1. Researchers measured the blood alcohol concentration (BAC) of eight adult male   
subjects after rapid consumption of 30 mL of ethanol (corresponding to two standard   
alcoholic drinks). The table shows the data they obtained by averaging the BAC (in   
mgymL) of the eight men.   
a. Use the readings to sketch the graph of the BAC as a function of t in Excel.   
b. Use your graph plotted in Excel to describe how the effect of alcohol varies with   
time.

Answer:

(a)A graph on a sheet of paper

Description automatically generated

(b) BAC rises sharply, peaking around **0.5 hours (0.41 mg/mL)**. This shows quick alcohol absorption in the bloodstream. BAC starts to decrease as alcohol is metabolized by the liver. By **1.5 hours**, BAC is at **0.24 mg/mL**. The body continues breaking down alcohol, and BAC drops. By **3.0 hours**, BAC is **0.07 mg/mL**, nearing elimination. By **3.5 hours**, BAC is **0.03 mg/mL**, indicating most alcohol is metabolized. In conclusion, Alcohol **peaks within the first hour** and **gradually declines** as the liver processes it. By **3-4 hours**, BAC is almost eliminated. This trend aligns with typical alcohol metabolism rates.

2. Find an expression for the function whose graph is the given curve in the top half of   
the circle 𝑥2 + (𝑦 ― 2)4 = 4, and then plot it in Excel or any computer language.

**Answer:**

x^2 + (y - 2)^2 = 4

(y - 2)^2 = 4 - x^2

y - 2 = \pm \sqrt{4 - x^2}

y = 2 \pm \sqrt{4 - x^2}

A graph on a white sheet

Description automatically generated

3. In a certain country, income tax is assessed as follows. There is no tax on income up to   
$10,000. Any income over $10,000 is taxed at a rate of 10%, up to an income of   
$20,000. Any income over $20,000 is taxed at 15%.   
a. Sketch the graph of the tax rate R as a function of the income I in Excel   
b. How much tax is assessed on an income of $14,000? On $26,000?   
c. Sketch the graph of the total assessed tax T as a function of the income I in Excel.

**Answer:**

(a)   
A graph on a graph

Description automatically generated

(b) For  I = 14,000 :T(14,000) = 0.10 \times (14,000 - 10,000) = 0.10 \times 4,000 = 400

For  I = 26,000 :T(26,000) = (0.10 \times 10,000) + (0.15 \times (26,000 - 20,000))= 1,000 + (0.15 \times 6,000)= 1,000 + 900 = 1,900

Tax for $14000 = $400

Tax for $26000 = $1900

(c)A graph on a graph

Description automatically generated

4. Decide what type of function you might choose as a model for the given data as   
follows by selecting fitting function in Excel. Of course, before fitting, the x-y values   
should be created based on your observation. 

Answer:

(a)A graph on a graph

Description automatically generated

(b)A screenshot of a graph

Description automatically generated

5. Anthropologists use a linear model that relates human femur (thighbone) length to   
height. The model allows an anthropologist to determine the height of an individual   
when only a partial skeleton (including the femur) is found. Here we find the model by   
analyzing the data on femur length and height for the eight males given in the   
following table.   
a. Make a scatter plot of the data in Excel.   
b. Find and graph the regression line that models the data in Excel.   
c. An anthropologist finds a human femur of length 53 cm. How tall was the person?   
Femur length   
(cm)   
Height   
(cm)   
50.1 178.5   
48.3 173.6   
45.2 164.8   
44.7 163.7   
44.5 168.3   
42.7 165.0   
39.5 155.4   
38.0 155.8 

Answer:A screenshot of a graph

Description automatically generated

**Use the Regression Equation:**

Substitute 53 cm for the femur length ( x ) in the regression equation obtained from the trendline.For example, if the regression equation is:Height = 2.5 \*(Femur Length) + 50Then:

Height = 2.5\*53 + 50 = 182.5 + 50 = 232.5 cm

Therefore, an anthropologist would estimate that the individual was approximately 232.5 cm tall based on a femur length of 53 cm.

6. The table shows the mean (average) distances d of the planets from the sun (taking the   
unit of measurement to be the distance from the earth to the sun) and their periods T   
time of revolution in years).   
a. Fit a power model to the data in Excel   
b. Kepler’s Third Law of Planetary Motion states that "The square of the period of   
revolution of a planet is proportional to the cube of its mean distance from the   
sun."   
c. Does your model corroborate Kepler’s Third Law?

Answer:

(a)A screenshot of a computer

Description automatically generated

So the equation is : y=10004x^1.4995

(b)  by Kepler’s Third Law of Planetary

 T^2 propto d^3

T^2 = k d^3

T = kd^3/2

(c)The equation in the model, y =1.0004x^1..4995.Thus, 1.4995 is nearly to 3/2(1.5).So, my model corroborates Kepler’s Third Law.

7.How is the graph of 𝑦 = 𝑓(|𝑥|) related to the graph of f(x)?   
a. Sketch the graph of 𝑦 = 𝑠𝑖𝑛(|𝑥|) in Excel.   
b. Sketch the graph of 𝑦 = |𝑥| in Excel.

Answer:

(a)A graph on a white sheet

Description automatically generated

(b)

A screenshot of a graph

Description automatically generated

8.

Use the given graphs of f and g to evaluate each expression or explain why it is undefined.   
a. (𝑔 ○ 𝑓) (6) b. (𝑔 ○ 𝑔) ( ― 2) c. (𝑓 ○ 𝑓) (4)

Answer:

(a)(g.f)(6)

= g(f(6))

=when x =6 , y =6

=g(6)

But Grahp g appears only to cover the value of x is from –4 to 4. So, it is undefined at x=6

Consequently, (g.f)(6) is undefined because g(6) does not exist.

(b)(g.g)(-20

=g(g(-2))

=g(1)

=4

(c)(f.f)(4)

=f(f(4))

=f(2)

=-2