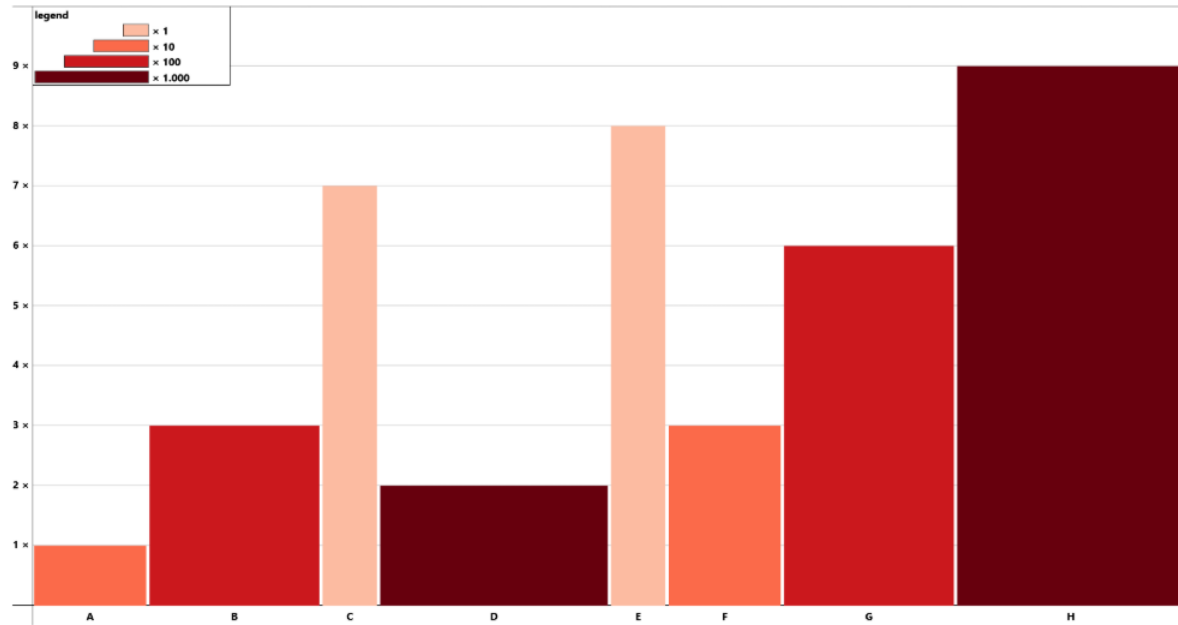
Divide the larger value by the smaller value. The ratio is a number.

A & B

Back

Next

63% completed



14. Please enter the ratio of two given bars into the text box.

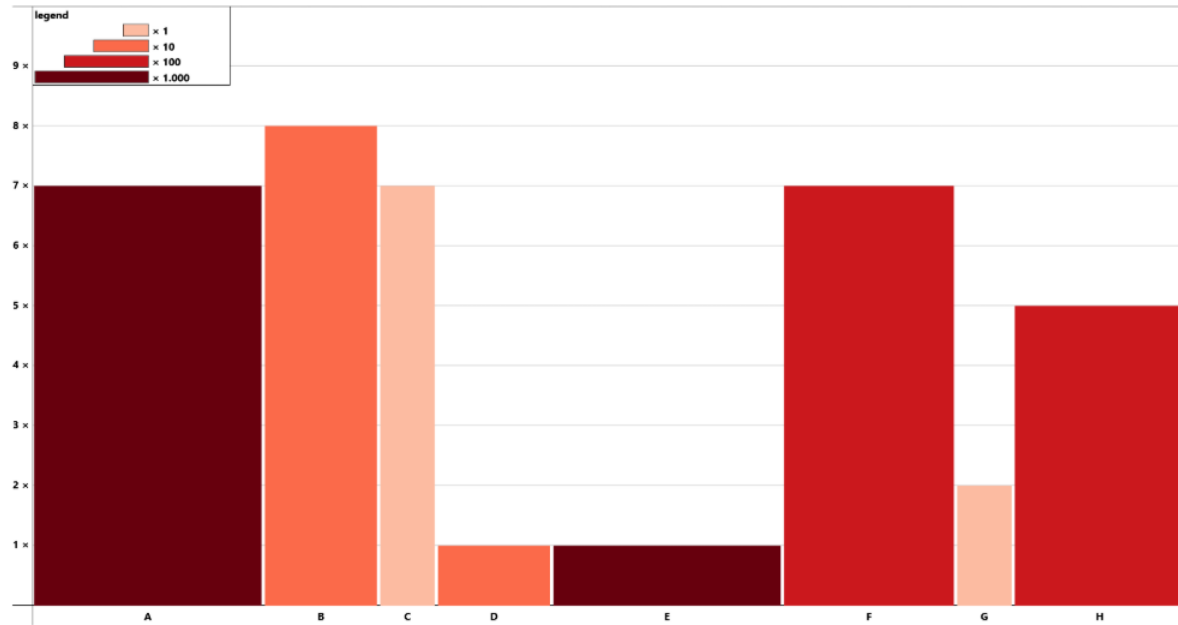
Divide the larger value by the smaller value. The ratio is a number.

A & E

Back

Next

66% completed



15. Please enter the ratio of two given bars into the text box.

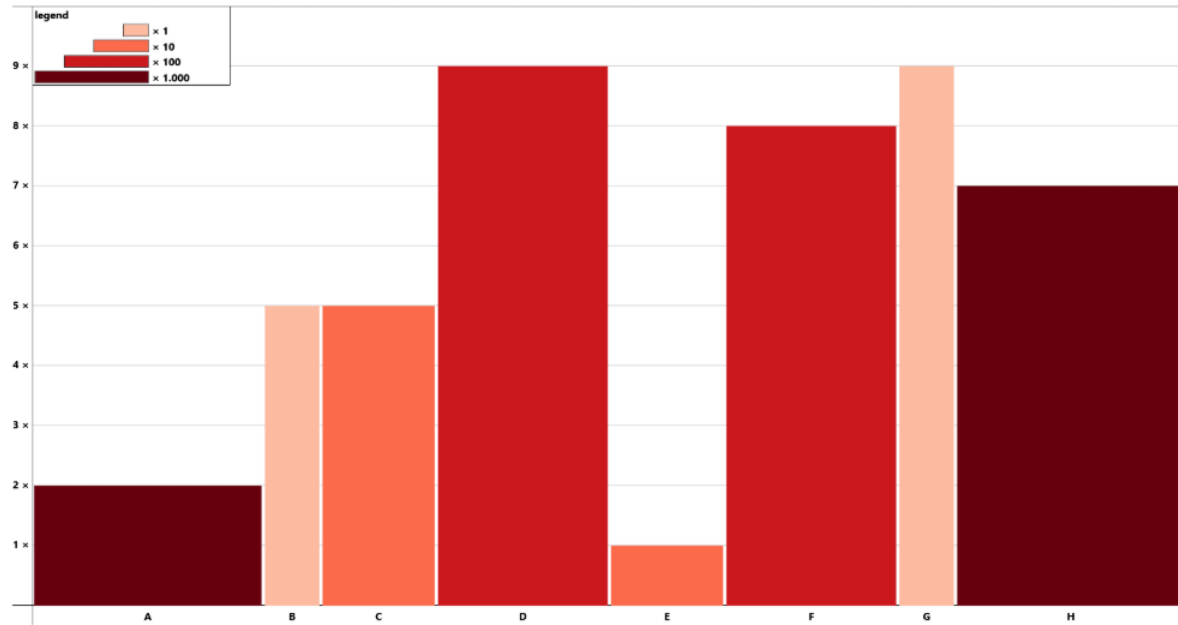
Divide the larger value by the smaller value. The ratio is a number.

A & H

Back

Next

68% completed



16. Please enter the ratio of two given bars into the text box.

Divide the larger value by the smaller value. The ratio is a number.

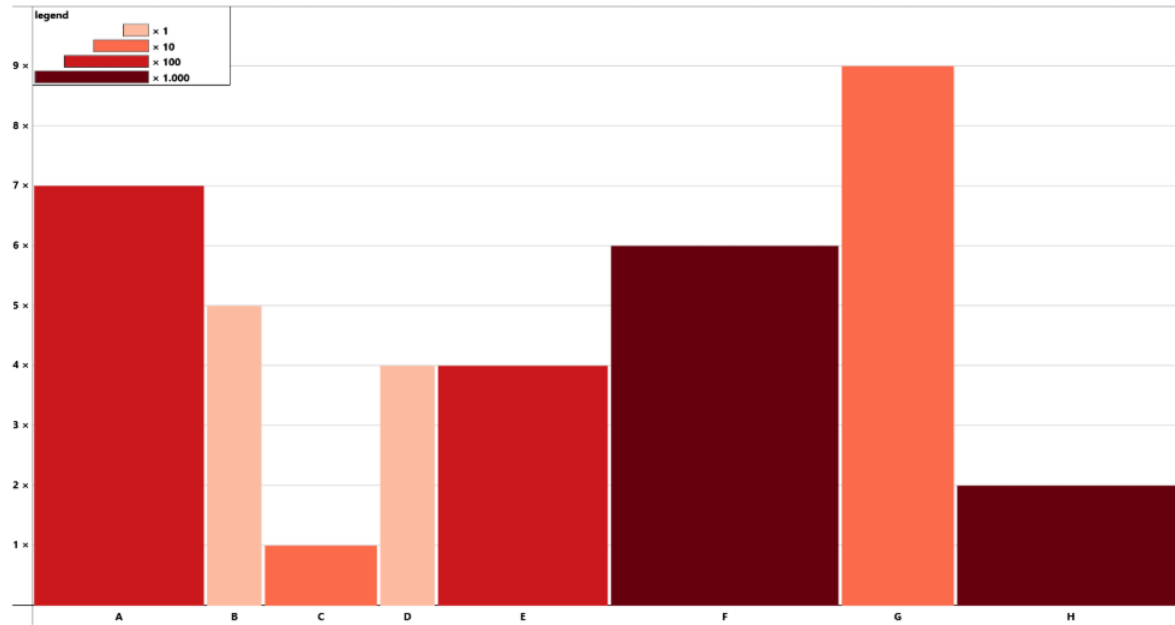
A & B

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Next

71% completed

Page 17



17. Please enter the ratio of two given bars into the text box.

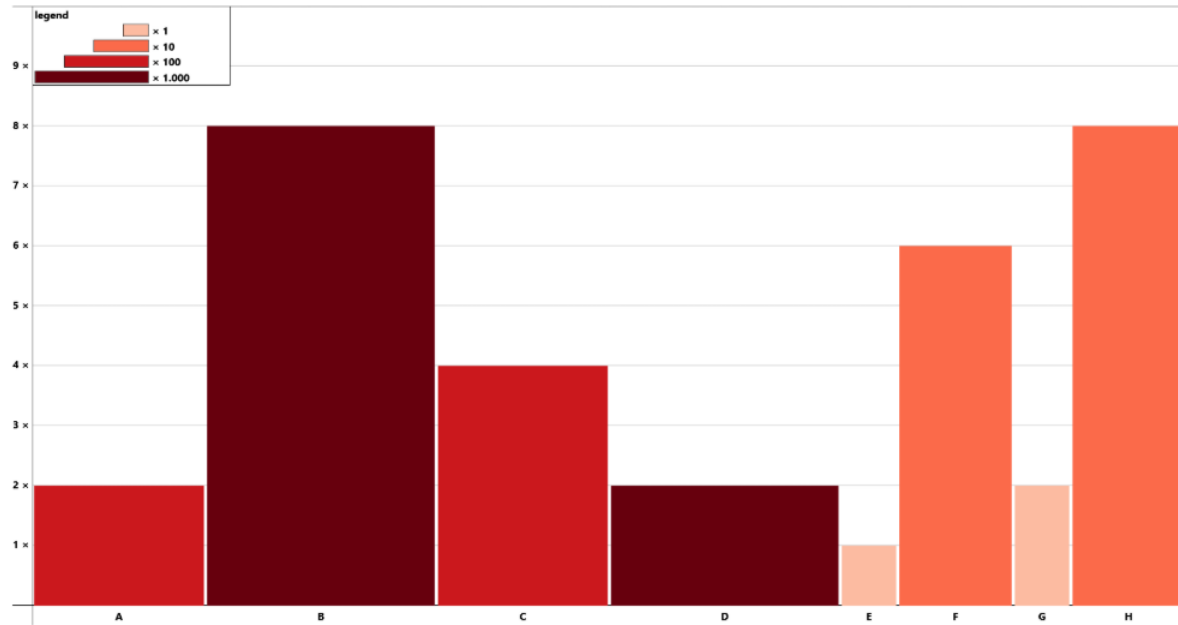
Divide the larger value by the smaller value. The ratio is a number.

A & E

Back

Next

74% completed



18. Please enter the ratio of two given bars into the text box.

Divide the larger value by the smaller value. The ratio is a number.

A & H

Back

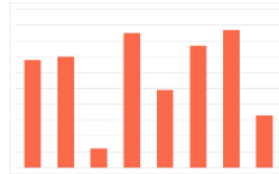
Next

76% completed

Break 🍵

This is a short break. Calm down and answer one question, please.
Take as long time as you want to and answer honestly.

Please select the bar chart.



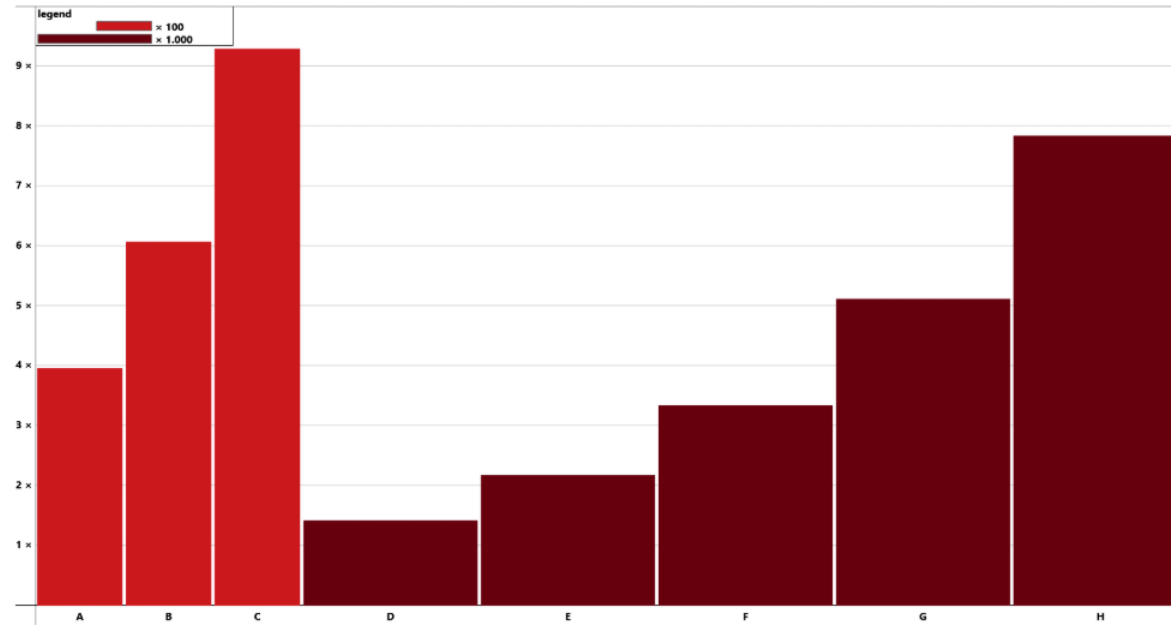
If you are ready to continue the study, please click on the "Next" button.

Remember to read the value(s) carefully but as quickly as you can.

Back

Next

79% completed



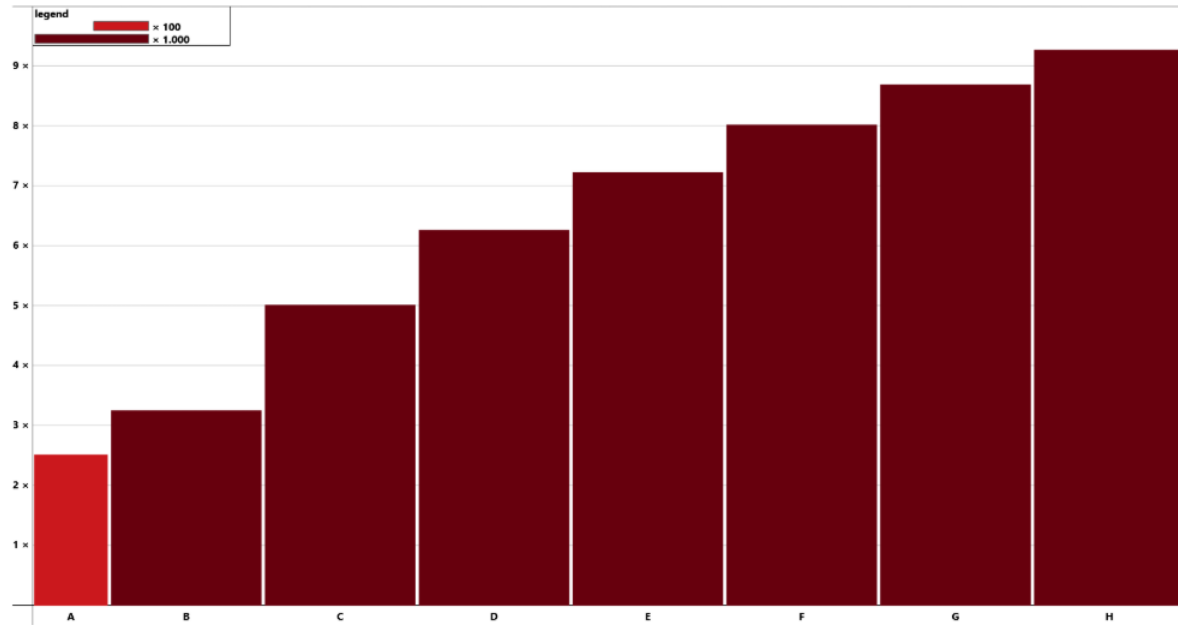
19. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none

Back

Next

82% completed



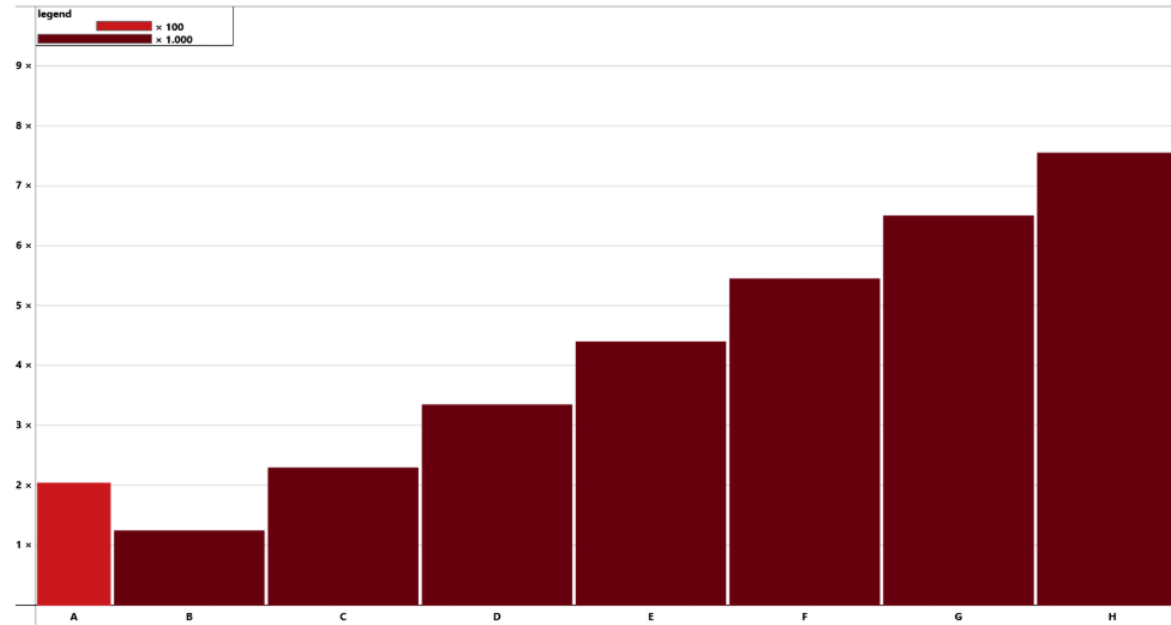
20. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none

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Next

84% completed

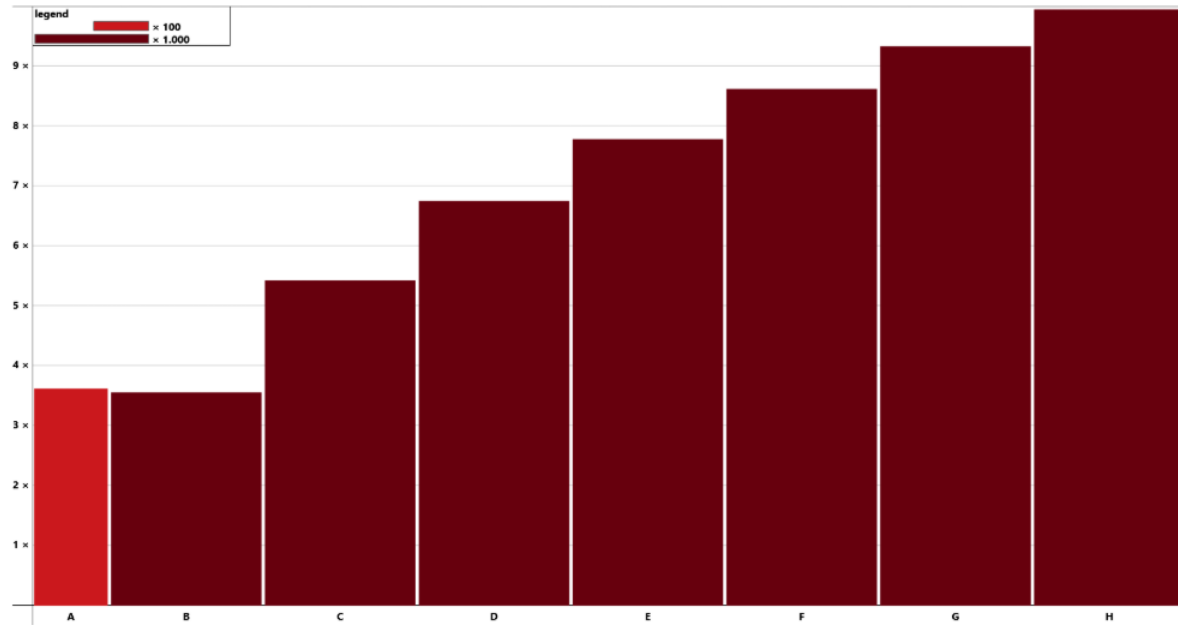


21. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none

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Next

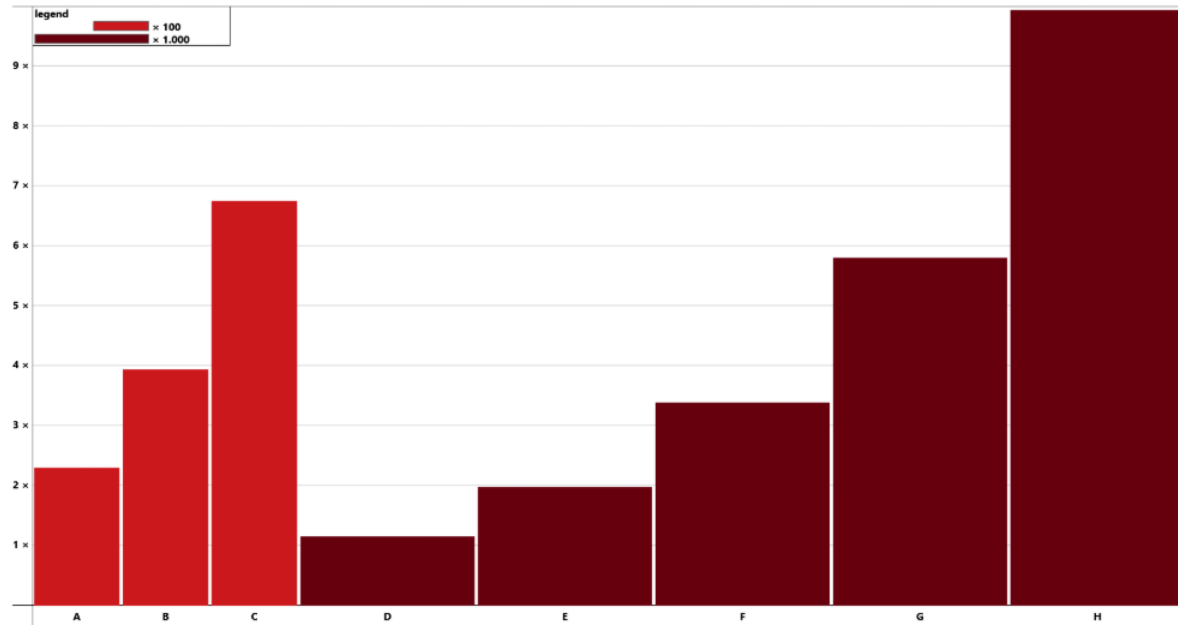


22. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none

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Next



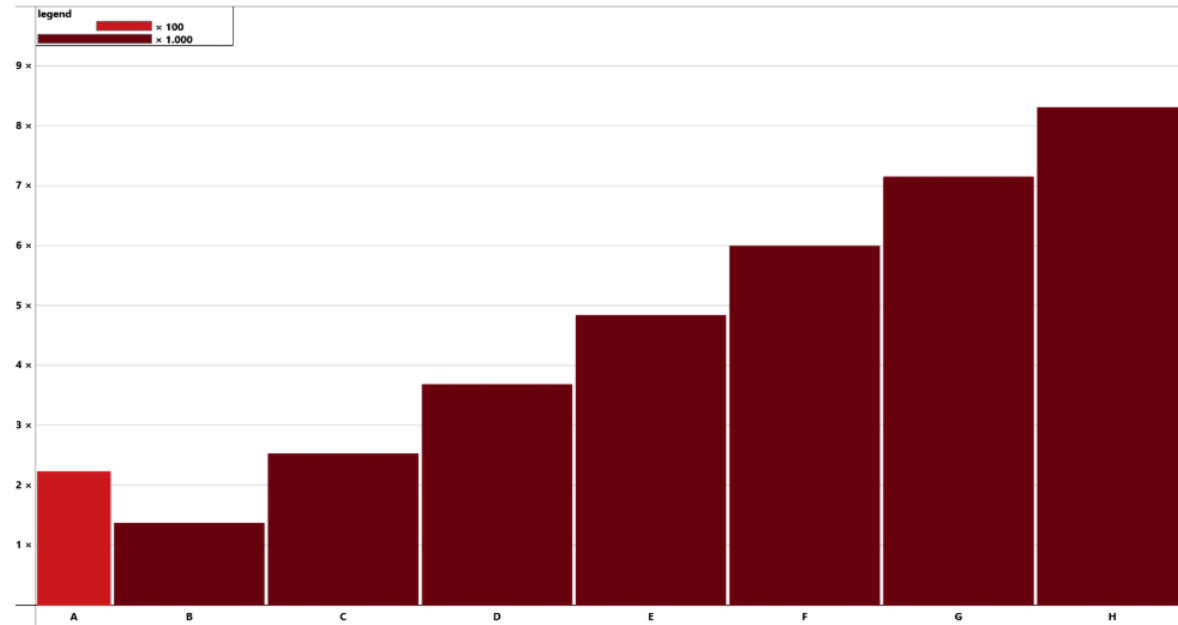
23. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none

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Next

92% completed



24. Please identify the trend type in the chart.

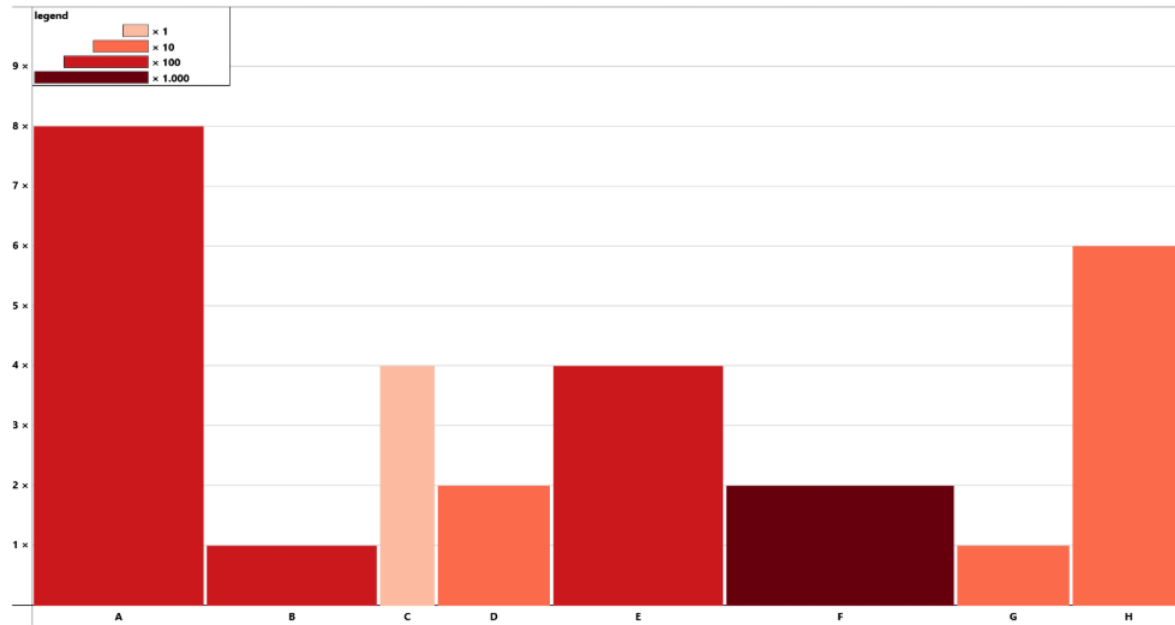
- exponential
- linear
- logarithmic
- none

Back

Next

95% completed

additional questions



Could you imagine using this design?

If so, please consider a context?

yes

no

[Back](#)

[Next](#)

97% completed

additional questions

Personal opinion

If you have any comments or information that you have not yet been able to write down, you can do so here. This could be, for example, the following:

- Difficulties in answering individual questions
- Something you found particularly appealing
- ...

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97% completed

Thank you for participating in this study!
