

## JAF03 Lesson 9 Graphs and calculations

### Warm-up:

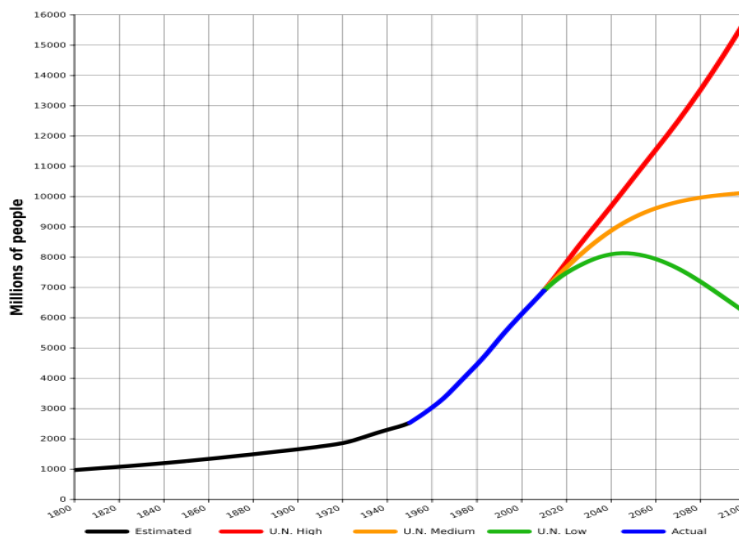
1. How could you describe number 2 in mathematical terms?
2. What basic mathematical operations do you know?
3. Put the following statements into mathematical notation:
  - a) the squared sum of  $x$  and  $y$  is equal to the sum of  $x$  squared, the product of two  $x$  and  $y$ , and  $y$  squared;
  - b)  $x$  to the power of minus 10 is less than cube root of  $y$ .

### Graphs and charts

Charts and graphs measure various statistics and are helpful when presenting large amounts of information that need to be understood quickly. This includes: facts and figures, statistical information, profit and loss, polling information, etc.

**What are graphs used for in physics? What information do we have to include when plotting a graph?**

#### 1. World population – describing trends



World population estimates from 1800 to 2100, based on "high", "medium" and "low" United Nations projections in 2010 (colored red, orange and green) and US Census Bureau historical estimates (in black). Actual recorded population figures are colored in blue.

#### a) Complete the gaps with the words below:

*seen range show remain experienced stood declined increase peaked*

The world population has (1) \_\_\_\_\_ continuous growth since the end of the Great Famine and the Black Death in 1350, when it (2) \_\_\_\_\_ at around 370 million. The highest rates of growth – global population increases above 1.8% per year – were (3) \_\_\_\_\_ briefly during the 1950s, and for a longer period during the 1960s and 1970s. The growth rate (4) \_\_\_\_\_ at 2.2% in 1963, then (5) \_\_\_\_\_ to below 1.1% by 2012. Total annual births were highest in the late 1980s at about 138 million, and are now expected to (6) \_\_\_\_\_ essentially constant at their 2011 level of 134 million, while deaths number 56 million per year, and are expected to (7) \_\_\_\_\_ to 80 million per year by 2040.

Current UN projections (8) \_\_\_\_\_ a continued increase in population in the near future (but a steady decline in the population growth rate), with the global population expected to reach between 8.3 and 10.9 billion by 2050. UN Population Division estimates for the year 2150 (9) \_\_\_\_\_ between 3.2 and 24.8 billion; mathematical modeling supports the lower estimate. Some analysts have questioned the sustainability of further world population growth, highlighting the growing pressures on the environment, global food supplies, and energy resources.

[http://en.wikipedia.org/wiki/World\\_population](http://en.wikipedia.org/wiki/World_population)

**b) Now fill in the missing prepositions:**

To peak \_\_\_\_\_ 17%

To increase \_\_\_\_\_ 2% / to increase \_\_\_\_\_ 2%

To decline \_\_\_\_\_ below 3 billion

To range \_\_\_\_\_ 4.5 and 5.3 billion / to range \_\_\_\_\_ A to Z

**c) Which of the verbs below can be used to refer to diagrams?**

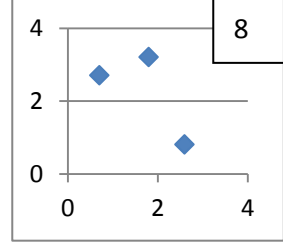
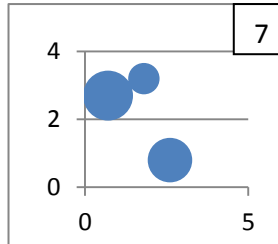
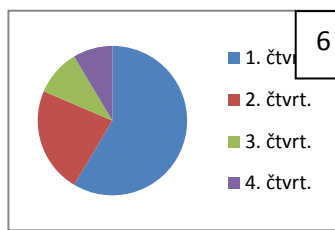
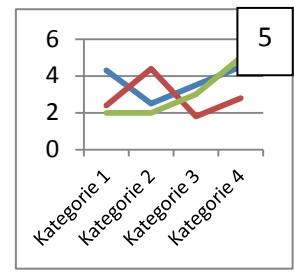
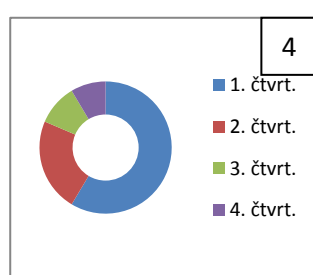
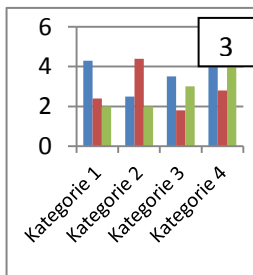
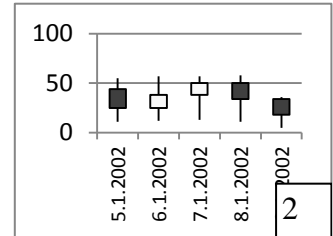
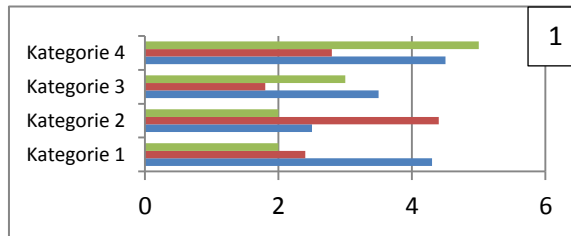
illustrates shows believes suggests indicates represents states  
demonstrates argues reflects

**2. Types of graphs**

Match the types of graphs on the left below with their respective charts. Then complete the sentences below.

(<http://office.microsoft.com/en-us/excel-help/available-chart-types-HA010342187.aspx>)

- A column chart
- A line chart
- A pie chart
- A bar chart
- An XY (scatter) chart
- A stock chart
- A doughnut chart
- A bubble chart



- a) \_\_\_\_\_ are often a good choice to show comparisons among data.
- b) \_\_\_\_\_ are well suited to showing change over time.
- c) \_\_\_\_\_ are well suited for showing parts of a whole.
- d) Like a pie chart, a \_\_\_\_\_ shows the relationship of parts to a whole, but it can contain more than one data series.
- e) You could use a \_\_\_\_\_ chart to indicate the fluctuation of daily or annual temperatures.

### 3. Language of Graphs and Charts

(<http://esl.about.com/od/businessmeetings/a/Language-Of-Graphs-And-Charts.htm>)

#### Useful phrases used to describe common bar charts, line charts and pie charts

There are a number of specific words and phrases used to describe and discuss graphs and charts. This vocabulary is especially important when presenting to groups of people. Much of the language of graphs and charts relates to movement. In other words, the language of graphs and charts often speaks of small or large movement or differences between various data points. Refer to this language of graphs and charts to help improve your ability to speak about graphs and charts.

The following list the verb and noun used to speak about positive and negative movements, as well as predictions. Example sentences are included in each section.

#### Positive

to climb - a climb  
to ascend - an ascent  
to rise - a rise  
to improve - an improvement  
to recover - a recovery  
to increase - an increase

*Sales have climbed over the past two quarters.  
We've experienced a rise in consumer demand.  
Consumer confidence recovered in the second quarter.  
There has been an increase of 23% since June.  
Have you seen any improvement in customer satisfaction?*

#### Negative

to fall - a fall  
to decline - a decline  
to plunge - a plunge  
to decrease - a decrease  
to worsen - a slip  
to deteriorate - a dip

*Research and development spending has fallen by 30% since January.  
Unfortunately, we've seen a decline over the past three months.  
As you can see, sales have plunged in northwest region.  
Government spending has decreased by 10% over the past two years.  
There's been a slip in profits this past quarter.*

#### Predicting Future Movement

to project - a projection  
to forecast - a forecast  
to predict - a prediction

*We project improved sales in the coming months.  
As you can see from the chart, we forecast increased research and development spending next year.  
We predict improving sales through June.*

**a) Now transform these sentences using the given word so that they mean the same:**

- a) There's been a slight decline in sales.  
Sales .....
- b) We made a sharp increase in investment.  
Investment .....
- c) There was an abrupt drop in sales in March.  
Sales.....
- d) Unfortunately, consumer interest suddenly decreased.  
There.....
- e) The dramatic growth has come after we invested in a new product line.  
We've .....
- f) Profit has been flat over the past two years.  
There.....
- g) There has been steady improvement over the past three months.  
Sales .....

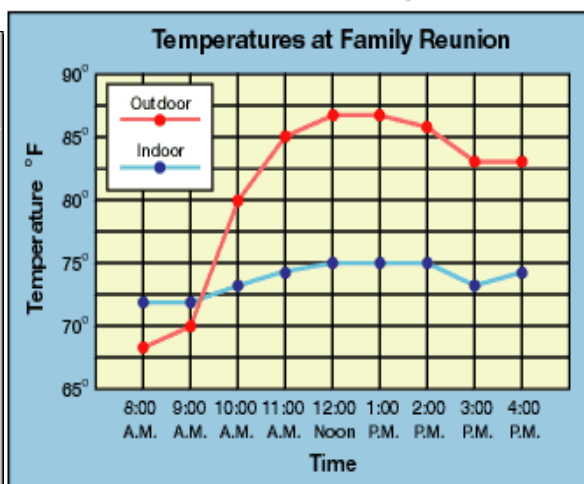
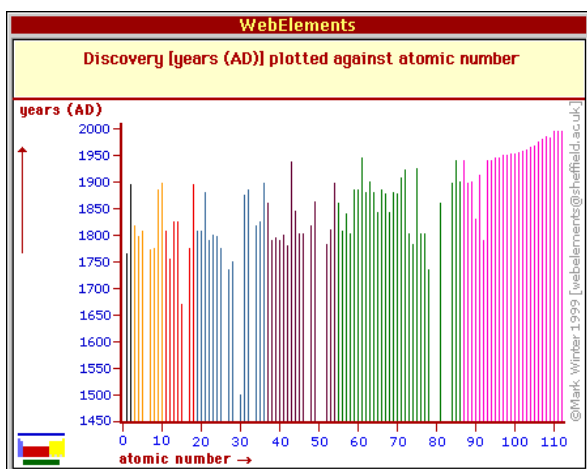
**b) Complete the following tables supplying the appropriate vocabulary.**

<p><b>VERB</b> to rise to increase to improve to fall to decrease to recover</p>	<p><b>ADJECTIVE</b> slight sharp dramatic steady</p>	<p><b>ADVERB</b> slightly</p>	<p><b>NOUN</b></p> <p><b>HOW MUCH CHANGE?</b> very small</p>
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**c) Use the following graphs and the vocabulary from the above tables to describe the movement of the various objects concerned.**

[http://www.webelements.com/periodicity/discovery/bar\\_chart.html](http://www.webelements.com/periodicity/discovery/bar_chart.html)

[http://www.eduplace.com/math/hmm/background/5/06a/te\\_5\\_06a\\_overview.html](http://www.eduplace.com/math/hmm/background/5/06a/te_5_06a_overview.html)

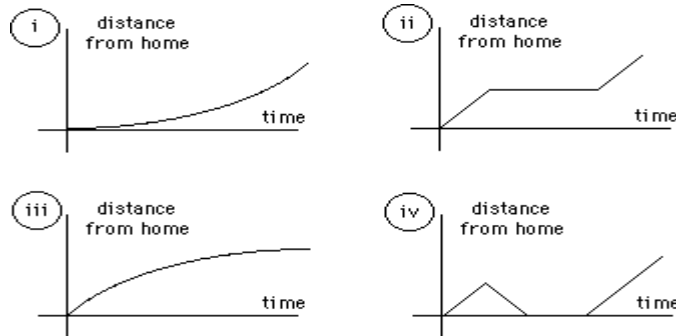


**d) Interpreting Data:**

(<http://staff.tuhsd.k12.az.us/gfoster/standard/bgraph2.htm>)

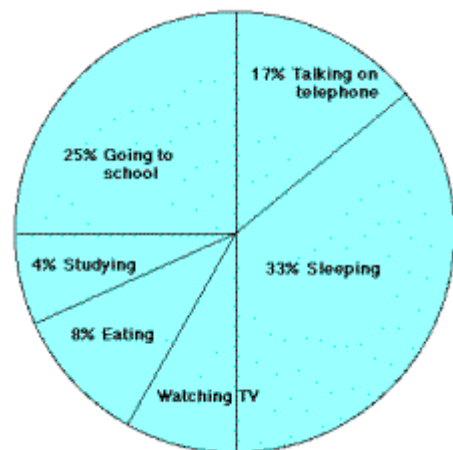
**1. Identify the graph that matches each of the following stories:**

- a. I had just left home when I realized I had forgotten my books so I went back to pick them up.
- b. Things went fine until I had a flat tyre.
- c. I started out calmly, but sped up when I realized I was going to be late.



**2. The graph represents the typical day of a teenager. Answer these questions:**

- a. What per cent of the day is spent watching TV?
- b. How many hours are spent sleeping?



**3. Answer these questions about the data table:**

- a. What is the independent variable on this table?
- b. What is the dependent variable on this table?
- c. Describe the shape of the line graph that this data would produce.

Atomic Number	Ionization Energy (volts)
2	24.46
4	9.28
6	11.22
8	13.55
10	21.47

## Homework

Match the terms below with their definitions:

*median*      *mode*      *mean*      *discreet variable*      *continuous variable*  
*line of best fit*      *outlier*      *interpolation*      *extrapolation*      *trend*      *range*  
*negative correlation*

1. to estimate a value by following a pattern and staying within the values already known
2. a relationship between two sets of data - it will show a positive correlation, a negative correlation, or no correlation
3. upper extreme minus lower extreme
4. a point separated from the main body of the data
5. to estimate a value by following a pattern and going beyond the values already known
6. the middle value of all the numbers in the sample
7. the most frequently observed value of the measurements in the sample
8. the sum of all the results included in the sample divided by the number of observations
9. one set of data decreases as the other set of data increases
10. a line on a scatter plot which can be drawn near the points to more clearly show the trend between two sets of data
11. measurements that are distinct, periodic, and unconnected between data points
12. measurements are uninterrupted and connected between data points (e.g. growth of a plant)