



Grade 6

A case study

A student from India

Studying with us for last two years

The teachers have put a gag order on him so that others get a chance to answer questions in class.

- A batchmate of the student in his school who joined us recently.

The beginning

- The student is a resident of India of Indian origin.
- He was a typical average student for his age.
- He was studying in a reputed English medium school.
- His speaking and writing skills in English were very poor.
- His performance in math and science was similar to that of an average student in a good school.

All the screenshots of the activities are taken from **work done by the student** in the last two years.

No other work of his batch has been included in this document.

The start

- We started with a weekend batch with two one-hour sessions per week. This batch was already running for US students.
- He joined another batch with four one-hour sessions per week, in addition to the weekend batch.
- We stuck to our policy of:
 - No memorization
 - No homework
 - No extra study hours
 - Enjoy studies
 - Have fun while learning

* We don't charge extra if a student joins multiple batches.



Story of the next two years

A summary of the activities the student has done in the last two years since he joined us.



Snapshot of his online folder

All students have their individual online folders of activities, which include programming as well as non-programming activities.

The recordings and notes of sessions are stored separately and made accessible to the students.

Select items to perform actions on them.

☐ 0	▼	📁 / [redacted]
☐		..
☐		3D plotting
☐		A.project_stuff
☐		animation
☐		astronomy
☐		[redacted]
☐		english
☐		fun
☐		geo
☐		GRAF
☐		histroy
☐		HTML
☐		input
☐		managers
☐		maths
☐		mythology
☐		ploting
☐		programing
☐		science

☐ 0	▼	📁 [redacted] managers
☐		..
☐		basic plotting
☐		sscience
☐		ArithmeticOperationManager.ipynb
☐		BookManager.ipynb
☐		CalendarManager.ipynb
☐		DataHandlingManager-ploting.ipynb
☐		DataHandlingManager.ipynb
☐		ElementaryIntegerManager.ipynb
☐		FastArithmeticManager-Copy1.ipynb
☐		FastArithmeticManager-Copy2.ipynb
☐		FastArithmeticManager.ipynb
☐		GraphManager.ipynb
☐		MatrixManager.ipynb
☐		MovementPlottingManager.ipynb
☐		PowerManager.2-Copy1.ipynb
☐		PowerManager.2.ipynb
☐		3d plottingmanager.ipynb
☐		AdvancedPowerManager.2.ipynb
☐		AlgebricExpressionManager.ipynb
☐		AreaManager.ipynb

☐		AreaManager.ipynb
☐		ArithmeticExpressionManager.2.ipynb
☐		ArithmeticExpressionManager.ipynb
☐		ArithmeticInequalityManager.ipynb
☐		ArithmeticManager.ipynb
☐		BasicGeometricCalculationManager.ipynb
☐		BasicGeometricCalculationManager_Practice.ipynb
☐		BasicOperationManager.ipynb
☐		BasicPlottingManager.ipynb
☐		BookManager.ipynb
☐		CircleManager.ipynb
☐		DecimalOperationManager.ipynb
☐		DivisibilityManager.ipynb
☐		FastCalculationManager.ipynb
☐		FlowchartManager.ipynb
☐		from xv.math.basicmaths import PrimeNumberManager.ipynb
☐		GeometricSeriesManager.ipynb
☐		Grade6MathManager.ipynb
☐		Grade7MathManager.ipynb
☐		GraphManager.ipynb
☐		HistoryComprehensionManager.ipynb
☐		JokesManager.ipynb

☐		LomManager.ipynb
☐		LearnLanguageManager.ipynb
☐		LogarithmManager.ipynb
☐		MovementPlottingManager-practice.ipynb
☐		MovementPlottingManager.ipynb
☐		MultiVariableManager.2.ipynb
☐		MultiVariableManager.ipynb
☐		NumberSystemManager.2.ipynb
☐		NumberSystemManager.ipynb
☐		NumberUnitManager.ipynb
☐		PeriodicTableManager.ipynb
☐		practice calendar manager.ipynb
☐		ProbabilityManager.ipynb
☐		ratio plotting.ipynb
☐		RatioManager.ipynb
☐		RationalNumberManager.ipynb
☐		RationalNumberManager2.ipynb
☐		SeriesPatternManager.ipynb
☐		SimpleArithmeticManager--2.ipynb
☐		SimpleArithmeticManager.ipynb
☐		SingleVariableManager.2.ipynb
☐		SingleVariableManager.ipynb
☐		SpellingManager.ipynb
☐		StatementToExprManager.ipynb
☐		TimeManager.ipynb
☐		Untitled.ipynb
☐		UsageManager.ipynb
☐		Vocabulary Manager.ipynb
☐		WordManager.ipynb

0

/

maths

..

RationalNumberLine.ipynb

printing the calendar.ipynb

15min barchart.ipynb

algebraic math.ipynb

ArithmeticInequalityManager_practice.ipynb

barchart3.ipynb

i dont know the name.ipynb

Inequality.ipynb

mils and km.ipynb

multy.ipynb

np.array.ipynb

number-line.ipynb

numpy-and-graph.ipynb

pandas.ipynb

plotting eqations.ipynb

☐	multy.ipynb
☐	np.array.ipynb
☐	number-line.ipynb
☐	numpy-and-graph.ipynb
☐	pandas.ipynb
☐	plotting eqations.ipynb
☐	point_postion.ipynb
☐	printing calender.ipynb
☐	range list.ipynb
☐	range open and close.ipynb
☐	range.ipynb
☐	rate, slope.ipynb
☐	Rational and Fractional Numbers.ipynb
☐	RationalNumberLine.ipynb
☐	sin-cos-tan.ipynb
☐	sires.ipynb
☐	sympy.abc.ipynb

0

/

ploting

⌵

..

⌵

crazy 3D stuff

⌵

games

⌵

goodme

⌵

input

⌵

manga ep

⌵

output

⌵

range and liinspace.ipynb

⌵

2d ploting .ipynb

⌵

3d blabla.ipynb

⌵

3d plotting.ipynb

⌵

< or >.ipynb

⌵

american revolution.ipynb

⌵

Animate Circle.ipynb

⌵

Animation of points.ipynb

⌵

animation.1.ipynb

⌵

animation.2-Copy1.ipynb

⌵

animation.2.ipynb

⌵

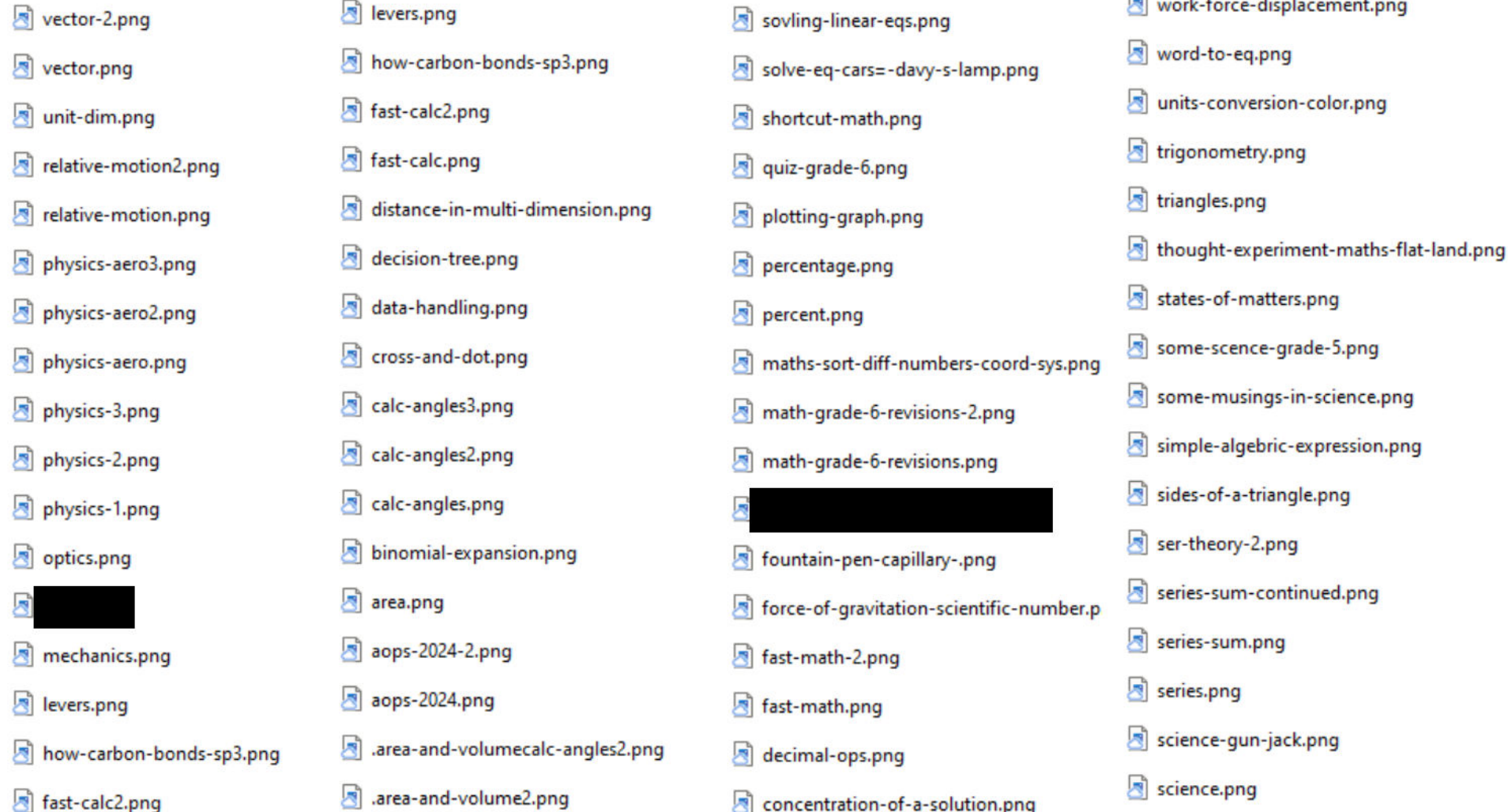
animation.ipynb

⌵

annimation-star.ipynb

☐	blabla plotting.ipynb
☐	blabla.ipynb
☐	carrm bord.2.ipynb
☐	carrm bord.ipynb
☐	cartuns.ipynb
☐	chart stuff.ipynb
☐	charts.ipynb
☐	circle 2.ipynb
☐	circle 3.ipynb
☐	circlemanagerpractice.ipynb
☐	colours and shapes.ipynb
☐	COMPARE-NUMBERS.ipynb
☐	coolnes.ipynb
☐	difference .ipynb
☐	differint shaps.ipynb
☐	draw-carrmm-bord.ipynb
☐	draw-circle.ipynb
☐	draw_circle-day_2.ipynb
☐	draw_circle-day_3.ipynb
☐	draw_circle-day_4_the_circle_masterpice.ipynb
☐	draw_circle.ipynb
☐	drawing family.ipynb

Partial snapshot of the notes folder of his batch



190111C

 religion-dateline.png

 religion..png

 ration-and-proportions.png

 quiz-greek.png

 pressure-energy-hydraulic-jack.png

 physics-pressure.png

 pert-cpm-diff-cost.png

 muti-digit-number.png

 maths-ratios-greek-mythology.png

 maths-logic.png

 maths-dis-time-speed.png

 Maths-algebra.png

 math-review.png

 math-arithmetic-review.png

 light.png

 geometry-vector-what-is-this.png

 geometry.png

 fractions.png

 eq-what-is-this.png

 electricity-2.png

 divide-into-parts.png

 distance-time.png

 distance-speech-times.png

 current.png

 co-ordinnates.png

 company-valuation.png

 classification-triangles.png

 classes-for-python-chap.png

 chemistry-percentage.png

 chemistry.png

 calculate-gravitational-force.png

 body-parts-elements-neutrients.png

 atom-str.png

 arithmetic-series.png

 [REDACTED]

 volcano-2.png

 volcano.png

 venn-diagram.png

 trigonometry.png

 story-of-matter.png

 statistics-introduction.png

 solving-variables.png

 recurring-decimal.png

 ratios.png

 percentage.png

 one-ly-to-km.png

 number-operations.png

 mixed-num.png

 matrix.png

 maths-history.png

 math-estimate.png

 lcm.png

 latitude-longitude-plane-of-revolution.p.

 jump-and-slide.png

 irrational.png

 how-fountain-pens-work.png

 fractions-heartfelt-heartiest.png

 fractions.png

 english-words-angles.png

 drawing.png

 [REDACTED]

 decimal-operations.png

 data-handling-2.png

 data-handling.png

 classification-of-living-beings.png

 arithmetic-with-units.png

 arithmetic-arrangement.png

 arithmetic.png

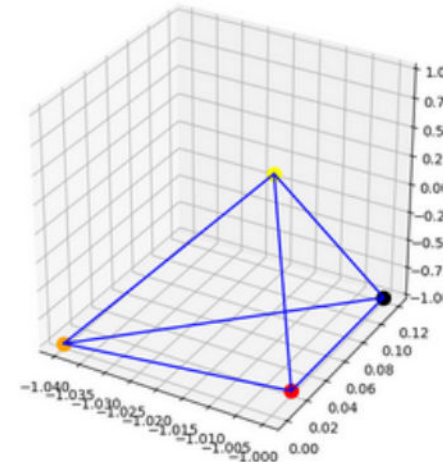
He, like all our students, is also a good programmer because that helps them in better and faster learning of Math, Science, English, Geography, and other subjects.

He knows Python, HTML, CSS and SVG.

Learning geometry through programming

- He loves programming.
- Plotting in Python made learning geometry easier and faster.
- It was not just about writing code but finding the right coordinates of the points, lines, and other shapes.

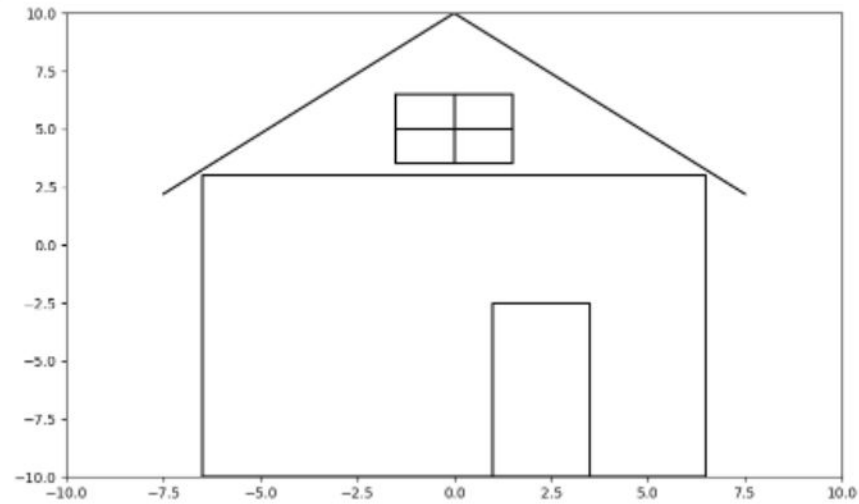
```
In [18]: 1 fig = plt.figure(figsize = (8, 8))
2 ax = fig.add_subplot(projection = '3d', box_aspect = (1, 1, 1))
3
4 ax.plot(-1, 0.02, -1, marker = 'o', markersize = 10, color = 'red')
5 ax.plot(-1.04, 0, -1, marker = 'o', markersize = 10, color = 'orange')
6 ax.plot(-1, 0, 1, marker = 'o', markersize = 10, color = 'yellow')
7 ax.plot(-1, 0.12, -1, marker = 'o', markersize = 10, color = 'black')
8 ax.plot( (-1.04, -1), (0, 0.12), (-1, -1), color = 'blue' )
9 ax.plot( (-1.04, -1), (0, 0), (-1, 1), color = 'blue' )
10 ax.plot( (-1, -1), (0, 0.02), (1, -1), color = 'blue' )
11 ax.plot( (-1.04, -1), (0, 0.02), (-1, -1), color = 'blue' )
12 ax.plot( (-1, -1), (0, 0.12), (1, -1), color = 'blue' )
13 ax.plot( (-1, -1), (0.02, 0.12), (-1, -1), color = 'blue' )
14
Out[18]: [Cmp1_toolkits.mplot3d.art3d.Line3D at 0x7f41f310dd00]
```



```

80 color = 'black'
81 )
82 )
83
84 #plt.plot(1, -10, marker = 'o', color = 'red', markersize = 5)
85 #plt.plot(1, -2.5, marker = 'o', color = 'red', markersize = 5)
86 #plt.plot(3.5, -2.5, marker = 'o', color = 'red', markersize = 5)
87 #plt.plot(3.5, -10, marker = 'o', color = 'red', markersize = 5)
88
89
90 plt.plot(
91     [1, 1, 3.5, 3.5, 1],
92     [-10, -2.5, -2.5, -10, -10],
93     color = 'black'
94 )
95
96
97
98 plt.xlim(-10, 10)
99 plt.ylim(-10, 10)
100 plt.show()
101

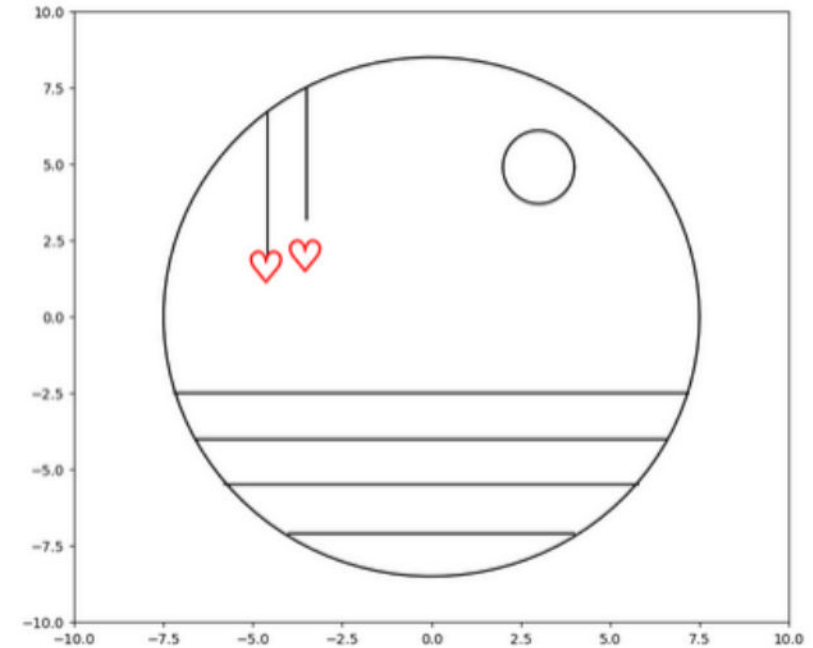
```



```

45
46
47 #plt.plot(-3.5, 7.5, marker = 'o', markersize = 10, color = 'cyan')
48 #plt.plot(-3.5, 2, marker = 'o', markersize = 10, color = 'cyan')
49 plt.plot((-3.5, -3.5), (7.5, 3.2), color = 'black')
50 plt.plot(-3.5, 2, marker = r'$\heartsuit$', markersize = 15, color = 'red')
51
52
53
54
55 plt.xlim(-10, 10)
56 plt.ylim(-10, 10)
57 plt.show()
58

```

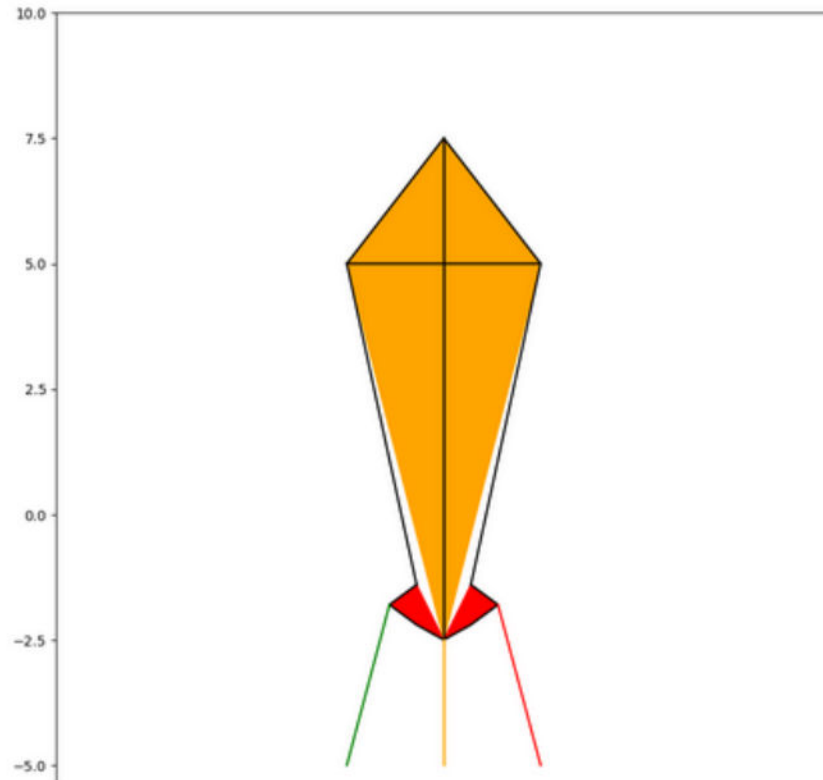


```

26 #plt.plot(-2.5, -5, color = 'yellow', marker = 'o')
27 #plt.plot(0, -5, color = 'red', marker = 'o')
28 #plt.plot(2.5, -5, color = 'black', marker = 'o')
29
30 plt.plot( (-2.5, -1.4), (-5, -1.8), color = 'green' )
31 plt.plot( (0, 0), (-5, -2.5), color = 'orange' )
32 plt.plot( (2.5, 1.4), (-5, -1.8), color = 'red' )
33
34 plt.fill( (0, -0.7, -1.4, -0.7), (-2.5, -2.2, -1.8, -1.4), color = 'red' )
35 plt.fill( (0, 0.7, 1.4, 0.7), (-2.5, -2.2, -1.8, -1.4), color = 'red' )
36 plt.fill( (-2.5, 0, 2.5, -1.5), (5, 7.5, 5, 5), color = 'yellow' )
37 plt.fill( (0, -2.5, 0, 2.5, 0), (7.5, 5, -2.5, 5, 7.5), color = 'orange' )
38
39 plt.xlim(-10, 10)
40 plt.ylim(-10, 10)

```

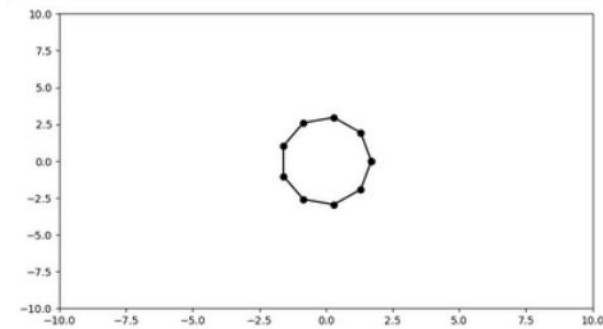
(-10.0, 10.0)



```

1 #ndecagon
2 plt.figure(figsize = (8, 5))
3
4 theta = linspace(0, pi * 2, 10)
5 r1 = 1.7
6 r2 = 3
7 x1 = r1 * cos(theta)
8 y1 = r1 * sin(theta)
9 plt.plot(x1, y1, color = 'black', marker = 'o')
10
11 plt.xlim(-10, 10)
12 plt.ylim(-10, 10)
13 plt.show()

```

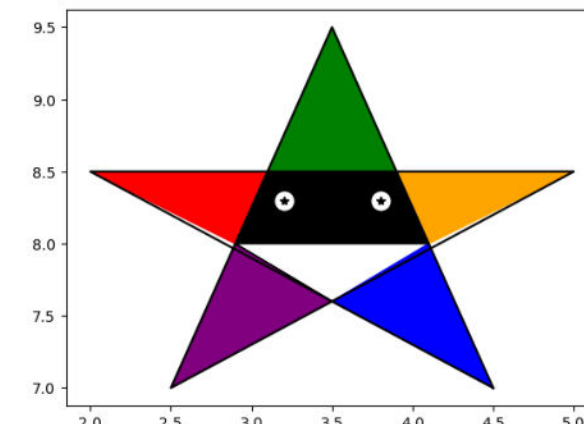


```

65 #eyes
66 plt.plot(3.8, 8.3, marker = 'o', color = 'white', markersize = 12)
67 plt.plot(3.2, 8.3, marker = 'o', color = 'white', markersize = 12)
68 plt.plot(3.8, 8.3, marker = '*', color = 'black', markersize = 6)
69 plt.plot(3.2, 8.3, marker = '*', color = 'black', markersize = 6)

```

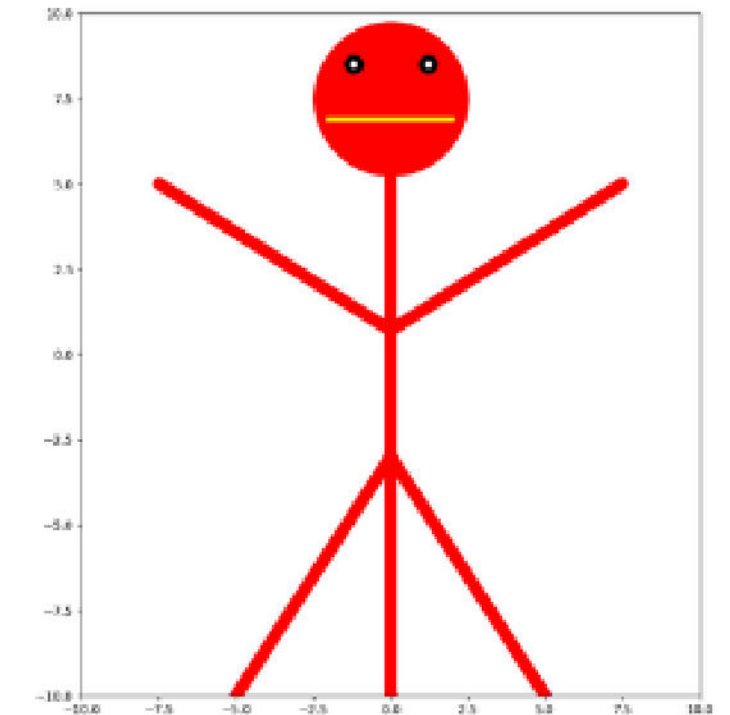
[<matplotlib.lines.Line2D at 0x7f90be4ef7f0>]



```

100 #nose
101 plt.plot(0, -5, marker = 'o', color = 'black', markersize = 10)
102
103 plt.plot(0, -10, marker = 'o', color = 'black', markersize = 10)
104 plt.plot(0, -10, marker = 'o', color = 'black', markersize = 10)
105 plt.plot(0, -10, marker = 'o', color = 'black', markersize = 10)
106 plt.plot(0, -10, marker = 'o', color = 'black', markersize = 10)
107 plt.plot(0, -10, marker = 'o', color = 'black', markersize = 10)
108
109 #body
110 plt.plot(1.2, 0.0, marker = 'o', color = 'black', markersize = 10)
111 plt.plot(1.2, 0.0, marker = 'o', color = 'black', markersize = 10)
112 plt.plot(1.2, 0.0, marker = 'o', color = 'black', markersize = 10)
113 plt.plot(1.2, 0.0, marker = 'o', color = 'black', markersize = 10)
114 plt.plot(1.2, 0.0, marker = 'o', color = 'black', markersize = 10)
115
116 #limbs
117 plt.plot(2, 0.0, marker = 'o', color = 'black', markersize = 10)
118 plt.plot(2, 0.0, marker = 'o', color = 'black', markersize = 10)
119 plt.plot(2, 0.0, marker = 'o', color = 'black', markersize = 10)
120
121 #feet
122 plt.plot(1.2, 2, marker = 'o', color = 'black', markersize = 10)
123 plt.plot(1.2, 2, marker = 'o', color = 'black', markersize = 10)
124 plt.plot(1.2, 2, marker = 'o', color = 'black', markersize = 10)
125
126 #show
127 plt.show()

```



Programming for math and other subjects as well.

```
File Edit View Insert Cell Kernel Widgets Help
+ -> <-> Run Code
In [41]: 1 def arith_series(a = 1, d = 3, count = 10):
2 |     s = []
3     n_next = a + d
4     s.append(a)
5     s.append(n_next)
6     print(s)
7     for i in range(count):
8         #print(i)
9
10        n_next = n_next + d
11        s.append(n_next)
12        print(s)
13
14
15        pass
16        pass
In [42]: 1 arith_series(a = 1, d = 4)
```

```
[1, 5]
[1, 5, 9]
[1, 5, 9, 13]
[1, 5, 9, 13, 17]
[1, 5, 9, 13, 17, 21]
[1, 5, 9, 13, 17, 21, 25]
[1, 5, 9, 13, 17, 21, 25, 29]
[1, 5, 9, 13, 17, 21, 25, 29, 33]
[1, 5, 9, 13, 17, 21, 25, 29, 33, 37]
[1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41]
```

```
File Edit View Insert Cell Kernel Widgets Help
+ -> <-> Run Code
[1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45]
In [43]: 1 def a_series(a = 1, d = 3, count = 10):
2     s = []
3     n_next = a + d
4     s.append(a)
5     s.append(n_next)
6     #print(s)
7     for i in range(count):
8         #print(i)
9
10        n_next = n_next + d
11        s.append(n_next)
12        #print(s)
13        pass
14    return s
15    pass
```

```
In [38]: 1 a_series(a = 3, d = 4)
```

```
Out[38]: [1, 11, 21, 31, 41, 51, 61, 71, 81, 91, 101, 111]
```

```
In [39]: 1 a_series(a = 9, d = 18)
```

```
Out[39]: [9, 27, 45, 63, 81, 99, 117, 135, 153, 171, 189, 207]
```

```
In [40]: 1 a_series(a = 200, d = -46)
```

```
Out[40]: [200, 154, 108, 62, 16, -30, -76, -122, -168, -214, -260, -306]
```



```

Edit View Insert Cell Kernel Widgets Help
[Icons] Run [Icons] Code v [Icon]

In [5]: 1 def g_series(a = 1, r = 3, count = 10):
        2     s = []
        3     n_next = a * r
        4     s.append(a)
        5     s.append(n_next)
        6     #print(s)
        7     for i in range(count):
        8         #print(i)
        9
        10         n_next = n_next * r
        11         s.append(n_next)
        12         #print(s)
        13         pass
        14     return s
        15     pass

```

```

In [6]: 1 g_series(a = 2, r = 3)

Out[6]: [2, 6, 18, 54, 162, 486, 1458, 4374, 13122, 39366, 118098, 354294]

```

```

View Insert Cell Kernel Widgets Help
[Icons] Run [Icons] Code v [Icon]

[0, 1, 1, 2, 3, 5, 8, 13, 21]
[0, 1, 1, 2, 3, 5, 8, 13, 21, 34]
[0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55]
[0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]

1 def fibo_seires(count=10):
2     fs = []
3     n0 = 0
4     n1 = 1
5     n2 = 2
6     fs.append(n0)
7     fs.append(n1)
8     #print(fs)
9
10    for i in range(count):
11        n_next = n0 + n1 # 0 + 1 = 1
12        fs.append(n_next)
13        #print(fs)
14
15        n0 = n1 # 1
16        n1 = n_next # 1
17        #print(n0)
18        #print(n1)
19
20    return fs
21    pass

```

```

1 fibo_seires(10)

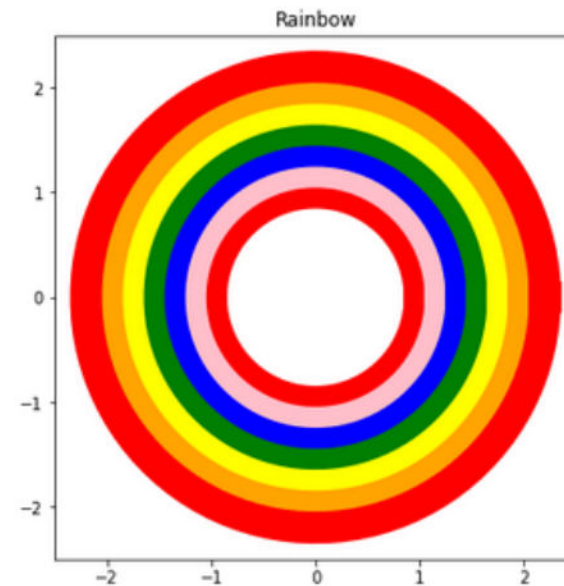
[0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]

```

Comfortable in using advanced packages as well!

- Advanced packages like Numpy and Sympy to plot things and rotate them
- He uses even sin and cos functions and understands why they are used
- Plotting network graphs for various topics

```
38 r7 = 2.2
39 xs = r7 * cos(angles)
40 ys = r7 * sin(angles)
41 plt.plot(xs, ys, color = "red", lw = 20)
42
43 plt.xlim(-2.5, 2.5)
44 plt.ylim(-2.5, 2.5)
45 plt.gca().set_aspect('equal', adjustable='b')
46 plt.title("Rainbow")
47 plt.axis("on")
48 plt.show()
```



```

Edit View Insert Cell Kernel Widgets Help
In [15]: 1 import calendar

In [16]: 1 year = 2012
         2 month = 6

In [19]: 1 # initializing the year and month
         2 # month starts from 1, not zero
         3 year = 2012
         4 month = 6
         5 # printing the calendar
         6 print(calendar.month(year, month))

        June 2012
        Mo Tu We Th Fr Sa Su
                1  2  3
        4  5  6  7  8  9 10
       11 12 13 14 15 16 17
       18 19 20 21 22 23 24
       25 26 27 28 29 30

In [28]: 1 print(calendar.calendar(1300))

```

2989

January							February							March						
Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su
-	-	-	-	-	1	2	-	-	-	-	-	1	-	-	-	-	-	-	-	1

```

In [1]: 1 import networkx as nx
         2

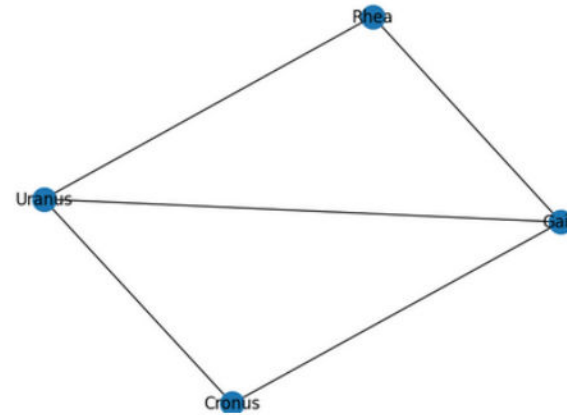
In [2]: 1 G = nx.Graph()
         2

In [3]: 1 G.add_edge("Uranus", "Gaia")

In [4]: 1 G.add_edge("Uranus", "Cronus")
         2 G.add_edge("Gaia", "Cronus")
         3 G.add_edge("Gaia", "Rhea")
         4 G.add_edge("Uranus", "Rhea")

In [5]: 1 nx.draw(G, with_labels = True)

```



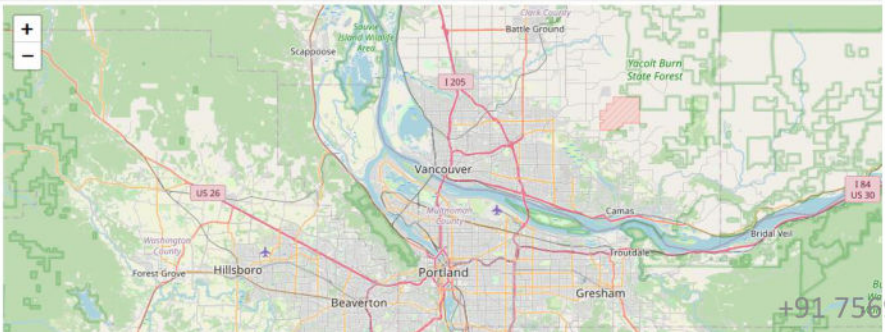
```

Edit View Insert Cell Kernel Widgets Help
In [1]: 1 import folium

In [2]: 1 m = folium.Map(location=[45.5236, -122.6750])
         2 m

Out[2]:

```



Handling data as well

- Learned how to load data and plot it
- This is an example of solar system data from the NASA website
- He got the initial code but quickly started writing his own code

```

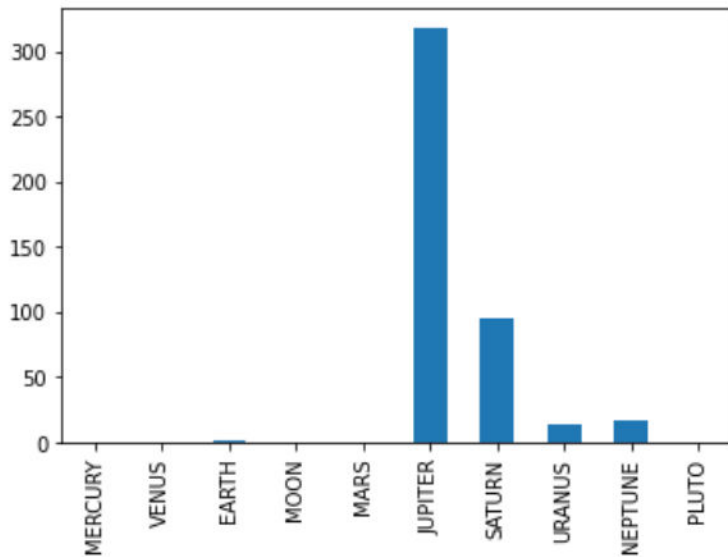
Edit View Insert Cell Kernel Widgets Help Not Trusted
⌕ ↶ ↷ ⏪ ⏩ ▶ Run ■ ↺ ⏮ ⏭
Code
In [1]: 1 import pandas as pd
        2 import numpy as np
        3
In [2]: 1 webpage = "https://nssdc.gsfc.nasa.gov/planetary/factsheet/planet_table_ratio.html"
        2 webpage
        3
Out[2]: 'https://nssdc.gsfc.nasa.gov/planetary/factsheet/planet_table_ratio.html'
In [3]: 1 tables = pd.read_html(webpage, header = 0)
        2 ss = tables[0]
        3 ss
        4
Out[3]:
      Unnamed: 0  MERCURY  VENUS  EARTH  MOON  MARS  JUPITER  SATURN  URANUS  NEPTUNE  PLUTO
0      Mass      0.0553   0.815    1    0.0123  0.107    317.8    95.2    14.5    17.1    0.0025
1      Diameter    0.383   0.949    1    0.2724  0.532    11.21    9.45     4.01    3.88    0.186
2      Density     0.984   0.951    1    0.605   0.713    0.240    0.125    0.230    0.297    0.380
3      Gravity     0.378   0.907    1    0.166   0.377     2.36    0.916    0.889    1.12    0.071
4      Escape Velocity 0.384   0.926    1    0.213   0.450     5.32    3.17     1.90    2.10    0.116
5      Relative Density 0.524   0.524    1    0.524   0.524     0.145    0.145    0.230    0.230    0.145

```

The downloaded data was used for beautiful visualization, analysis, and understanding.

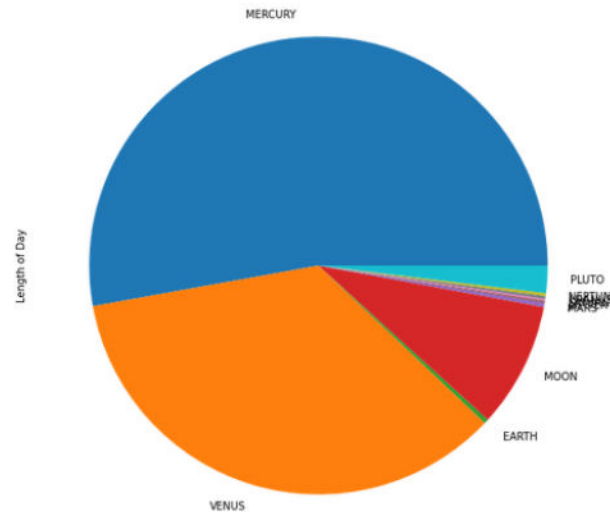
```
1 ss.Mass.astype(float).plot.bar()
2
```

<AxesSubplot:>



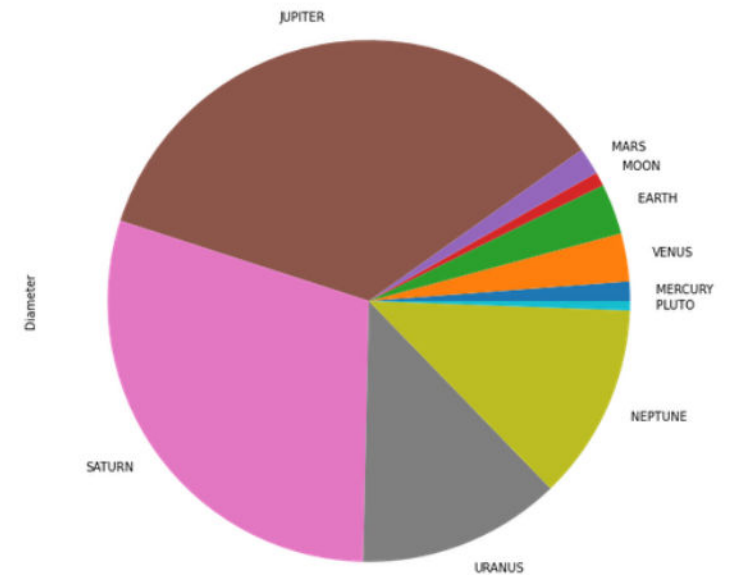
```
In [13]: 1 plt.figure(figsize=(10,10))
2         ss["Length of Day"].astype(float).plot.pie()
```

Out[13]: <AxesSubplot:ylabel='Length of Day'>



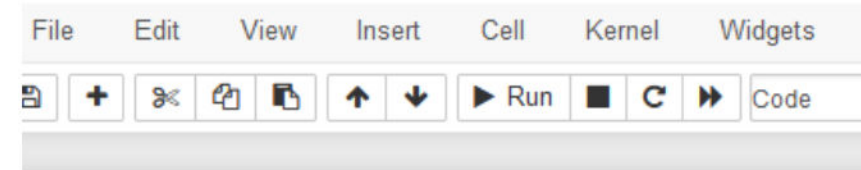
```
In [11]: 1 plt.figure(figsize=(10,10))
2         ss.Diameter.astype(float).plot.pie()
```

Out[11]: <AxesSubplot:ylabel='Diameter'>



Plotting to learn geography

- Plotting countries, continents, rivers, and other landscapes
- Locating and identifying things on maps
- Analyzing and predicting about places and verifying whether their analytical conclusions are right or not



```
In [1]: 1 from xv.geo import MapManager
```

```
In [2]: 1 ke = MapManager(verbose = False)
        2 ke
```

```
1 ke.getRandomProblem(problem_type = 0,
2                       search = ['France'],
3                               ]
4 )
```

Locate the following on the map.

France, Baillet-en-France, San Francisco, Puiseux-en-France, Francenigo, Frances Baard District Municipality, Francetown, Merville-Franceville-Plage, Fort Frances, Belloy-en-France, Franceville





‘Managers’ serve as our modern equivalent of books and question banks

All managers can generate unlimited number of non-repetitive questions based on a set of concepts.

The managers shown in this document are the only those which were done by this student. He used large number of managers, only a few are presented in this document.

Each manager contains a large number of problem types. This document shows examples for a few managers. In other cases, random sample problems have been shown.

Managers from math.

```
In [1]: 1 from xv.math.algebra import AlgebraicExpressionManager
```

```
In [2]: 1 ke = AlgebraicExpressionManager()
```

```
In [3]: 1 ke.printProblemTypes()
        2
```

```
0. _problem_add
1. _problem_add_advanced
2. _problem_subtract
3. _problem_subtract_advanced
4. _problem_multiple_subtracts
5. _problem_multiply
6. _problem_multiply_advanced
7. _problem_divide
8. _problem_divide_advanced_1
9. _problem_divide_advanced_2
10. _problem_divide_advanced_3
11. _problem_division_with_zero
12. _problem_power_with_zero
13. _problem_abs_values
```

```
In [4]: 1 ke.getRandomProblem(problem_type = 9)
```

```
Out[4]: Divide  $4y + 2z^3 + 5z^2 + 5z$  by  $x$ 
```

```
In [5]: 1 ke.printAnswer()
        2
```

```
Out[5]:  $\frac{4y}{x} + \frac{2z^3}{x} + \frac{5z^2}{x} + \frac{5z}{x}$ 
```

```
In [6]: 1 ke.printSolution()
        2
```

```
Out[6]:  $(4y + 2z^3 + 5z^2 + 5z) / (x)$ 
```

$$\begin{aligned}
 &= \frac{4y}{x} + \frac{2z^3}{x} + \frac{5z^2}{x} + \frac{5z}{x} \\
 &= \frac{4y}{x} + \frac{2z^3}{x} + \frac{5z^2}{x} + \frac{5z}{x}
 \end{aligned}$$



```
In [1]: 1 from xv.math.kids import DataHandlingManager
```

```
In [2]: 1 ke = DataHandlingManager()
2 ke.printProblemTypes()
```

```
0. _problem_random_data_counting
1. _problem_find_closest_pair
2. _problem_forecasting
```

```
In [3]: 1 ke.getRandomProblem(problem_type = 0)
```

Out[3]: We have this data:

2, 4, 1, 2, 4, 2, 2, 4, 6, 1, 2, 2, 5, 4, 2, 2, 6, 1, 2, 2, 2, 2, 6, 2, 4, 5, 4, 2, 6, 2, 6, 5, 6, 6, 4, 1, 2, 2, 2, 6, 1, 2, 1, 5

Based on the above data, answer the following questions:

- How many times each item appears (it is also called frequency)?
- What is sum of each item separately?
- Show cumulative frequency of each item.
- What is total count of all items?
- What is total sum of all items?
- What is the value of the lowest item?
- What is the value of the highest item?
- What is the difference of term with highest value and the term with lowest value?
- Which number comes highest number of times?
- Which number comes lowest number of times?
- What is average of all numbers?
- Find the item in the middle.

```
In [5]: 1 ke.printSolution()
```

Out[5]: Q 1. How many times each item appears (it is also called frequency)?
The number of times an item appears is also called its frequency.

Item (x)	Frequency (f)
1	6
2	20
4	7
5	5
6	8

Q 2. What is sum of each item separately?
Sum of each item:

x	f	f * x	Sum (f * x)
1	6	1 * 6	6
2	20	2 * 20	40
4	7	4 * 7	28
5	5	5 * 5	25
6	8	6 * 8	48

Q 3. Show cumulative frequency of each item.
Keep on adding row frequencies to get cumulative frequency.
Keep on adding row sums to get cumulative sum

Q 3. Show cumulative frequency of each item.

Keep on adding row frequencies to get cumulative frequency.
Keep on adding row sums to get cumulative sum

x	f	Cumulative f	Sum (f * x)	Cumulative Sum
1	6	6	6	6
2	20	26	40	46
4	7	33	28	74
5	5	38	25	99
6	8	46	48	147
Total	46		147	

Q 4. What is total count of all items?
46

Q 5. What is total sum of all items?
147

Q 6. What is the value of the lowest item?
1

Q 7. What is the value of the highest item?
6

Q 7. What is the value of the highest item?
6

Q 8. What is the difference of term with highest value and the term with lowest value (term with highest value) - (term with lowest value)
= 6 - 1 = 5
The difference of term with highest value and the term with lowest value

Q 9. Which number comes highest number of times?
2

It comes 20 times.

The number that comes highest number of times is also called mode.

Q 10. Which number comes lowest number of times?
5

It comes 5 times.

Q 11. What is average of all numbers?
average of all numbers = $\frac{\text{Sum of numbers}}{\text{Count of numbers}} = \frac{147}{46} = 3.196$
The average is also called MEAN.

Q 12. Find the item in the middle.
The total count of items = 46
The Index of middle item = $\frac{46+1}{2} = 23.5$

The cumulative frequency table is:

x	f	Cumulative f
1	6	6
2	20	26
4	7	33
5	5	38
6	8	46
Total	46	

See the cumulative frequency column of the table.
The 23.5th item is 2
The middle term is also called median.

```
1 from xv.math.basicmaths import ArithmeticExpressionManager
```

```
1 ke = ArithmeticExpressionManager()
2 ke.printProblemTypes()
```

```
0. _problem_multilayer_fraction
1. _problem_multilayer_fraction_2
2. _problem_root_format_to_exp_format
3. _problem_inv_root_format_to_exp_format
4. _problem_exp_format_to_root_format
5. _problem_type_root_exp_1
6. _problem_type_root_exp_2
7. _problem_multiple_operators
8. _problem_statements_to_exprs
9. _problem_write_expression_simple
10. _problem_write_expression
11. _problem_write_expression_advanced
12. _problem_write_expression_advanced_2
13. _problem_solve_expression_advanced
14. _problem_expression_solver
```

```
1 ke.getRandomProblem(problem_type = 0)
```

Solve:

$$8 \times \frac{2}{9} + \frac{2}{6}$$

```
In [5]: 1 ke.printSolution()
```

```
Out[5]: {
  8 * 2 / 9 + 2 / 6
}
```

$$= \left[\frac{2}{8} \right] \times \left\{ \frac{8 \times \frac{2}{9} + \frac{2}{6}}{\frac{2}{9}} \right\} \quad \text{Simplify denominator fraction } \frac{2}{9}$$

$$= \left[\frac{2}{8} \times \frac{9}{4} \right] \times \left\{ \frac{8 \times \frac{2}{9} + \frac{2}{6}}{\frac{2}{9}} \right\} \quad \text{Simplify denominator fraction } \frac{2}{9}$$

$$= \left[\frac{2}{8} \times \frac{9}{4} \times \frac{9}{2} \right] \times \left\{ 8 \times \frac{2}{9} + \frac{2}{6} \right\} \quad \text{Simplify denominator fraction } \frac{2}{9}$$

$$= \left[\frac{2}{8} \times \frac{9}{4} \times \frac{9}{2} + \frac{8}{1} \right] \times \left\{ \frac{2}{9} + \frac{2}{6} \right\} \quad \text{Simplify numerator fraction } \frac{2}{9}$$

$$= \left[\frac{2}{8} \times \frac{9}{4} \times \frac{9}{2} + \frac{8}{1} \times \frac{2}{9} \right] \times \left\{ \frac{2}{6} \right\} \quad \text{Simplify numerator fraction } \frac{2}{9}$$

$$= \frac{2}{8} \times \frac{9}{4} \times \frac{9}{2} + \frac{8}{1} \times \frac{2}{9} \times \frac{2}{6} \quad \text{Simplify numerator fraction } \frac{2}{9}$$

$$= \frac{2 \times 9 \times 8 \times 9 \times 2}{6 \times 2 \times 1 \times 2 \times 4 \times 8}$$

$$= \frac{23328}{768}$$

$$= 30.375$$


```
1 from xv.math.basicmaths import DecimalOperationManager
```

```
1 ke = DecimalOperationManager()
2 ke.printProblemTypes()
```

```
0. _problem_positional_values
1. _problem_concept_of_decimal
2. _problem_concept_of_decimal_advanced
3. _problem_compare_decimal_numbers
4. _problem_type_int_as_float
5. _problem_type_int_multiplied_by_ten_exp
6. _problem_type_int_divided_by_ten_exp
7. _problem_type_decimal_and_exp
8. _problem_convert_decimal_to_rational
9. _problem_convert_rational_to_decimal
10. _problem_type_multiply_decimal_numbers
11. _problem_convert_decimals_div_to_rational_number
12. _problem_type_frac_add
13. _problem_type_frac_sub
14. _problem_type_frac_pow
15. _problem_type_mul_fractions
16. _problem_decimals_mixed_operations_1
17. _problem_decimals_mixed_operations_2
18. _problem_decimals_mixed_operations_3
19. _problem_decimals_mixed_operations_4
20. _problem_convert_number_systems
21. _problem_add_subtract_number_systems
22. _problem_operate_number_systems
```

```
1 ke.getRandomProblem(problem_type = 18)
```

Simplify the followings:

$$\frac{8.0 + 0.4}{40.0} * \frac{1}{6.0}$$

```
1 ke.printAnswer()
```

$$\frac{7}{200} \quad \text{or}$$

0.035

```
1 ke.printSolution()
```

$$\frac{8.0 + 0.4}{40.0} * \frac{1}{6.0}$$

$$= \frac{8.4}{40.0} * \frac{1}{6}$$

$$= \frac{42}{40} * \frac{1}{6}$$

$$= \frac{42 * 1}{40 * 5} * \frac{1}{6}$$

$$= \frac{42 * 1 * 1}{40 * 5 * 6}$$

$$= \frac{42}{1200}$$

$$= \frac{7}{200}$$

```
1 from xv.math.basicmaths import LogManager
```

```
1 ke = LogManager()
2 ke.printProblemTypes()
```

```
0. _problem_concept_of_log
1. _problem_general_concept_of_log
2. _problem_why_concept_of_log
3. _problem_simple_log_expr
4. _problem_find_log_of_product_series
5. _problem_find_log_of_product_of_pairs
6. _problem_log_of_division
7. _problem_find_log_of_exp_to_exp
8. _problem_find_log_of_exp_product
9. _problem_find_log_of_div_exp_both
10. _problem_log_and_exponent
11. _problem_log_reciprocal
12. _problem_log_chain_rule
13. _problem_product_of_two_terms
14. _problem_div_of_two_terms
15. _problem_simplify_log_in_exponent
16. _problem_log_of_multi_terms
17. _problem_long_expanded_to_simplified
18. _problem_log_of_common_numbers
19. problem custom questions
```

```
1 ke.getRandomProblem(problem_type = 19)
```

Prove that

$$\frac{2}{5} < \log_{10} 3 < \frac{1}{2}$$

```
1 ke.printAnswer()
```

2

$$\frac{2}{5} < \log_{10} 3 < \frac{1}{2}$$

```
1
2
3 ke.printSolution()
4
```

$$\log_{10} 3 \quad ? \quad \frac{2}{5}$$

$$\Rightarrow 3 \quad ? \quad 10^{\frac{2}{5}}$$

$$\Rightarrow 3^5 > 10^2,$$

$$\text{Now } \log_{10} 3 \quad ? \quad \frac{1}{2}$$

$$\Rightarrow 3 \quad ? \quad 10^{\frac{1}{2}}$$

$$\Rightarrow 3^2 < 10, \text{ which is true}$$

$$\text{Hence } \frac{2}{5} < \log_{10} 3 < \frac{1}{2}$$

```
1 from xv.math.basicmaths import NumberUnitManager
```

```
1 ke = NumberUnitManager()
```

```
1 ke.getRandomProblem(problem_type = 4)
```

Convert 9 oz to ounce.

Note: You may use the following table:

1 ounce = 28.35 gram

1 pound = 16 oz

1 kilo-gram = 2.205 pound

1 pound = 0.0005 short-ton

1 metric-ton = 1.12 short-ton

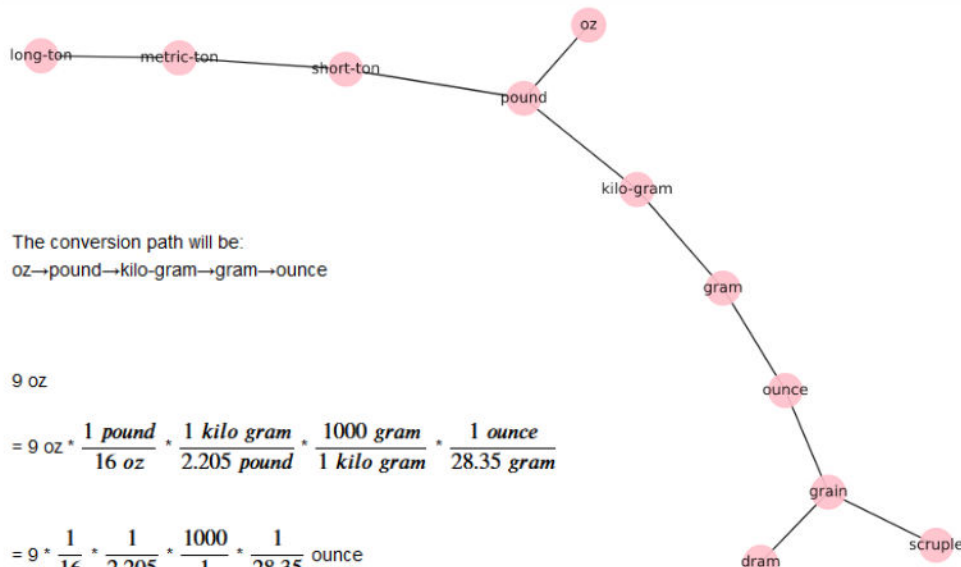
1 long-ton = 1.016 metric-ton

1 grain = 0.05 scruple

1 grain = 0.01667 dram

1 grain = 0.00208 ounce

1 kilo-gram = 1000 gram



The conversion path will be:

oz→pound→kilo-gram→gram→ounce

9 oz

$$= 9 \text{ oz} * \frac{1 \text{ pound}}{16 \text{ oz}} * \frac{1 \text{ kilo gram}}{2.205 \text{ pound}} * \frac{1000 \text{ gram}}{1 \text{ kilo gram}} * \frac{1 \text{ ounce}}{28.35 \text{ gram}}$$

$$= 9 * \frac{1}{16} * \frac{1}{2.205} * \frac{1000}{1} * \frac{1}{28.35} \text{ ounce}$$

$$= 9 * 0.9998120353373564 \text{ ounce}$$

$$= 8.998308318036207 \text{ ounce}$$

```
1 ke.getRandomProblem(problem_type = 11)
2
```

Form 2-letter words from letters r, k, v, g, f, u, x. The words need not be meaningful

```
1 ke.printAnswer()
2
```

84

```
1 ke.printSolution()
2
```

ways of selecting 3 from 9 items

$$= \binom{9}{3}$$

$$= \frac{9!}{(9-3)! 3!}$$

$$= \frac{9!}{6! 3!}$$

$$= \frac{362880}{720 * 6}$$

= 84

```
1 ke.getRandomProblem(problem_type= 2)
2
```

Find the ratio of numbers 0.014, 0.031 and 0.58

```
1 ke.printAnswer()
2
```

14 : 31 : 580

```
1 ke.printSolution()
2
```

The greatest common divisor (GCD) of the numbers 27, 12 and 3 = 3

To get ratio, we have to divide the numbers by the GCD.

Ratio of numbers 27, 12 and 3

$$= \frac{27}{3} : \frac{12}{3} : \frac{3}{3}$$

= 9 : 4 : 1

```
ke.printSolution()
```

Numbers:

$$\frac{1}{2}, -\frac{2}{7}, \frac{6}{1}, \frac{1}{1}, \frac{1}{2}, -\frac{2}{1}$$

Common Denominators:

Let us make all denominators equal to their LCM = 14

$$= \frac{1 * 7}{2 * 7}, -\frac{2 * 2}{7 * 2}, \frac{6 * 14}{1 * 14}, \frac{1 * 14}{1 * 14}, \frac{1 * 7}{2 * 7}, -\frac{2 * 14}{1 * 14}$$

$$= \frac{7}{14}, -\frac{4}{14}, \frac{84}{14}, \frac{14}{14}, \frac{7}{14}, -\frac{28}{14}$$

Sum:

As we have common denominator

$$= \frac{80}{14}$$

$$= \frac{80 / 2}{14 / 2}$$

$$= \frac{40}{7}$$

$$= \frac{40}{7}$$

Average:

Average of numbers

$$= \frac{40}{7}$$

$$= \frac{1}{6} * \frac{40}{7}$$

$$= \frac{20}{21}$$

Sorted Numbers:

$$-\frac{28}{14}, -\frac{4}{14}, \frac{7}{14}, \frac{7}{14}, \frac{14}{14}, \frac{84}{14}$$

$$= -\frac{2}{1}, -\frac{2}{7}, \frac{1}{2}, \frac{1}{2}, 1, 6$$

Median:

The number of fractions is 6, an even number.

The middle term is, $\frac{6+1}{2} = \frac{7}{2}$ th term.

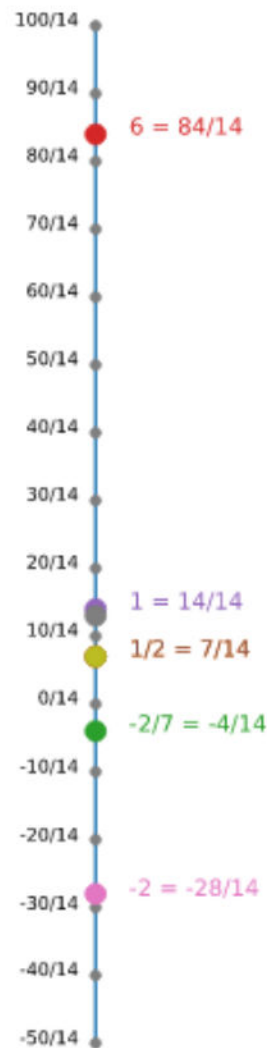
Hence, the median will be average of 3rd and 4th terms.

Median

$$= \frac{\frac{1}{2} + \frac{1}{2}}{2}$$

$$= \frac{1}{2}$$

$$= \frac{1}{2}$$



20/21 = 13/14 (Avg)

1/2 = 7/14 (Med)



```
1 ke.getRandomProblem(problem_type = 7)
2
```

Marium has 7 *farm*. Each *farm* has 2 *garden*. Each *garden* has 60 *tree*. Each *tree* has 10 *fruit*. Each *box* has 50 *fruit*. Each box sells for \$3. The cost of maintaining each tree is \$0.5. Answer the following questions:

1. What is the total number of farm?
2. What is the total number of garden?
3. What is the total number of tree?
4. What is the total number of fruit?
5. What is the total number of box?
6. What is the total sales value?
7. What is the total cost?
8. What is the net profit?

```
1 ke.printSolution()
```

The equation of the question are as follows:

$$1 \text{ } \textit{Mary} = 8 \text{ } \textit{garden}$$

$$1 \text{ } \textit{garden} = 20 \text{ } \textit{tree}$$

$$1 \text{ } \textit{tree} = 20 \text{ } \textit{fruit}$$

$$1 \text{ } \textit{fruit} = \frac{1}{12} \text{ } \textit{box}$$

$$1 \text{ } \textit{box} = \$800/3 \quad [\text{sell price}]$$

$$1 \text{ } \textit{garden} = \$200 \quad [\text{cost price}]$$

Let us do calculations:

Total sales revenue

$$= 8 \text{ } \textit{garden}$$

$$= 8 \text{ } \textit{garden} * \frac{20 \text{ } \textit{tree}}{\textit{garden}} \quad \text{So, } 160 \text{ } \textit{tree}$$

$$= 8 \text{ } \textit{garden} * \frac{20 \text{ } \textit{tree}}{\textit{garden}} * \frac{20 \text{ } \textit{fruit}}{\textit{tree}} \quad \text{So, } 3200 \text{ } \textit{fruit}$$

$$= 8 \text{ } \textit{garden} * \frac{20 \text{ } \textit{tree}}{\textit{garden}} * \frac{20 \text{ } \textit{fruit}}{\textit{tree}} * \frac{\textit{box}}{12 \text{ } \textit{fruit}} \quad \text{So, } 800/3 \text{ } \textit{box}$$

$$= 8 \text{ } \textit{garden} * \frac{20 \text{ } \textit{tree}}{\textit{garden}} * \frac{20 \text{ } \textit{fruit}}{\textit{tree}} * \frac{\textit{box}}{12 \text{ } \textit{fruit}} * \frac{\$8}{\textit{box}}$$

$$= 8 * 20 * 20 * \frac{1}{12} * \$8$$

$$= \$6400/3$$

Cost

$$= \frac{\$200}{\textit{garden}}$$

$$= \frac{\$200}{\textit{garden}} * 8 \text{ } \textit{garden}$$

$$= \$1600$$

Net Profit

$$= \text{Total Cost} - \text{Total Revenue}$$

$$= \$6400/3 - \$1600$$

$$= \$1600/3$$

Now, we can answer the questions:

1. What is the total number of garden?

Answer: 8

2. What is the total number of tree?

Answer: 160

3. What is the total number of fruit?

Answer: 3200

4. What is the total number of box?

Answer: 800/3

5. What is the total sales value?

Answer: \$6400/3

6. What is the total cost?

Answer: \$1600

7. What is the net profit?

Answer: \$1600/3

```
1 ke.getRandomProblem(problem_type = 12)
2
```

Easy level: 1

Solve the following:

$$3 - \frac{-7x - 2}{2} = 6 + \frac{6 - 6x}{3}$$

```
1 ke.printAnswer()
2
```

$$\frac{8}{11}$$

```
1 ke.printSolution()
```

$$3 - \frac{-7x - 2}{2} = 6 + \frac{6 - 6x}{3}$$

$$\Rightarrow 3 - \frac{-7x - 2}{2} - 3 = 6 + \frac{6 - 6x}{3} - 3 \quad \text{To remove 3 from left side, subtract}$$

$$\Rightarrow -\frac{-7x - 2}{2} = 3 + \frac{6 - 6x}{3}$$

$$\Rightarrow -\frac{-7x - 2}{2} - \frac{6 - 6x}{3} = 3 + \frac{6 - 6x}{3} - \frac{6 - 6x}{3} \quad \text{Move x terms to the lhs.}$$

$$\Rightarrow -\frac{-7x - 2}{2} - \frac{6 - 6x}{3} = 3 + \frac{6 - 6x}{3} - \frac{6 - 6x}{3} \quad \text{Move x terms}$$

$$\Rightarrow -\frac{-7x - 2}{2} - \frac{6 - 6x}{3} = 3$$

$$\Rightarrow -\frac{-7x - 2}{2} \cdot \frac{-3}{-3} - \frac{6 - 6x}{3} \cdot \frac{2}{2} = 3 \quad \text{Make denominator of bot}$$

$$\Rightarrow \frac{(21x + 6) - (12 - 12x)}{6} = 3$$

$$\Rightarrow \frac{33x - 6}{6} = 3$$

$$\Rightarrow \frac{33x - 6}{6} \cdot 6 = 3 \cdot 6 \quad \text{Multiply both sides with 6}$$

$$\Rightarrow 33x - 6 = 18$$

$$\Rightarrow 33x - 6 + 6 = 18 + 6 \quad \text{To both sides, add 6}$$

$$\Rightarrow 33x = 24$$

$$\Rightarrow \frac{33x}{33} = \frac{24}{33} \quad \text{Divide both sides with 33}$$

$$\Rightarrow x = 0.7272727272727272$$

$$\Rightarrow x = \frac{8}{11}$$

info@xcelvations.com



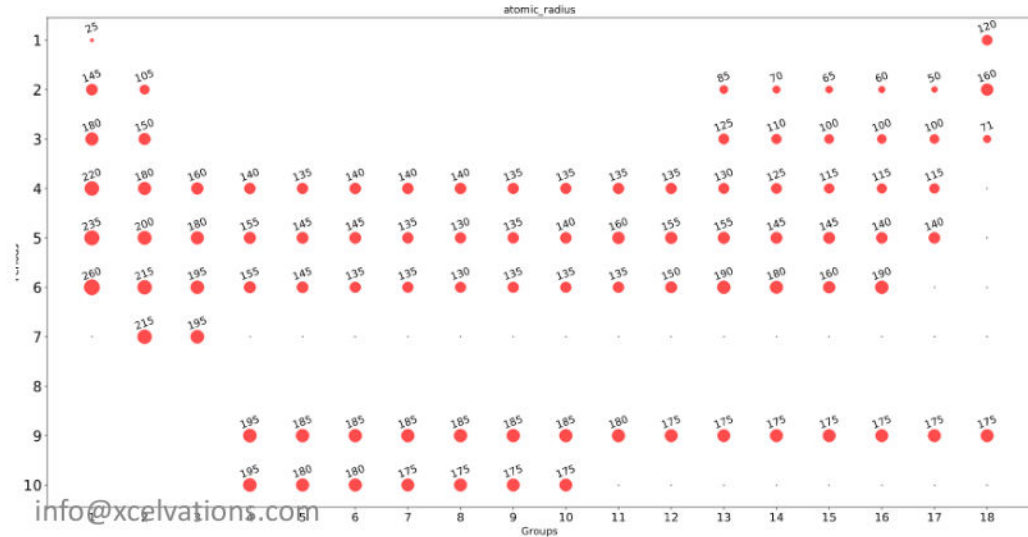
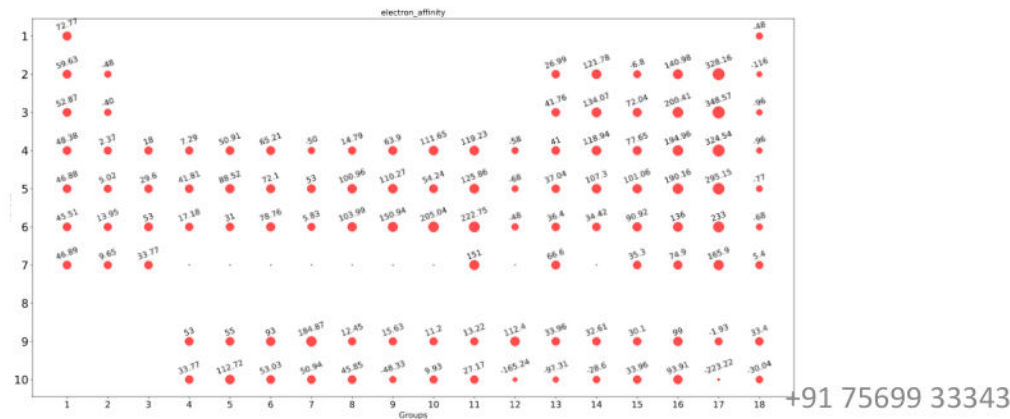
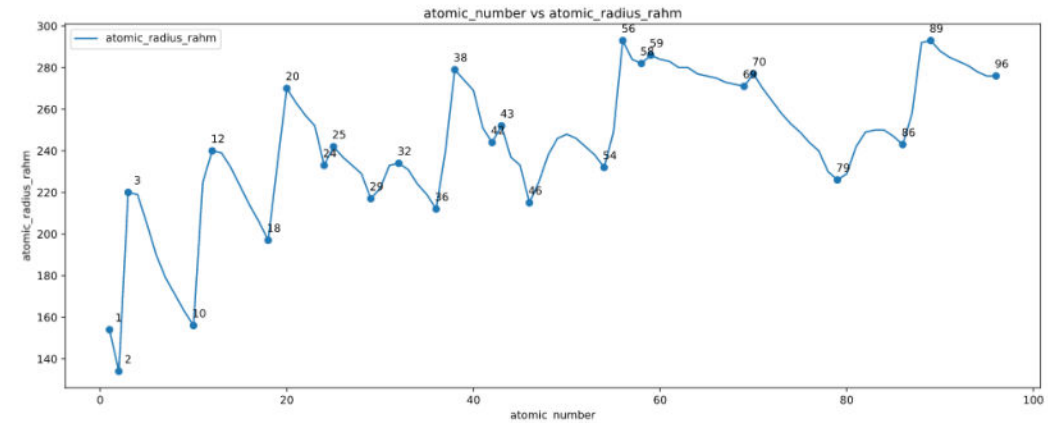
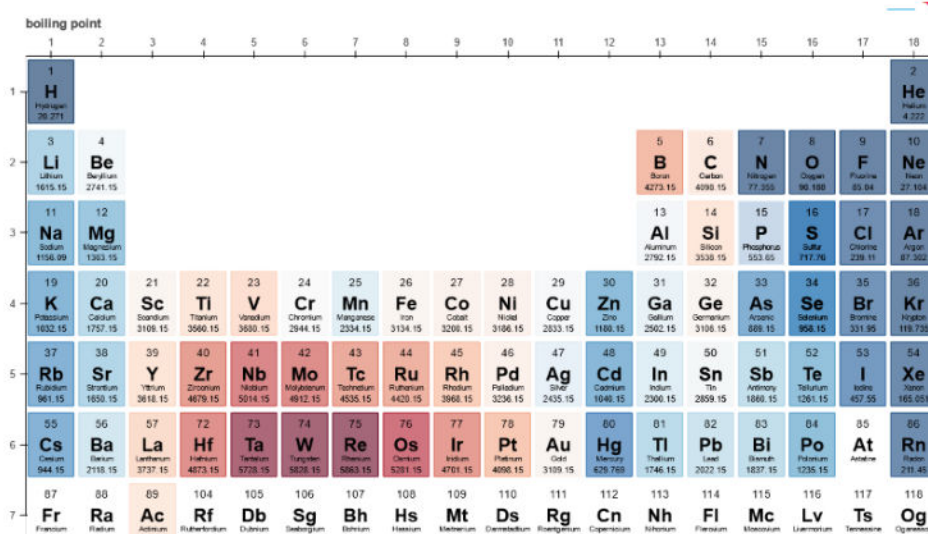
```
View Insert Cell Kernel Widgets Help
[Icons] [Run] [Code]
1 F = 1/(4 * np.pi * e0) * (q1 * q2)/ r ** 2
1 F = (q1 * q2) / (4 * np.pi * e0 * r ** 2)
1 plt.plot(r, F)
[matplotlib.lines.Line2D at 0x7fd4f201b8e0]
```





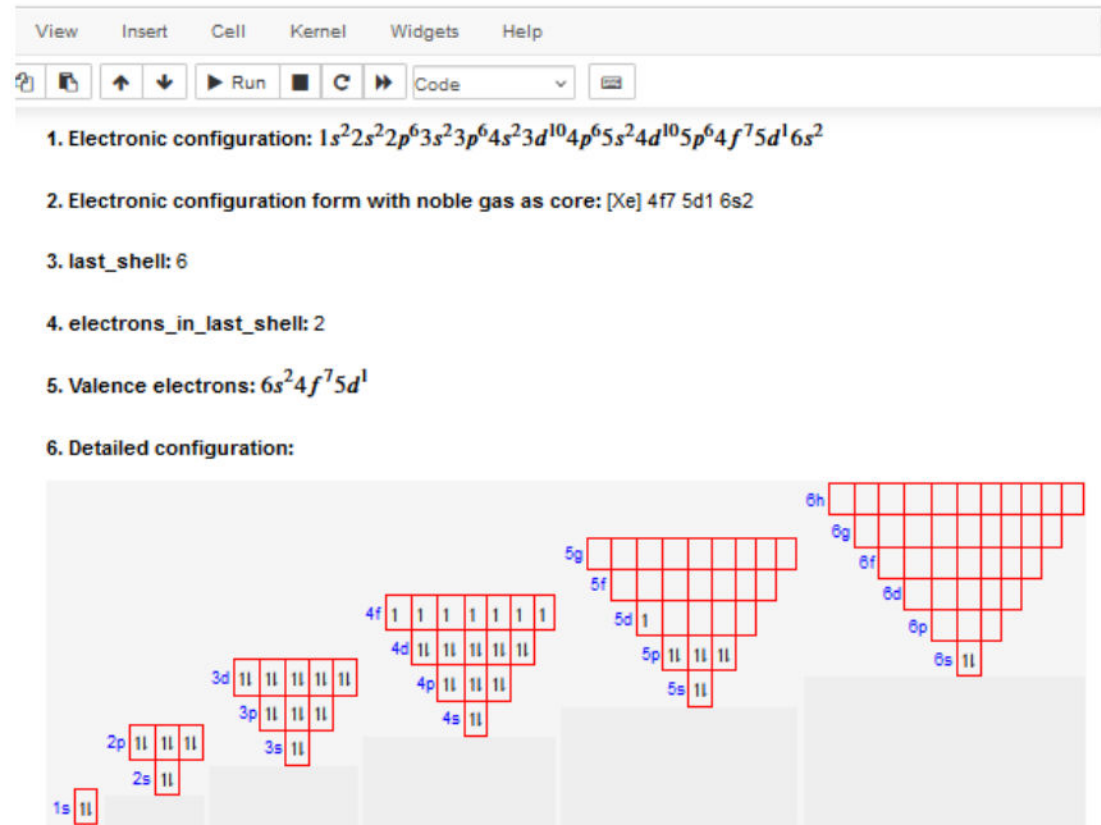
Chemistry has been both in-depth
and fun

He uses periodic table plotting to enhance his understanding of elements and their properties



He knows about atoms, their structures, electronic configurations, possible bonds, and much more

- He can not only write the electronic configuration as shown but also interpret it to predict possible bonds.
- He can also suggest some hybridizations.
- He is also well-versed in ionic and covalent bonds, and their effects on electrical and thermal conductivity.



```
1 ke.getRandomProblem(problem_type = 2)
2
```

Use ptable.com to answer the following for the atom $^{46}\text{X}_{106}$.

We use representation as $\overset{\text{atomic number}}{\text{Symbol}}\overset{\text{charge}}{\text{mass number}}$

- What is name and symbol of the element? How will you represent it?
- If the number of neutrons in the atom increases by 5, how will you represent it? How the original atom and this atom are related?
- If the number of protons in the atom increases by 3 and the number of neutrons decreases by the same number, how will you represent it? How the original atom and this atom are related?
- If the atom loses 3 electron, what is the result?
- If the atom gains 3 electron, what is the result?

```
1 ke.printAnswer()
2
```

a. Name: Palladium and symbol: Pd

Representation: $^{46}\text{Pd}_{106}$

b. The new atom is $^{46}\text{Pd}_{111}$. The atoms $^{46}\text{Pd}_{106}$ and $^{46}\text{Pd}_{111}$ are isotopes of each other.

c. The new atom is $^{49}\text{In}_{106}$. The atoms $^{46}\text{Pd}_{106}$ and $^{49}\text{In}_{106}$ are isobars of each other.

d. $^{46}\text{Pd}^{+3}_{106}$

d. $^{46}\text{Pd}^{-3}_{106}$

```
1 ke.getRandomProblem(problem_type = 8)
2
```

Write the following for the atom with atomic number 64:

- Electronic configuration
- Electronic configuration form with noble gas as core
- last_shell
- electrons_in_last_shell
- Valence electrons
- Detailed configuration

```
1 ke.printAnswer()
2
```

Atomic number: 64

Name: Gadolinium

1. Electronic configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 4f^7 5d^1 6s^2$

2. Electronic configuration form with noble gas as core: [Xe] 4f⁷ 5d¹ 6s²

3. last_shell: 6

4. electrons_in_last_shell: 2

5. Valence electrons: $6s^2 4f^7 5d^1$

6. Detailed configuration:



English was his Achilles' heel, but not anymore.

We helped him with our special modules, enabled with voice support to improve his skills in English.

Learning English was organized and intuitive

- We focused on vocabulary, pronunciation, reading books, jokes, and articles, and watching videos.
- Each manager can generate a huge number of non-repetitive questions.
- The focus is on analytical learning rather than rote learning.

```
View  Insert  Cell  Kernel  Widgets  Help
[Icons] [Run] [Code]

1 from xv.english import WordManager

1 ke = WordManager(verbose = False)
2 ke.printProblemTypes()
```

```
0. _problem_uncountable_nouns_ending_in_s
1. _problem_common_plural_nouns
2. _problem_word_usage
3. _problem_word_usage_fill_blanks
4. _problem_irregular_plural_forms
5. _problem_irregular_singular_forms
6. _problem_noun_plural_fill_blanks
7. _problem_noun_fill_blanks
8. _problem_pronoun_fill_blanks
9. _problem_adjective_fill_blanks
10. _problem_verb_fill_blanks
11. _problem_adverb_fill_blanks
12. _problem_preposition_fill_blanks
13. _problem_conjunction_fill_blanks
14. _problem_interjection_fill_blanks
15. _problem_determiner_fill_blanks
16. _problem_predeterminer_fill_blanks
17. _problem_fill_confusing_words
18. _problem_match_confusing_words_meanings
19. _problem_fill_misspelled_words
20. _problem_find_misspelled_out
21. _problem_fill_gender_words
21. _problem_fill_gender_words
22. _problem_gender_match_columns
23. _problem_option_genders
24. _problem_find_odd_gender
25. _problem_word_with_opposite_gender
26. _problem_thesaurus_match_synonyms
27. _problem_thesaurus_match_antonyms
28. _problem_find_odd_synonyms_antonyms
29. _problem_idioms_match_columns
30. _problem_find_synonym_thesaurus
31. _problem_find_antonym_thesaurus
32. _problem_find_by_synonyms_antonyms
33. _problem_regular_synonyms
34. _problem_regular_antonyms
35. _problem_collective_nouns
36. _problem_regular_nouns_singular_plural
37. _problem_regular_adjective_forms
38. _problem_regular_similes
39. _problem_regular_homonyms
40. _problem_regular_homophones
41. _problem_compound_prepositions
42. _problem_animal_sounds
43. _problem_animal_youngs
44. _problem_single_word_for_phrases
45. _problem_american_british_words
```



```
: 1 from xv.english import VocabularyManager
```

```
: 1 ke = VocabularyManager()
2 ke.printProblemTypes()
```

```
0. _problem_english_for_junior_competitions
1. _problem_english_toefl_words
2. _problem_predict_similar_opposite_words
3. _problem_single_word_for_phrase
4. _problem_answer_yes_no
5. _problem_fill_confusing_words_with_meanings_and_usages
6. _problem_fill_misused_word_sets_with_usages
7. _problem_fill_confusing_words
8. _problem_fill_misspelled_words
9. _problem_fill_homophone_words
10. _problem_identify_homophone_words_in_sentences
11. _problem_fill_similar_opposite_words
12. _problem_fill_weird_words
13. _problem_predict_prefixes
14. _problem_predict_suffixes
15. _problem_predict_word_roots
16. _problem_words_related_to_phobia
17. _problem_words_related_to_mania
18. _problem_fill_in_with_appropriate_words
19. _problem_test_yourself
```

```
In [1]: 1 from xv.english import SpellingManager
```

```
In [2]: 1 ke = SpellingManager()
2 ke.printProblemTypes()
```

```
0. _problem_random_spellings
1. _problem_leading_word_spellings
2. _problem_trailing_word_spellings
3. _problem_closest_syllables_pairs
4. _problem_homophone_words
5. _problem_prefixes_word_pairs
6. _problem_suffixes_word_pairs
7. _problem_misspelling_prone_pairs
8. _problem_confusing_word_pairs
9. _problem_gender_word_pairs
10. _problem_phrases
11. _problem_idioms
12. problem game guess word
```

```
In [1]: 1 from xv.english import BookManager
```

```
In [2]: 1 ke = BookManager(file_path = "The Race f
2 ke.printProblemTypes()
```

```
0. _problem_book_translate
1. _problem_hear_and_write
2. _problem_read_a_text
3. _problem_put_sentence_in_order
4. _problem_put_paragraph_in_order
5. _problem_insert_a_sentence
6. _problem_word_usage
7. _problem_fill_words_of_a_pos
8. _problem_word_usage_fill_blanks
9. _problem_noun_fill_blanks
10. _problem_pronoun_fill_blanks
11. _problem_adjective_fill_blanks
12. _problem_verb_fill_blanks
13. _problem_adverb_fill_blanks
14. _problem_preposition_fill_blanks
15. _problem_conjunction_fill_blanks
16. _problem_interjection_fill_blanks
17. _problem_determiner_fill_blanks
18. _problem_predeterminer_fill_blanks
19. _problem_fill_confusing_words
20. _problem_match_confusing_words_meanings
21. _problem_find_misspelled_out
22. _problem_fill_gender_words
23. _problem_gender_match_columns
24. _problem_option_genders
25. _problem_find_odd_gender
26. _problem_word_with_opposite_gender
27. _problem_thesaurus_match_synonyms
28. _problem_thesaurus_match_antonyms
29. _problem_find_odd_synonyms_antonyms
30. _problem_idioms_match_columns
31. _problem_find_synonym_thesaurus
32. _problem_find_antonym_thesaurus
33. _problem_find_by_synonyms_antonyms
34. _problem_find_by_synonyms_antonyms
```

Fill in the blanks with the words give below. Change the form of words if needed.

trusted, usual, taste, usually

His mind was not in a normal state. A healthy man _____ thinks of, feels, and remembers innumerable things simultaneously, but has the power and will to select one sequence of thoughts or events on which to fix his whole attention. A healthy man can tear himself away from the deepest reflections to say a civil word to someone who comes in and can then return again to his own thoughts. ... - War And Peace

He laughed in his _____ dry, cold, unpleasant way, with his lips only and not with his eyes. - War And Peace

... And as counters of imitation gold can be used only among a group of people who agree to accept them as gold, or among those who do not know the nature of gold, so universal historians and historians of culture, not answering humanity's essential question, serve as currency for some purposes of their own, only in universities and among the mass of readers who have a _____ for what they call "serious reading." - War And Peace

But she still hoped, and asked, in words she herself did not _____ : - War And Peace

trusted, usual, taste, usually

Answer:

His mind was not in a normal state. A healthy man **usually** thinks of, feels, and remembers innumerable things simultaneously, but has the power and will to select one sequence of thoughts or events on which to fix his whole attention. A healthy man can tear himself away from the deepest reflections to say a civil word to someone who comes in and can then return again to his own thoughts. ... - War And Peace

He laughed in his **usual** dry, cold, unpleasant way, with his lips only and not with his eyes. - War And Peace

... And as counters of imitation gold can be used only among a group of people who agree to accept them as gold, or among those who do not know the nature of gold, so universal historians and historians of culture, not answering humanity's essential question, serve as currency for some purposes of their own, only in universities and among the mass of readers who have a **taste** for what they call "serious reading." - War And Peace

But she still hoped, and asked, in words she herself did not **trust** : - War And Peace

Answer:

Phrase	Single Word
1.	ii
2.	iv
3.	i
4.	iii

Solution:

	Phrase	Single Word
1.	record of heart action	ii. cardiogram
2.	socially awkward	iv. gauche
3.	A word formed by parts of two other distinct words, such as smog, which consists of the sm from smoke + the og from fog	i. portmanteau
4.	record produced by such an instrument	iii. cardiogram

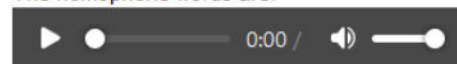
gauche (*gawch*): adjective

1. meaning: Awkward or lacking in social graces; bumbling.

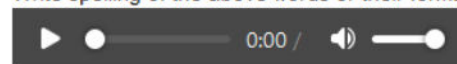
2. meaning: Skewed, not plane.

3. meaning: Describing a torsion angle of 60°.

The homophone words are:



Write spelling of the above words or their forms in the following sentences:



Answer:

Homophones words: medal, meddle, metal, mettle, meddler and medlar

Paragraph:

1. He medalled twice at the Olympics.
2. We have American Airlines tickets, but it's on British Airways metal.

Match the phrases and single words for them.

	Phrase	Single Word
1.	record of heart action	i. portmanteau
2.	socially awkward	ii. cardiogram
3.	A word formed by parts of two other distinct words, such as smog, which consists of the sm from smoke + the og from fog	iii. cardiogram
4.	record produced by such an instrument	iv. gauche

Write the name of words related to each obsession.

1. Ecdemomania
2. Toxicomania
3. Trichotillomania
4. Doromania

Answer:

1. **Ecdemomania:** Abnormal compulsion for wandering
2. **Toxicomania:** Morbid craving for poisons
3. **Trichotillomania:** Neurosis where patient pulls out own hair
4. **Doromania:** Obsession with owning furs

Solution:

1. Is incredulity the mark of the agnostic?: **yes**
2. Do carnivorous animals eat meat?: **yes**
3. Is dermatitis an inflammation of one of the limbs?: **no**
4. Is the product of a consummately skillful counterfeiter likely to be taken as genuine?: **yes**

Fill in the blanks with appropriate words.

slay, sleigh

1. you should see him in concert because he will _____ you

2. Santa Claus is usually pictured on Christmas cards arriving in a _____ pulled by reindeer

3. Ha ha! You _____ me!

4. 1956, "Giants _____ Bears in Pro Title Battle", in Lodi News-Sentinel, 1956 December 31, page 8

slay, sleigh



Which one of the following is correct?

Thither all the chiefs, and most of the distinguished warriors, followed; among whom the anxious Heyward found _____ enter without attracting any dangerous attention to himself. - **The Last Of The Mohicans**

- A. means towards
- B. means with
- C. means to
- D. means on

Answer:

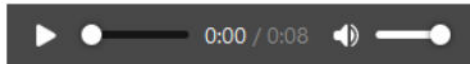
C. means to

Solution:

Thither all the chiefs, and most of the distinguished warriors, followed; among whom the anxious Heyward found **means to** enter without attracting any dangerous attention to himself. - **The Last Of The Mohicans**

Hint: Verb mean is generally followed by preposition to.

Hear and write.



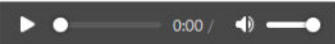
```
1 ke.printAnswer()
```

On July 21st, 1969, people around the world watched with great excitement as astronaut Neil Armstron..

Read the following:

As astronaut Michael Collins stayed aboard and piloted the command module, astronauts Neil Armstrong and Buzz Aldrin made the first manned landing on the moon's surface.

Answer:



Sort the word into a meaningful sentence. Add a few common words if you need.

1. And your water is
2. a sore decayer of
3. your whoreson dead body

Answer:

And your water is a sore decayer of your whoreson dead body.

Sort the sentences into a meaningful order:

1. We may call it herb of grace o' Sundays.
2. O you must wear your rue with a difference.
3. They say he made a good end.
4. I would give you some violets, but they wither'd all when my father died.

Answer:

We may call it herb of grace o' Sundays. O you must wear your rue with a difference. I would give you some violets, but they wither'd all when my father died. They say he made a good end.

Insert the sentence in the passage below. Use punctuation if needed.

But yet do I believe The origin and commencement of his grief Sprung from neglected love.

Passage

How now, Ophelia? You need not tell us what Lord Hamlet said, We heard it all. If she find him not, To England send him; or confine him where Your wisdom best shall think.

Answer:

But yet do I believe The origin and commencement of his grief Sprung from neglected love. How now, Ophelia? You need not tell us what Lord Hamlet said, We heard it all. If she find him not, To England send him; or confine him where Your wisdom best shall think.

Fill in the blanks using pronouns given below.

Use punctuation or change the form of words if needed.

Words: **noth__g**, **em**, **la__**, **eith_r**

... Long stay'd he so, At _____, -a little shaking of mine arm, And thrice his head thus waving up and down, He rais'd a sigh so piteous and profound As it did seem to shatter all his bulk And end his being. That done, he lets me go, And with his head over his shoulder turn'd He seem'd to find his way without his eyes, For out o' doors he went without their help, And to the _____ bended their light on me. - **None**

... The scrimers of their nation He swore had neither motion, guard, nor eye, If you oppos'd them. Sir, this report of his Did Hamlet so envenom with his envy That he could _____ do but wish and beg Your sudden coming o'er to play with him. Now, out of this, - **None**

... Here's fine revolution, an we had the trick to see't. Did these bones cost no more the breeding but to play at loggets with ' _____? Mine ache to think on't. - **None**

FIRST CLOWN. What is he that builds stronger than _____ the mason, the shipwright, or the carpenter? - **None**

Words: **noth__g**, **em**, **la__**, **eith_r**

Answer:

Words: nothing, either, last, em



Match words with their meanings

1. wait	a. point or degree to which something extend
2. weight	b. stay in one place and anticipate something
3. extend	c. widen, broaden in scope or range or area
4. extent	d. weight unit, unit used to measure weight

Usage:

... have you eyes? You cannot call it love; for at your age The hey-day in the blood is tame, it's humble, And **waits** upon the judgment: and what judgment Would step from this to this? Sense sure you have, Else could you not have motion; but sure that sense is apoplex'd, for madness would not err Nor sense to ecstasy was ne'er so thrall'd But it reserv'd some quantity of choice To serve in such a difference. ... - **None**
... The appurtenance of welcome is fashion and ceremony. Let me comply with you in this garb, lest my **extent** to the players, which I tell you must show fairly outward, should more appear like entertainment than yours. You are welcome. - **None**
... Tears seven times salt, Burn out the sense and virtue of mine eye. By heaven, thy madness shall be paid by **weight** , Till our scale turn the beam. O rose of May! ... - **None**

Find odd spellings out.

1. sergeant
2. grat
3. great
4. presence
5. exceed

Select the masculine gender out.

1. cock
2. brother
3. male
4. boar
5. sister

Answer:

1. sergeant
2. **grat**
3. great
4. presence
5. exceed

Usage:

BARNARDO. It was about to speak, when the **cock** crew. - **None**
... A bloody deed. Almost as bad, good mother, As kill a king and marry with his **brother** . - **None**
... Therefore our sometime **sister** , now our queen, Th'imperial jointress to this warlike state, Have we, one dropping eye, With mirth in funeral, and with dirge in marriage, In equal scale weighing delight an better wisdoms, which have freely gone With this affair along. ... - **None**

Answer:

1. cock
2. brother
3. male
4. boar
5. **sister**

grat

All others are correctly spelled.

Match opposite genders

1. fox	a. vixen
2. boar	b. hen
3. cock	c. sow
4. buck	d. doe

Usage:

... [_Sings_] By Gis and by Saint Charity, Alack, and ... Bring me to him. Hide **fox** , and all after. - **None**

Match words with their synonyms

1. ask	a. deceitful
2. purport	b. ruminate
3. meditation	c. vociferate
4. utterance	d. supplicate

Usage:

OPHELIA. Pray you, let's have no words of this; but when they **ask** you what it means, say you this: [_Sings_] Tomorrow is Saint Valentine's day, All in the morning betime, And I a maid at your window, To be your Valentine. - **None**
HAMLET. Haste me to know't, that I, with wings as swift As **meditation** or the thoughts of love May sweep to my revenge. - **None**
OPHELIA. My lord, as I was sewing in my chamber, Lord Hamlet, with his doublet all unbrac'd, No hat upon his head, his stockings foul'd, Ungart'red, and down-gyved to his ankle, Pale as his shirt, his knees knocking each other, And with a look so piteous in **purport** As if he had been loosed out of hell To speak of horrors, he comes before me. - **None**
GUILDENSTERN. But these cannot I command to any **utterance** of harmony. I have not the skill. - **None**

Find odd meaning out.

1. kenning
2. elegy
3. legible
4. limn
5. euphuism
6. peruse

Usage:

OPHELIA. He took me by the wrist and held me hard; Then goes he to the length of all his arm; And with his other hand thus o'er his brow, He falls to such **perusal** of my face As he would draw it. Long stay'd he so, At last,-a little shaking of mine arm, And thrice his head thus waving up and down, He rais'd a sigh so piteous and profound As it did seem to shatter all his bulk And end his being. - **None**

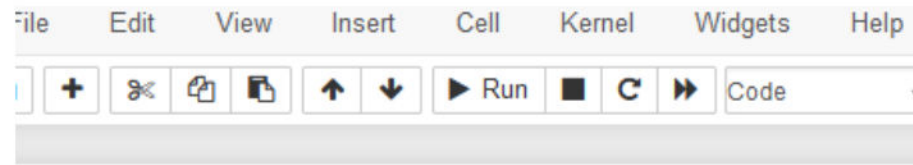
Answer:

1. kenning
2. elegy
3. **legible**
4. limn
5. euphuism
6. **peruse**

Match idioms with their meanings

1. go ape	a. a highly placed, well-paid executive
2. loose cannon	b. express wild excitement or anger
3. fly high	c. be very successful, especially temporarily
4. fat cat	d. someone out of control; someone who speaks or acts recklessly

Comprehension to improve English and analytical ability in other subjects.



```
In [1]: 1 from xv.biology import AnatomyManager
```

```
In [2]: 1 ke = AnatomyManager()
        2 ke
```

```
In [6]: 1 ke.printProblemTypes()
        2
```

```
0. _problem_introduction_to_cell
1. _problem_bones_in_human_body
2. _problem_tissues_introduction
```

```
In [8]: 1 ke.getRandomProblem(problem_type = 1)
        2
```

Out[8]: **Comprehension Text:**

Watch the following videos.

[Skeletal structure and function | Muscular-skeletal system physiology | NCLEX-RN | Khan Academy](#)

[Anatomy of the Skeleton](#)

In the human body, bones serve as the structural framework, providing support, protection, and enabling movement. There are three main types of bones: long, short, flat, irregular, and sesamoid bones.

Question:

1. Give an example of gliding joint.
2. What is cavity in bone?
3. Why are fractured bones plastered?
4. Match the items in column I with one or more items of column II:

Column I	Column II
(i) Upper jaw	(a) have fins on the body
(ii) Fish	(b) has an outer skeleton
(iii) Ribs	(c) can fly in the air
(iv) Snail	(d) is an immovable joint
(v) Cockroach	(e) protect the heart
	(f) shows very slow movement
	(g) have a streamlined body
5. What do you mean by movement?
6. What are pelvic bones?
7. Name the places where two parts of the body are seen to be joined.
8. Give two examples of hinge joints.
9. If you tie a scale with your arm, are you able to bend your elbow?
10. What do you mean by streamlined?

In [9]: 1 ke.printAnswer()
2

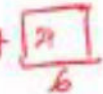
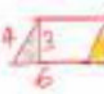
Out[9]:

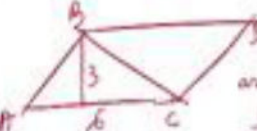
1. The joint in backbone.
2. The hollow space in the bone is called cavity.
3. Plaster keeps broken bones at their right place so that they grow and join properly.
4. (i) d
(ii) a
(iii) e
(iv) b
(v) c
5. The changing position of the body or any part of the body is called movement.
6. The bones which enclose the body part below the stomach are called pelvic bones.
7. These places are called joint.
8. (i) Joints in fingers
(ii) Joints in knee
9. No, we cannot bend our elbow.
10. If the body tapers at both the ends then such, shape of the body is said to be streamlined.

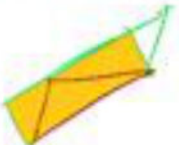
30. How does the snake move?
Snakes have a long backbone and many thin muscles which help in the movement. They give it a forward push by pressing against the ground.



We create notes while teaching. In the next few slides, we present a sample of some notes used by him.

4  4  Area = base * height = 6 * 3 = 18

 Area = $\frac{1}{2} \times 6 \times 3 = 9$

 Area = $\frac{1}{2} \times 3 \times 4 = 6$

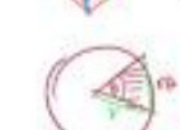
 Rhombus
Area = $4 \times \frac{1}{2} \times \frac{1}{2} \times 4 = 4$

 Area = $4 \times \frac{1}{2} \times \frac{1}{2} \times 5 = 5$

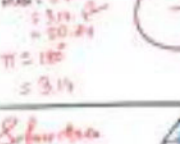
 Area = $4 \times \frac{1}{2} \times \frac{1}{2} \times 5 = 5$

 Area = $4 \times \frac{1}{2} \times \frac{1}{2} \times 4 = 4$

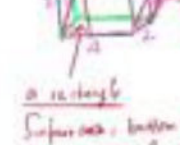
 Area = $4 \times \frac{1}{2} \times \frac{1}{2} \times 4 = 4$

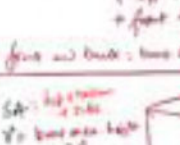
 Area = $\frac{1}{2} \times \pi r^2$

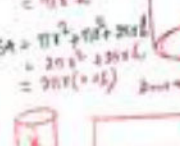
 Area = $\frac{1}{2} \times \pi r^2$

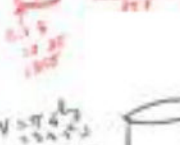
 Area = $\frac{1}{2} \times \pi r^2$

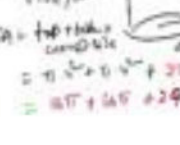
 Surface area = $2\pi r^2 + 2\pi rh$

 Surface area = $2\pi r^2 + 2\pi rh$

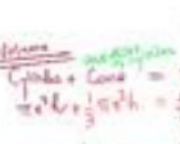
 Surface area = $2\pi r^2 + 2\pi rh$

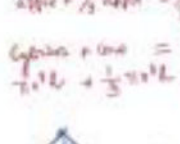
 Surface area = $2\pi r^2 + 2\pi rh$

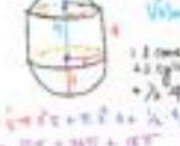
 Surface area = $2\pi r^2 + 2\pi rh$

 Surface area = $2\pi r^2 + 2\pi rh$

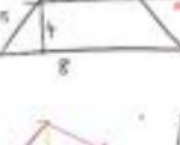
 Volume = $\frac{4}{3} \pi r^3$

 Volume = $\frac{4}{3} \pi r^3$

 Volume = $\frac{4}{3} \pi r^3$

 Volume = $\frac{4}{3} \pi r^3$

 Volume = $\frac{4}{3} \pi r^3$

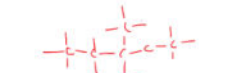
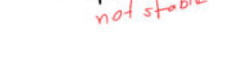
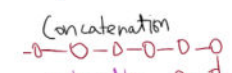
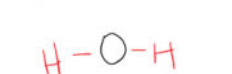
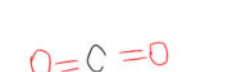
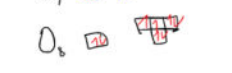
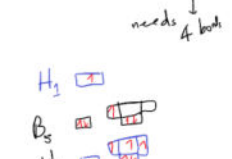
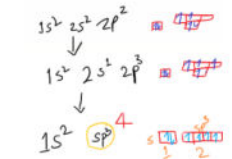
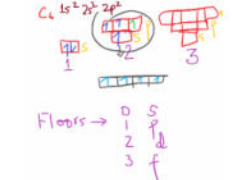
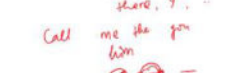
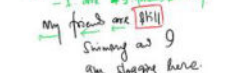
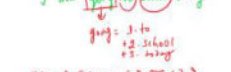
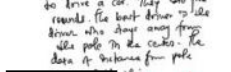
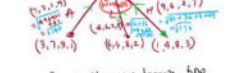
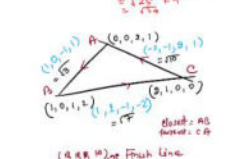
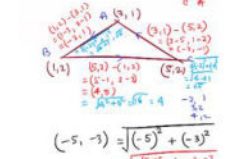
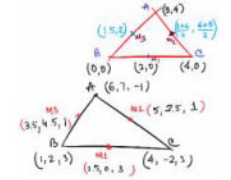
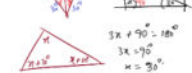
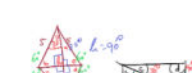
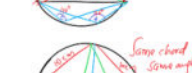
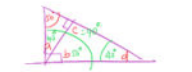
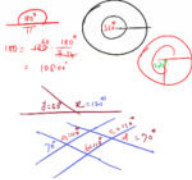
 Volume = $\frac{4}{3} \pi r^3$

 Volume = $\frac{4}{3} \pi r^3$

 Volume = $\frac{4}{3} \pi r^3$

 Volume = $\frac{4}{3} \pi r^3$

$g(a+b) = 2a+2b$
 $(a+b) \cdot -a = -a^2 - ab$
 $(a-b) \cdot 2a = 2a^2 - 2ab$
 $(a+b)(a+b) = a^2 + ab + ab + b^2 = a^2 + 2ab + b^2$
 $(a+b)^3 = \binom{3}{0} a^3 + \binom{3}{1} a^2 b + \binom{3}{2} a b^2 + \binom{3}{3} b^3 = a^3 + 3a^2 b + 3a b^2 + b^3$
 $(a+b)^4 = \binom{4}{0} a^4 + \binom{4}{1} a^3 b + \binom{4}{2} a^2 b^2 + \binom{4}{3} a b^3 + \binom{4}{4} b^4 = a^4 + 4a^3 b + 6a^2 b^2 + 4a b^3 + b^4$
 $(a+b)^5 = \binom{5}{0} a^5 + \binom{5}{1} a^4 b + \binom{5}{2} a^3 b^2 + \binom{5}{3} a^2 b^3 + \binom{5}{4} a b^4 + \binom{5}{5} b^5 = a^5 + 5a^4 b + 10a^3 b^2 + 10a^2 b^3 + 5a b^4 + b^5$
 $(a+b)^6 = \binom{6}{0} a^6 + \binom{6}{1} a^5 b + \binom{6}{2} a^4 b^2 + \binom{6}{3} a^3 b^3 + \binom{6}{4} a^2 b^4 + \binom{6}{5} a b^5 + \binom{6}{6} b^6 = a^6 + 6a^5 b + 15a^4 b^2 + 20a^3 b^3 + 15a^2 b^4 + 6a b^5 + b^6$
 $(a+b)^7 = \binom{7}{0} a^7 + \binom{7}{1} a^6 b + \binom{7}{2} a^5 b^2 + \binom{7}{3} a^4 b^3 + \binom{7}{4} a^3 b^4 + \binom{7}{5} a^2 b^5 + \binom{7}{6} a b^6 + \binom{7}{7} b^7 = a^7 + 7a^6 b + 21a^5 b^2 + 35a^4 b^3 + 35a^3 b^4 + 21a^2 b^5 + 7a b^6 + b^7$
 $(a+b)^8 = \binom{8}{0} a^8 + \binom{8}{1} a^7 b + \binom{8}{2} a^6 b^2 + \binom{8}{3} a^5 b^3 + \binom{8}{4} a^4 b^4 + \binom{8}{5} a^3 b^5 + \binom{8}{6} a^2 b^6 + \binom{8}{7} a b^7 + \binom{8}{8} b^8 = a^8 + 8a^7 b + 28a^6 b^2 + 56a^5 b^3 + 70a^4 b^4 + 56a^3 b^5 + 28a^2 b^6 + 8a b^7 + b^8$
 $(a+b)^9 = \binom{9}{0} a^9 + \binom{9}{1} a^8 b + \binom{9}{2} a^7 b^2 + \binom{9}{3} a^6 b^3 + \binom{9}{4} a^5 b^4 + \binom{9}{5} a^4 b^5 + \binom{9}{6} a^3 b^6 + \binom{9}{7} a^2 b^7 + \binom{9}{8} a b^8 + \binom{9}{9} b^9 = a^9 + 9a^8 b + 36a^7 b^2 + 84a^6 b^3 + 126a^5 b^4 + 126a^4 b^5 + 84a^3 b^6 + 36a^2 b^7 + 9a b^8 + b^9$
 $(a+b)^{10} = \binom{10}{0} a^{10} + \binom{10}{1} a^9 b + \binom{10}{2} a^8 b^2 + \binom{10}{3} a^7 b^3 + \binom{10}{4} a^6 b^4 + \binom{10}{5} a^5 b^5 + \binom{10}{6} a^4 b^6 + \binom{10}{7} a^3 b^7 + \binom{10}{8} a^2 b^8 + \binom{10}{9} a b^9 + \binom{10}{10} b^{10} = a^{10} + 10a^9 b + 45a^8 b^2 + 120a^7 b^3 + 210a^6 b^4 + 252a^5 b^5 + 210a^4 b^6 + 120a^3 b^7 + 45a^2 b^8 + 10a b^9 + b^{10}$
 $(a+b)^{11} = \binom{11}{0} a^{11} + \binom{11}{1} a^{10} b + \binom{11}{2} a^9 b^2 + \binom{11}{3} a^8 b^3 + \binom{11}{4} a^7 b^4 + \binom{11}{5} a^6 b^5 + \binom{11}{6} a^5 b^6 + \binom{11}{7} a^4 b^7 + \binom{11}{8} a^3 b^8 + \binom{11}{9} a^2 b^9 + \binom{11}{10} a b^{10} + \binom{11}{11} b^{11} = a^{11} + 11a^{10} b + 55a^9 b^2 + 165a^8 b^3 + 330a^7 b^4 + 462a^6 b^5 + 462a^5 b^6 + 330a^4 b^7 + 165a^3 b^8 + 55a^2 b^9 + 11a b^{10} + b^{11}$
 $(a+b)^{12} = \binom{12}{0} a^{12} + \binom{12}{1} a^{11} b + \binom{12}{2} a^{10} b^2 + \binom{12}{3} a^9 b^3 + \binom{12}{4} a^8 b^4 + \binom{12}{5} a^7 b^5 + \binom{12}{6} a^6 b^6 + \binom{12}{7} a^5 b^7 + \binom{12}{8} a^4 b^8 + \binom{12}{9} a^3 b^9 + \binom{12}{10} a^2 b^{10} + \binom{12}{11} a b^{11} + \binom{12}{12} b^{12} = a^{12} + 12a^{11} b + 66a^{10} b^2 + 220a^9 b^3 + 495a^8 b^4 + 792a^7 b^5 + 924a^6 b^6 + 792a^5 b^7 + 495a^4 b^8 + 220a^3 b^9 + 66a^2 b^{10} + 12a b^{11} + b^{12}$
 $(a+b)^{13} = \binom{13}{0} a^{13} + \binom{13}{1} a^{12} b + \binom{13}{2} a^{11} b^2 + \binom{13}{3} a^{10} b^3 + \binom{13}{4} a^9 b^4 + \binom{13}{5} a^8 b^5 + \binom{13}{6} a^7 b^6 + \binom{13}{7} a^6 b^7 + \binom{13}{8} a^5 b^8 + \binom{13}{9} a^4 b^9 + \binom{13}{10} a^3 b^{10} + \binom{13}{11} a^2 b^{11} + \binom{13}{12} a b^{12} + \binom{13}{13} b^{13} = a^{13} + 13a^{12} b + 78a^{11} b^2 + 273a^{10} b^3 + 572a^9 b^4 + 1001a^8 b^5 + 1287a^7 b^6 + 1287a^6 b^7 + 1001a^5 b^8 + 572a^4 b^9 + 273a^3 b^{10} + 78a^2 b^{11} + 13a b^{12} + b^{13}$
 $(a+b)^{14} = \binom{14}{0} a^{14} + \binom{14}{1} a^{13} b + \binom{14}{2} a^{12} b^2 + \binom{14}{3} a^{11} b^3 + \binom{14}{4} a^{10} b^4 + \binom{14}{5} a^9 b^5 + \binom{14}{6} a^8 b^6 + \binom{14}{7} a^7 b^7 + \binom{14}{8} a^6 b^8 + \binom{14}{9} a^5 b^9 + \binom{14}{10} a^4 b^{10} + \binom{14}{11} a^3 b^{11} + \binom{14}{12} a^2 b^{12} + \binom{14}{13} a b^{13} + \binom{14}{14} b^{14} = a^{14} + 14a^{13} b + 91a^{12} b^2 + 343a^{11} b^3 + 735a^{10} b^4 + 1302a^9 b^5 + 2002a^8 b^6 + 2002a^7 b^7 + 1302a^6 b^8 + 735a^5 b^9 + 343a^4 b^{10} + 91a^3 b^{11} + 14a^2 b^{12} + 14a b^{13} + b^{14}$
 $(a+b)^{15} = \binom{15}{0} a^{15} + \binom{15}{1} a^{14} b + \binom{15}{2} a^{13} b^2 + \binom{15}{3} a^{12} b^3 + \binom{15}{4} a^{11} b^4 + \binom{15}{5} a^{10} b^5 + \binom{15}{6} a^9 b^6 + \binom{15}{7} a^8 b^7 + \binom{15}{8} a^7 b^8 + \binom{15}{9} a^6 b^9 + \binom{15}{10} a^5 b^{10} + \binom{15}{11} a^4 b^{11} + \binom{15}{12} a^3 b^{12} + \binom{15}{13} a^2 b^{13} + \binom{15}{14} a b^{14} + \binom{15}{15} b^{15} = a^{15} + 15a^{14} b + 105a^{13} b^2 + 429a^{12} b^3 + 1001a^{11} b^4 + 2002a^{10} b^5 + 3003a^9 b^6 + 3003a^8 b^7 + 2002a^7 b^8 + 1001a^6 b^9 + 429a^5 b^{10} + 105a^4 b^{11} + 15a^3 b^{12} + 15a^2 b^{13} + 15a b^{14} + b^{15}$
 $(a+b)^{16} = \binom{16}{0} a^{16} + \binom{16}{1} a^{15} b + \binom{16}{2} a^{14} b^2 + \binom{16}{3} a^{13} b^3 + \binom{16}{4} a^{12} b^4 + \binom{16}{5} a^{11} b^5 + \binom{16}{6} a^{10} b^6 + \binom{16}{7} a^9 b^7 + \binom{16}{8} a^8 b^8 + \binom{16}{9} a^7 b^9 + \binom{16}{10} a^6 b^{10} + \binom{16}{11} a^5 b^{11} + \binom{16}{12} a^4 b^{12} + \binom{16}{13} a^3 b^{13} + \binom{16}{14} a^2 b^{14} + \binom{16}{15} a b^{15} + \binom{16}{16} b^{16} = a^{16} + 16a^{15} b + 120a^{14} b^2 + 560a^{13} b^3 + 1344a^{12} b^4 + 2688a^{11} b^5 + 4096a^{10} b^6 + 4096a^9 b^7 + 2688a^8 b^8 + 1344a^7 b^9 + 560a^6 b^{10} + 120a^5 b^{11} + 16a^4 b^{12} + 16a^3 b^{13} + 16a^2 b^{14} + 16a b^{15} + b^{16}$
 $(a+b)^{17} = \binom{17}{0} a^{17} + \binom{17}{1} a^{16} b + \binom{17}{2} a^{15} b^2 + \binom{17}{3} a^{14} b^3 + \binom{17}{4} a^{13} b^4 + \binom{17}{5} a^{12} b^5 + \binom{17}{6} a^{11} b^6 + \binom{17}{7} a^{10} b^7 + \binom{17}{8} a^9 b^8 + \binom{17}{9} a^8 b^9 + \binom{17}{10} a^7 b^{10} + \binom{17}{11} a^6 b^{11} + \binom{17}{12} a^5 b^{12} + \binom{17}{13} a^4 b^{13} + \binom{17}{14} a^3 b^{14} + \binom{17}{15} a^2 b^{15} + \binom{17}{16} a b^{16} + \binom{17}{17} b^{17} = a^{17} + 17a^{16} b + 136a^{15} b^2 + 680a^{14} b^3 + 1716a^{13} b^4 + 3596a^{12} b^5 + 5616a^{11} b^6 + 5616a^{10} b^7 + 3596a^9 b^8 + 1716a^8 b^9 + 680a^7 b^{10} + 136a^6 b^{11} + 17a^5 b^{12} + 17a^4 b^{13} + 17a^3 b^{14} + 17a^2 b^{15} + 17a b^{16} + b^{17}$
 $(a+b)^{18} = \binom{18}{0} a^{18} + \binom{18}{1} a^{17} b + \binom{18}{2} a^{16} b^2 + \binom{18}{3} a^{15} b^3 + \binom{18}{4} a^{14} b^4 + \binom{18}{5} a^{13} b^5 + \binom{18}{6} a^{12} b^6 + \binom{18}{7} a^{11} b^7 + \binom{18}{8} a^{10} b^8 + \binom{18}{9} a^9 b^9 + \binom{18}{10} a^8 b^{10} + \binom{18}{11} a^7 b^{11} + \binom{18}{12} a^6 b^{12} + \binom{18}{13} a^5 b^{13} + \binom{18}{14} a^4 b^{14} + \binom{18}{15} a^3 b^{15} + \binom{18}{16} a^2 b^{16} + \binom{18}{17} a b^{17} + \binom{18}{18} b^{18} = a^{18} + 18a^{17} b + 153a^{16} b^2 + 816a^{15} b^3 + 2040a^{14} b^4 + 4352a^{13} b^5 + 7428a^{12} b^6 + 9828a^{11} b^7 + 9828a^{10} b^8 + 7428a^9 b^9 + 4352a^8 b^{10} + 2040a^7 b^{11} + 816a^6 b^{12} + 153a^5 b^{13} + 18a^4 b^{14} + 18a^3 b^{15} + 18a^2 b^{16} + 18a b^{17} + b^{18}$
 $(a+b)^{19} = \binom{19}{0} a^{19} + \binom{19}{1} a^{18} b + \binom{19}{2} a^{17} b^2 + \binom{19}{3} a^{16} b^3 + \binom{19}{4} a^{15} b^4 + \binom{19}{5} a^{14} b^5 + \binom{19}{6} a^{13} b^6 + \binom{19}{7} a^{12} b^7 + \binom{19}{8} a^{11} b^8 + \binom{19}{9} a^{10} b^9 + \binom{19}{10} a^9 b^{10} + \binom{19}{11} a^8 b^{11} + \binom{19}{12} a^7 b^{12} + \binom{19}{13} a^6 b^{13} + \binom{19}{14} a^5 b^{14} + \binom{19}{15} a^4 b^{15} + \binom{19}{16} a^3 b^{16} + \binom{19}{17} a^2 b^{17} + \binom{19}{18} a b^{18} + \binom{19}{19} b^{19} = a^{19} + 19a^{18} b + 171a^{17} b^2 + 969a^{16} b^3 + 2431a^{15} b^4 + 5113a^{14} b^5 + 8165a^{13} b^6 + 9828a^{12} b^7 + 9828a^{11} b^8 + 8165a^{10} b^9 + 5113a^9 b^{10} + 2431a^8 b^{11} + 969a^7 b^{12} + 171a^6 b^{13} + 19a^5 b^{14} + 19a^4 b^{15} + 19a^3 b^{16} + 19a^2 b^{17} + 19a b^{18} + b^{19}$
 $(a+b)^{20} = \binom{20}{0} a^{20} + \binom{20}{1} a^{19} b + \binom{20}{2} a^{18} b^2 + \binom{20}{3} a^{17} b^3 + \binom{20}{4} a^{16} b^4 + \binom{20}{5} a^{15} b^5 + \binom{20}{6} a^{14} b^6 + \binom{20}{7} a^{13} b^7 + \binom{20}{8} a^{12} b^8 + \binom{20}{9} a^{11} b^9 + \binom{20}{10} a^{10} b^{10} + \binom{20}{11} a^9 b^{11} + \binom{20}{12} a^8 b^{12} + \binom{20}{13} a^7 b^{13} + \binom{20}{14} a^6 b^{14} + \binom{20}{15} a^5 b^{15} + \binom{20}{16} a^4 b^{16} + \binom{20}{17} a^3 b^{17} + \binom{20}{18} a^2 b^{18} + \binom{20}{19} a b^{19} + \binom{20}{20} b^{20} = a^{20} + 20a^{19} b + 190a^{18} b^2 + 1162a^{17} b^3 + 3527a^{16} b^4 + 7770a^{15} b^5 + 12598a^{14} b^6 + 16796a^{13} b^7 + 16796a^{12} b^8 + 12598a^{11} b^9 + 7770a^{10} b^{10} + 3527a^9 b^{11} + 1162a^8 b^{12} + 190a^7 b^{13} + 20a^6 b^{14} + 20a^5 b^{15} + 20a^4 b^{16} + 20a^3 b^{17} + 20a^2 b^{18} + 20a b^{19} + b^{20}$
 $(a+b)^{21} = \binom{21}{0} a^{21} + \binom{21}{1} a^{20} b + \binom{21}{2} a^{19} b^2 + \binom{21}{3} a^{18} b^3 + \binom{21}{4} a^{17} b^4 + \binom{21}{5} a^{16} b^5 + \binom{21}{6} a^{15} b^6 + \binom{21}{7} a^{14} b^7 + \binom{21}{8} a^{13} b^8 + \binom{21}{9} a^{12} b^9 + \binom{21}{10} a^{11} b^{10} + \binom{21}{11} a^{10} b^{11} + \binom{21}{12} a^9 b^{12} + \binom{21}{13} a^8 b^{13} + \binom{21}{14} a^7 b^{14} + \binom{21}{15} a^6 b^{15} + \binom{21}{16} a^5 b^{16} + \binom{21}{17} a^4 b^{17} + \binom{21}{18} a^3 b^{18} + \binom{21}{19} a^2 b^{19} + \binom{21}{20} a b^{20} + \binom{21}{21} b^{21} = a^{21} + 21a^{20} b + 210a^{19} b^2 + 1330a^{18} b^3 + 4199a^{17} b^4 + 9828a^{16} b^5 + 16796a^{15} b^6 + 24310a^{14} b^7 + 27908a^{13} b^8 + 24310a^{12} b^9 + 16796a^{11} b^{10} + 9828a^{10} b^{11} + 4199a^9 b^{12} + 1330a^8 b^{13} + 210a^7 b^{14} + 21a^6 b^{15} + 21a^5 b^{16} + 21a^4 b^{17} + 21a^3 b^{18} + 21a^2 b^{19} + 21a b^{20} + b^{21}$
 $(a+b)^{22} = \binom{22}{0} a^{22} + \binom{22}{1} a^{21} b + \binom{22}{2} a^{20} b^2 + \binom{22}{3} a^{19} b^3 + \binom{22}{4} a^{18} b^4 + \binom{22}{5} a^{17} b^5 + \binom{22}{6} a^{16} b^6 + \binom{22}{7} a^{15} b^7 + \binom{22}{8} a^{14} b^8 + \binom{22}{9} a^{13} b^9 + \binom{22}{10} a^{12} b^{10} + \binom{22}{11} a^{11} b^{11} + \binom{22}{12} a^{10} b^{12} + \binom{22}{13} a^9 b^{13} + \binom{22}{14} a^8 b^{14} + \binom{22}{15} a^7 b^{15} + \binom{22}{16} a^6 b^{16} + \binom{22}{17} a^5 b^{17} + \binom{22}{18} a^4 b^{18} + \binom{22}{19} a^3 b^{19} + \binom{22}{20} a^2 b^{20} + \binom{22}{21} a b^{21} + \binom{22}{22} b^{22} = a^{22} + 22a^{21} b + 231a^{20} b^2 + 1540a^{19} b^3 + 4620a^{18} b^4 + 10626a^{17} b^5 + 19404a^{16} b^6 + 27132a^{15} b^7 + 27132a^{14} b^8 + 19404a^{13} b^9 + 10626a^{12} b^{10} + 4620a^{11} b^{11} + 1540a^{10} b^{12} + 231a^9 b^{13} + 22a^8 b^{14} + 22a^7 b^{15} + 22a^6 b^{16} + 22a^5 b^{17} + 22a^4 b^{18} + 22a^3 b^{19} + 22a^2 b^{20} + 22a b^{21} + b^{22}$
 $(a+b)^{23} = \binom{23}{0} a^{23} + \binom{23}{1} a^{22} b + \binom{23}{2} a^{21} b^2 + \binom{23}{3} a^{20} b^3 + \binom{23}{4} a^{19} b^4 + \binom{23}{5} a^{18} b^5 + \binom{23}{6} a^{17} b^6 + \binom{23}{7} a^{16} b^7 + \binom{23}{8} a^{15} b^8 + \binom{23}{9} a^{14} b^9 + \binom{23}{10} a^{13} b^{10} + \binom{23}{11} a^{12} b^{11} + \binom{23}{12} a^{11} b^{12} + \binom{23}{13} a^{10} b^{13} + \binom{23}{14} a^9 b^{14} + \binom{23}{15} a^8 b^{15} + \binom{23}{16} a^7 b^{16} + \binom{23}{17} a^6 b^{17} + \binom{23}{18} a^5 b^{18} + \binom{23}{19} a^4 b^{19} + \binom{23}{20} a^3 b^{20} + \binom{23}{21} a^2 b^{21} + \binom{23}{22} a b^{22} + \binom{23}{23} b^{23} = a^{23} + 23a^{22} b + 253a^{21} b^2 + 1771a^{20} b^3 + 5293a^{19} b^4 + 12649a^{18} b^5 + 23538a^{17} b^6 + 33794a^{16} b^7 + 33794a^{15} b^8 + 23538a^{14} b^9 + 12649a^{13} b^{10} + 5293a^{12} b^{11} + 1771a^{11} b^{12} + 253a^{10} b^{13} + 23a^9 b^{14} + 23a^8 b^{15} + 23a^7 b^{16} + 23a^6 b^{17} + 23a^5 b^{18} + 23a^4 b^{19} + 23a^3 b^{20} + 23a^2 b^{21} + 23a b^{22} + b^{23}$
 $(a+b)^{24} = \binom{24}{0} a^{24} + \binom{24}{1} a^{23} b + \binom{24}{2} a^{22} b^2 + \binom{24}{3} a^{21} b^3 + \binom{24}{4} a^{20} b^4 + \binom{24}{5} a^{19} b^5 + \binom{24}{6} a^{18} b^6 + \binom{24}{7} a^{17} b^7 + \binom{24}{8} a^{16} b^8 + \binom{24}{9} a^{15} b^9 + \binom{24}{10} a^{14} b^{10} + \binom{24}{11} a^{13} b^{11} + \binom{24}{12} a^{12} b^{12} + \binom{24}{13} a^{11} b^{13} + \binom{24}{14} a^{10} b^{14} + \binom{24}{15} a^9 b^{15} + \binom{24}{16} a^8 b^{16} + \binom{24}{17} a^7 b^{17} + \binom{24}{18} a^6 b^{18} + \binom{24}{19} a^5 b^{19} + \binom{24}{20} a^4 b^{20} + \binom{24}{21} a^3 b^{21} + \binom{24}{22} a^2 b^{22} + \binom{24}{23} a b^{23} + \binom{24}{24} b^{24} = a^{24} + 24a^{23} b + 276a^{22} b^2 + 2024a^{21} b^3 + 6424a^{20} b^4 + 15984a^{19} b^5 + 31360a^{18} b^6 + 47376a^{17} b^7 + 47376a^{16} b^8 + 31360a^{15} b^9 + 15984a^{14} b^{10} + 6424a^{13} b^{11} + 2024a^{12} b^{12} + 276a^{11} b^{13} + 24a^{10} b^{14} + 24a^9 b^{15} + 24a^8 b^{16} + 24a^7 b^{17} + 24a^6 b^{18} + 24a^5 b^{19} + 24a^4 b^{20} + 24a^3 b^{21} + 24a^2 b^{22} + 24a b^{23} + b^{24}$
 $(a+b)^{25} = \binom{25}{0} a^{25} + \binom{25}{1} a^{24} b + \binom{25}{2} a^{23} b^2 + \binom{25}{3} a^{22} b^3 + \binom{25}{4} a^{21} b^4 + \binom{25}{5} a^{20} b^5 + \binom{25}{6} a^{19} b^6 + \binom{25}{7} a^{18} b^7 + \binom{25}{8} a^{17} b^8 + \binom{25}{9} a^{16} b^9 + \binom{25}{10} a^{15} b^{10} + \binom{25}{11} a^{14} b^{11} + \binom{25}{12} a^{13} b^{12} + \binom{25}{13} a^{12} b^{13} + \binom{25}{14} a^{11} b^{14} + \binom{25}{15} a^{10} b^{15} + \binom{25}{16} a^9 b^{16} + \binom{25}{17} a^8 b^{17} + \binom{25}{18} a^7 b^{18} + \binom{25}{19} a^6 b^{19} + \binom{25}{20} a^5 b^{20} + \binom{25}{21} a^4 b^{21} + \binom{25}{22} a^3 b^{22} + \binom{25}{23} a^2 b^{23} + \binom{25}{24} a b^{24} + \binom{25}{25} b^{25} = a^{25} + 25a^{24} b + 325a^{23} b^2 + 2600a^{22} b^3 + 9375a^{21} b^4 + 24375a^{20} b^5 + 47250a^{19} b^6 + 72765a^{18} b^7 + 72765a^{17} b^8 + 47250a^{16} b^9 + 24375a^{15} b^{10} + 9375a^{14} b^{11} + 2600a^{13} b^{12} + 325a^{12} b^{13} + 25a^{11} b^{14} + 25a^{10} b^{15} + 25a^9 b^{16} + 25a^8 b^{17} + 25a^7 b^{18} + 25a^6 b^{19} + 25a^5 b^{20} + 25a^4 b^{21} + 25a^3 b^{22} + 25a^2 b^{23} + 25a b^{24} + b^{25}$
 $(a+b)^{26} = \binom{26}{0} a^{26} + \binom{26}{1} a^{25} b + \binom{26}{2} a^{24} b^2 + \binom{26}{3} a^{23} b^3 + \binom{26}{4} a^{22} b^4 + \binom{26}{5} a^{21} b^5 + \binom{26}{6} a^{20} b^6 + \binom{26}{7} a^{19} b^7 + \binom{26}{8} a^{18} b^8 + \binom{26}{9} a^{17} b^9 + \binom{26}{10} a^{16} b^{10} + \binom{26}{11} a^{15} b^{11} + \binom{26}{12} a^{14} b^{12} + \binom{26}{13} a^{13} b^{13} + \binom{26}{14} a^{12} b^{14} + \binom{26}{15} a^{11} b^{15} + \binom{26}{16} a^{10} b^{16} + \binom{26}{17} a$



$$(a+b)^0 = 1$$

$$(a+b)^1 = a+b$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

$$(a+b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$$

$$(a+b)^6 = a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$$

$$(a+b)^7 = a^7 + 7a^6b + 21a^5b^2 + 35a^4b^3 + 35a^3b^4 + 21a^2b^5 + 7ab^6 + b^7$$

$$(a+b)^8 = a^8 + 8a^7b + 28a^6b^2 + 56a^5b^3 + 70a^4b^4 + 56a^3b^5 + 28a^2b^6 + 8ab^7 + b^8$$

$$(a+b)^9 = a^9 + 9a^8b + 36a^7b^2 + 84a^6b^3 + 126a^5b^4 + 126a^4b^5 + 84a^3b^6 + 36a^2b^7 + 9ab^8 + b^9$$

$$(a+b)^{10} = a^{10} + 10a^9b + 45a^8b^2 + 120a^7b^3 + 210a^6b^4 + 252a^5b^5 + 210a^4b^6 + 120a^3b^7 + 45a^2b^8 + 10ab^9 + b^{10}$$

$$(a+b)^{11} = a^{11} + 11a^{10}b + 55a^9b^2 + 165a^8b^3 + 330a^7b^4 + 462a^6b^5 + 462a^5b^6 + 330a^4b^7 + 165a^3b^8 + 55a^2b^9 + 11ab^{10} + b^{11}$$

$$(a+b)^{12} = a^{12} + 12a^{11}b + 66a^{10}b^2 + 220a^9b^3 + 495a^8b^4 + 792a^7b^5 + 924a^6b^6 + 792a^5b^7 + 495a^4b^8 + 220a^3b^9 + 66a^2b^{10} + 12ab^{11} + b^{12}$$

$$(a+b)^{13} = a^{13} + 13a^{12}b + 78a^{11}b^2 + 286a^{10}b^3 + 715a^9b^4 + 1287a^8b^5 + 1716a^7b^6 + 1716a^6b^7 + 1287a^5b^8 + 715a^4b^9 + 286a^3b^{10} + 78a^2b^{11} + 13ab^{12} + b^{13}$$

$$(a+b)^{14} = a^{14} + 14a^{13}b + 91a^{12}b^2 + 364a^{11}b^3 + 1001a^{10}b^4 + 2002a^9b^5 + 3003a^8b^6 + 3432a^7b^7 + 3003a^6b^8 + 2002a^5b^9 + 1001a^4b^{10} + 364a^3b^{11} + 91a^2b^{12} + 14ab^{13} + b^{14}$$

$$(a+b)^{15} = a^{15} + 15a^{14}b + 105a^{13}b^2 + 455a^{12}b^3 + 1365a^{11}b^4 + 3003a^{10}b^5 + 5005a^9b^6 + 6435a^8b^7 + 6435a^7b^8 + 5005a^6b^9 + 3003a^5b^{10} + 1365a^4b^{11} + 455a^3b^{12} + 105a^2b^{13} + 15ab^{14} + b^{15}$$

$$(a+b)^{16} = a^{16} + 16a^{15}b + 120a^{14}b^2 + 560a^{13}b^3 + 1792a^{12}b^4 + 4352a^{11}b^5 + 8704a^{10}b^6 + 12544a^9b^7 + 12544a^8b^8 + 8704a^7b^9 + 4352a^6b^{10} + 1792a^5b^{11} + 560a^4b^{12} + 120a^3b^{13} + 16a^2b^{14} + 16ab^{15} + b^{16}$$

$$(a+b)^{17} = a^{17} + 17a^{16}b + 136a^{15}b^2 + 680a^{14}b^3 + 2210a^{13}b^4 + 5428a^{12}b^5 + 11628a^{11}b^6 + 22100a^{10}b^7 + 35960a^9b^8 + 46188a^8b^9 + 46188a^7b^{10} + 35960a^6b^{11} + 22100a^5b^{12} + 11628a^4b^{13} + 5428a^3b^{14} + 136a^2b^{15} + 17ab^{16} + b^{17}$$

$$(a+b)^{18} = a^{18} + 18a^{17}b + 153a^{16}b^2 + 816a^{15}b^3 + 2808a^{14}b^4 + 7428a^{13}b^5 + 16797a^{12}b^6 + 33594a^{11}b^7 + 54284a^{10}b^8 + 74280a^9b^9 + 74280a^8b^{10} + 54284a^7b^{11} + 33594a^6b^{12} + 16797a^5b^{13} + 7428a^4b^{14} + 153a^3b^{15} + 18a^2b^{16} + 18ab^{17} + b^{18}$$

$$(a+b)^{19} = a^{19} + 19a^{18}b + 171a^{17}b^2 + 969a^{16}b^3 + 3771a^{15}b^4 + 11628a^{14}b^5 + 29394a^{13}b^6 + 63525a^{12}b^7 + 116280a^{11}b^8 + 171234a^{10}b^9 + 214740a^9b^{10} + 214740a^8b^{11} + 171234a^7b^{12} + 116280a^6b^{13} + 63525a^5b^{14} + 29394a^4b^{15} + 11628a^3b^{16} + 171a^2b^{17} + 19ab^{18} + b^{19}$$

$$(a+b)^{20} = a^{20} + 20a^{19}b + 190a^{18}b^2 + 1140a^{17}b^3 + 4845a^{16}b^4 + 15504a^{15}b^5 + 38760a^{14}b^6 + 85080a^{13}b^7 + 167970a^{12}b^8 + 271320a^{11}b^9 + 352716a^{10}b^{10} + 352716a^9b^{11} + 271320a^8b^{12} + 167970a^7b^{13} + 85080a^6b^{14} + 38760a^5b^{15} + 15504a^4b^{16} + 4845a^3b^{17} + 1140a^2b^{18} + 190ab^{19} + b^{20}$$

$$(a+b)^{21} = a^{21} + 21a^{20}b + 210a^{19}b^2 + 1330a^{18}b^3 + 6174a^{17}b^4 + 22314a^{16}b^5 + 58080a^{15}b^6 + 128700a^{14}b^7 + 254256a^{13}b^8 + 435456a^{12}b^9 + 672450a^{11}b^{10} + 818514a^{10}b^{11} + 818514a^9b^{12} + 672450a^8b^{13} + 435456a^7b^{14} + 254256a^6b^{15} + 128700a^5b^{16} + 58080a^4b^{17} + 22314a^3b^{18} + 6174a^2b^{19} + 210ab^{20} + b^{21}$$

$$(a+b)^{22} = a^{22} + 22a^{21}b + 231a^{20}b^2 + 1540a^{19}b^3 + 7722a^{18}b^4 + 33078a^{17}b^5 + 106260a^{16}b^6 + 263340a^{15}b^7 + 542840a^{14}b^8 + 972432a^{13}b^9 + 1548168a^{12}b^{10} + 2147424a^{11}b^{11} + 2147424a^{10}b^{12} + 1548168a^9b^{13} + 972432a^8b^{14} + 542840a^7b^{15} + 263340a^6b^{16} + 106260a^5b^{17} + 33078a^4b^{18} + 7722a^3b^{19} + 1540a^2b^{20} + 231ab^{21} + b^{22}$$

$$(a+b)^{23} = a^{23} + 23a^{22}b + 253a^{21}b^2 + 1771a^{20}b^3 + 9242a^{19}b^4 + 41998a^{18}b^5 + 162150a^{17}b^6 + 471435a^{16}b^7 + 1144066a^{15}b^8 + 2429586a^{14}b^9 + 4354560a^{13}b^{10} + 6724500a^{12}b^{11} + 8185140a^{11}b^{12} + 8185140a^{10}b^{13} + 6724500a^9b^{14} + 4354560a^8b^{15} + 2429586a^7b^{16} + 1144066a^6b^{17} + 471435a^5b^{18} + 162150a^4b^{19} + 41998a^3b^{20} + 9242a^2b^{21} + 1771ab^{22} + b^{23}$$

$$(a+b)^{24} = a^{24} + 24a^{23}b + 276a^{22}b^2 + 2024a^{21}b^3 + 11628a^{20}b^4 + 57152a^{19}b^5 + 243100a^{18}b^6 + 835216a^{17}b^7 + 2279808a^{16}b^8 + 5428416a^{15}b^9 + 11628000a^{14}b^{10} + 21474240a^{13}b^{11} + 35271600a^{12}b^{12} + 46188000a^{11}b^{13} + 46188000a^{10}b^{14} + 35271600a^9b^{15} + 21474240a^8b^{16} + 11628000a^7b^{17} + 835216a^6b^{18} + 243100a^5b^{19} + 57152a^4b^{20} + 11628a^3b^{21} + 2024a^2b^{22} + 276ab^{23} + b^{24}$$

$$(a+b)^{25} = a^{25} + 25a^{24}b + 300a^{23}b^2 + 2300a^{22}b^3 + 13520a^{21}b^4 + 72192a^{20}b^5 + 330750a^{19}b^6 + 1287000a^{18}b^7 + 4082400a^{17}b^8 + 11440656a^{16}b^9 + 26334000a^{15}b^{10} + 54284160a^{14}b^{11} + 97243200a^{13}b^{12} + 154816800a^{12}b^{13} + 154816800a^{11}b^{14} + 154816800a^{10}b^{15} + 97243200a^9b^{16} + 54284160a^8b^{17} + 26334000a^7b^{18} + 1287000a^6b^{19} + 4082400a^5b^{20} + 11440656a^4b^{21} + 2431000a^3b^{22} + 330750a^2b^{23} + 2300ab^{24} + b^{25}$$

$$(a+b)^{26} = a^{26} + 26a^{25}b + 325a^{24}b^2 + 2600a^{23}b^3 + 16900a^{22}b^4 + 97240a^{21}b^5 + 520020a^{20}b^6 + 2353980a^{19}b^7 + 8581680a^{18}b^8 + 26334000a^{17}b^9 + 67245000a^{16}b^{10} + 154816800a^{15}b^{11} + 335940000a^{14}b^{12} + 635250000a^{13}b^{13} + 972432000a^{12}b^{14} + 1254400000a^{11}b^{15} + 1254400000a^{10}b^{16} + 1254400000a^9b^{17} + 972432000a^8b^{18} + 635250000a^7b^{19} + 335940000a^6b^{20} + 154816800a^5b^{21} + 67245000a^4b^{22} + 26334000a^3b^{23} + 8581680a^2b^{24} + 2353980ab^{25} + b^{26}$$

$$(a+b)^{27} = a^{27} + 27a^{26}b + 351a^{25}b^2 + 2925a^{24}b^3 + 19665a^{23}b^4 + 111978a^{22}b^5 + 608220a^{21}b^6 + 2790780a^{20}b^7 + 11440656a^{19}b^8 + 40824000a^{18}b^9 + 114406560a^{17}b^{10} + 263340000a^{16}b^{11} + 542841600a^{15}b^{12} + 972432000a^{14}b^{13} + 1548168000a^{13}b^{14} + 2147424000a^{12}b^{15} + 2542560000a^{11}b^{16} + 2542560000a^{10}b^{17} + 2542560000a^9b^{18} + 2147424000a^8b^{19} + 1548168000a^7b^{20} + 972432000a^6b^{21} + 542841600a^5b^{22} + 263340000a^4b^{23} + 114406560a^3b^{24} + 40824000a^2b^{25} + 2790780ab^{26} + b^{27}$$

$$(a+b)^{28} = a^{28} + 28a^{27}b + 378a^{26}b^2 + 3276a^{25}b^3 + 22176a^{24}b^4 + 135240a^{23}b^5 + 721920a^{22}b^6 + 3307500a^{21}b^7 + 12870000a^{20}b^8 + 40824000a^{19}b^9 + 114406560a^{18}b^{10} + 263340000a^{17}b^{11} + 542841600a^{16}b^{12} + 972432000a^{15}b^{13} + 1548168000a^{14}b^{14} + 2147424000a^{13}b^{15} + 2542560000a^{12}b^{16} + 2542560000a^{11}b^{17} + 2542560000a^{10}b^{18} + 2147424000a^9b^{19} + 1548168000a^8b^{20} + 972432000a^7b^{21} + 542841600a^6b^{22} + 263340000a^5b^{23} + 114406560a^4b^{24} + 40824000a^3b^{25} + 2790780a^2b^{26} + 28ab^{27} + b^{28}$$

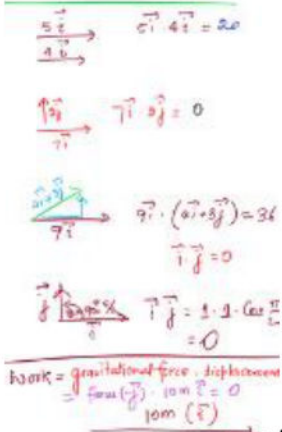
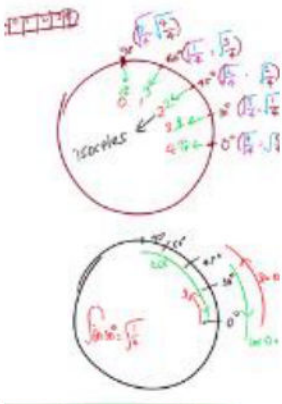
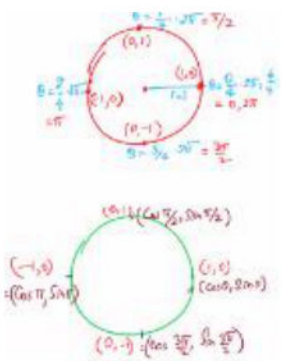
$$(a+b)^{29} = a^{29} + 29a^{28}b + 406a^{27}b^2 + 3542a^{26}b^3 + 24310a^{25}b^4 + 154816a^{24}b^5 + 835216a^{23}b^6 + 4082400a^{22}b^7 + 16215000a^{21}b^8 + 54284160a^{20}b^9 + 154816800a^{19}b^{10} + 408240000a^{18}b^{11} + 858168000a^{17}b^{12} + 1548168000a^{16}b^{13} + 2542560000a^{15}b^{14} + 3527160000a^{14}b^{15} + 4354560000a^{13}b^{16} + 4618800000a^{12}b^{17} + 4618800000a^{11}b^{18} + 4618800000a^{10}b^{19} + 4354560000a^9b^{20} + 3527160000a^8b^{21} + 2542560000a^7b^{22} + 1548168000a^6b^{23} + 858168000a^5b^{24} + 408240000a^4b^{25} + 162150000a^3b^{26} + 54284160a^2b^{27} + 406ab^{28} + b^{29}$$

$$(a+b)^{30} = a^{30} + 30a^{29}b + 435a^{28}b^2 + 3915a^{27}b^3 + 27435a^{26}b^4 + 177150a^{25}b^5 + 972432a^{24}b^6 + 5005008a^{23}b^7 + 22314000a^{22}b^8 + 85816800a^{21}b^9 + 263340000a^{20}b^{10} + 672450000a^{19}b^{11} + 1548168000a^{18}b^{12} + 3359400000a^{17}b^{13} + 6352500000a^{16}b^{14} + 9724320000a^{15}b^{15} + 12544000000a^{14}b^{16} + 12544000000a^{13}b^{17} + 12544000000a^{12}b^{18} + 12544000000a^{11}b^{19} + 12544000000a^{10}b^{20} + 12544000000a^9b^{21} + 12544000000a^8b^{22} + 12544000000a^7b^{23} + 12544000000a^6b^{24} + 12544000000a^5b^{25} + 12544000000a^4b^{26} + 12544000000a^3b^{27} + 12544000000a^2b^{28} + 12544000000ab^{29} + b^{30}$$

$$(a+b)^{31} = a^{31} + 31a^{30}b + 465a^{29}b^2 + 4290a^{28}b^3 + 31395a^{27}b^4 + 205425a^{26}b^5 + 1162800a^{25}b^6 + 6082200a^{24}b^7 + 27907800a^{23}b^8 + 114406560a^{22}b^9 + 408240000a^{21}b^{10} + 1144065600a^{20}b^{11} + 2633400000a^{19}b^{12} + 5428416000a^{18}b^{13} + 9724320000a^{17}b^{14} + 15481680000a^{16}b^{15} + 21474240000a^{15}b^{16} + 25425600000a^{14}b^{17} + 25425600000a^{13}b^{18} + 25425600000a^{12}b^{19} + 25425600000a^{11}b^{20} + 25425600000a^{10}b^{21} + 25425600000a^9b^{22} + 25425600000a^8b^{23} + 25425600000a^7b^{24} + 25425600000a^6b^{25} + 25425600000a^5b^{26} + 25425600000a^4b^{27} + 25425600000a^3b^{28} + 25425600000a^2b^{29} + 25425600000ab^{30} + b^{31}$$

$$(a+b)^{32} = a^{32} + 32a^{31}b + 500a^{30}b^2 + 4608a^{29}b^3 + 33536a^{28}b^4 + 223104a^{27}b^5 + 1287000a^{26}b^6 + 6724500a^{25}b^7 + 30030000a^{24}b^8 + 114406560a^{23}b^9 + 352716000a^{22}b^{10} + 858168000a^{21}b^{11} + 1871100000a^{20}b^{12} + 3876000000a^{19}b^{13} + 7428000000a^{18}b^{14} + 12544000000a^{17}b^{15} + 18711000000a^{16}b^{16} + 22310400000a^{15}b^{17} + 22310400000a^{14}b^{18} + 22310400000a^{13}b^{19} + 22310400000a^{12}b^{20} + 22310400000a^{11}b^{21} + 22310400000a^{10}b^{22} + 22310400000a^9b^{23} + 22310400000a^8b^{24} + 22310400000a^7b^{25} + 22310400000a^6b^{26} + 22310400000a^5b^{27} + 22310400000a^4b^{28} + 22310400000a^3b^{29} + 22310400000a^2b^{30} + 22310400000ab^{31} + b^{32}$$

$$(a+b)^{33} = a^{33} + 33a^{32}b + 528a^{31}b^2 + 4852a^{30}b^3 + 35936a^{29}b^4 + 243104a^{28}b^5 + 1479360a^{27}b^6 + 7723200a^{26}b^7 + 33075000a^{25}b^8 + 114406560a^{24}b^9 + 300300000a^{23}b^{10} + 672450000a^{22}b^{11} + 1352760000a^{21}b^{12} + 2542560000a^{20}b^{13} + 4354560000a^{19}b^{14} + 7428000000a^{18}b^{15} + 11440656000a^{17}b^{16} + 16215000000a^{16}b^{17} + 18711000000a^{15}b^{18} + 18711000000a^{14}b^{19} + 18711000000a^{13}b^{20} + 18711000000a^{12}b^{21} + 18711000000a^{11}b^{22} + 18711000000a^{10}b^{23} + 18711000000a^9b^{24} + 18711000000a^8b^{25} + 18711000000a^7b^{26} + 18711000000a^6b$$



Quantity, unit, dimension

Qty:		Height	Weight
61 inch, 157 cm,	width	61 inch 157 cm	60 kg 132 lbs
64 inch 60 kg 133 lbs	depth	64 inch 164 cm	55 kg 120 lbs
Units: inch, cm, lbs, kg			
Dimensions:	[L], [M]		

	Qty	Unit	Dim
Circle			
radius	2 m	m	[L]
center	(0,0)	1	[]
Circumfer	$2 \cdot 2\pi \cdot 2m = 12.56m$	m	[L]
Area	$3.14 \cdot 2m^2 = 12.56m^2$	m^2	[L ²]
angle	$2\pi = 2 \cdot 3.14 = 6.28$	1	[]
Rectangle			
width	3m	m	[L]
length	4m	m	[L]
Diagonal	5m	m	[L]
perimeter	14m	m	[L]
area	12m ²	m ²	[L ²]
Cube			
side	4m	m	[L]
area	$6 \cdot 4m \cdot 4m = 96m^2$	m ²	[L ²]
Volume	$4m \cdot 4m \cdot 4m = 64m^3$	m ³	[L ³]

Fundamental dimensions

M = Mass
L = Length
T = Time
K = Temperature
C = Charge Coulomb

We do 100 Joule work
find discussion of the work.

Work = Force · displacement
[L]

Force = mass · acceleration
 $\downarrow$
 [m]

$$\text{acceleration} = \frac{\text{velocity}}{\text{time}} \leftarrow [T]$$

$$\text{Velocity} = \frac{\text{Displacement}}{\text{time}} \quad \frac{[L]}{[T]}$$

$$[Work] = [Force \cdot displacement]$$

$$= [m \cdot a \cdot L]$$

$$= [M \cdot \frac{v}{t} \cdot L]$$

$$= \left[M \frac{d_F}{T} L \right]$$

$$= [M \frac{L}{T \cdot T} L]$$

$$= \left[\frac{m L^2}{T^2} \right]$$

$$= [M T^{-2} L^2]$$

What is conversion of element?

Newton is measure force.

$$[\text{Force}] = [m \cdot a] = \left[m \cdot \frac{v}{t} \right] = \left[m \cdot \frac{\frac{d}{t}}{t} \right]$$

$$= \left[\frac{ML}{T^2} \right] = [MLT^{-2}]$$

What is unit of force in base units?

force = $[M L T^{-2}] = \text{Kg} \cdot \text{m} \cdot \text{seconds}^2$

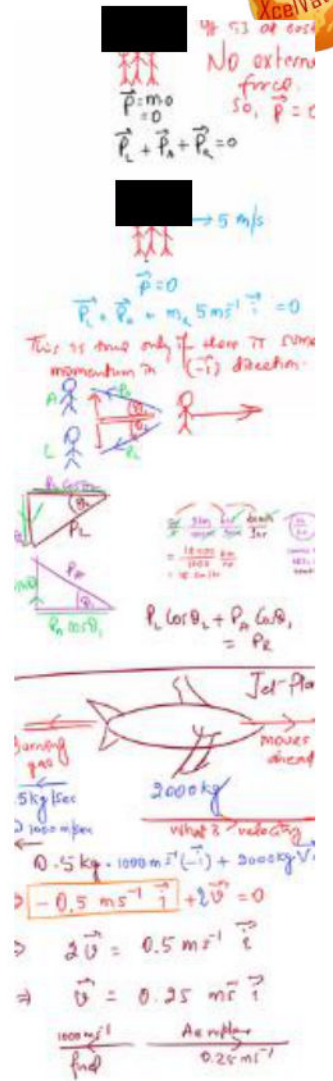
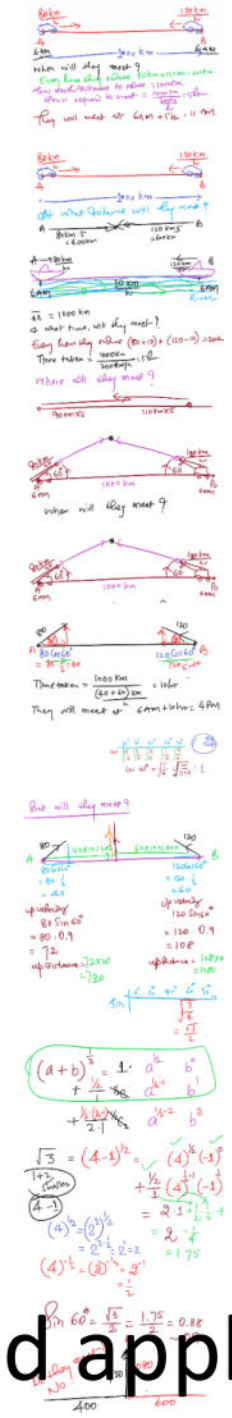
$$1 \text{ Newton} = \frac{1 \text{ Kg m}}{\text{Second}^2}$$

Find unit of power in base
SI units?

	SI unit	cgs unit
Power = $\frac{\text{Work}}{\text{Time}}$	Kg	gram
	meter	cm
	second	second
Power = $\frac{[ML^2T^{-2}]}{[T]}$	Kelvin	Kelvin
	Coulomb	Coulomb
= $[ML^2T^{-3}]$	Joule	Calorie
	(Power) Watt	
base SI unit	$\text{Kg m}^2 \text{s}^{-3}$	litre
if Power = $\text{Kg m}^2 \text{s}^{-3}$	$= \text{Joule}$	1000 cm^3

base SI unit
of Power = $\text{kg m}^2 \text{s}^{-3}$
= Joule

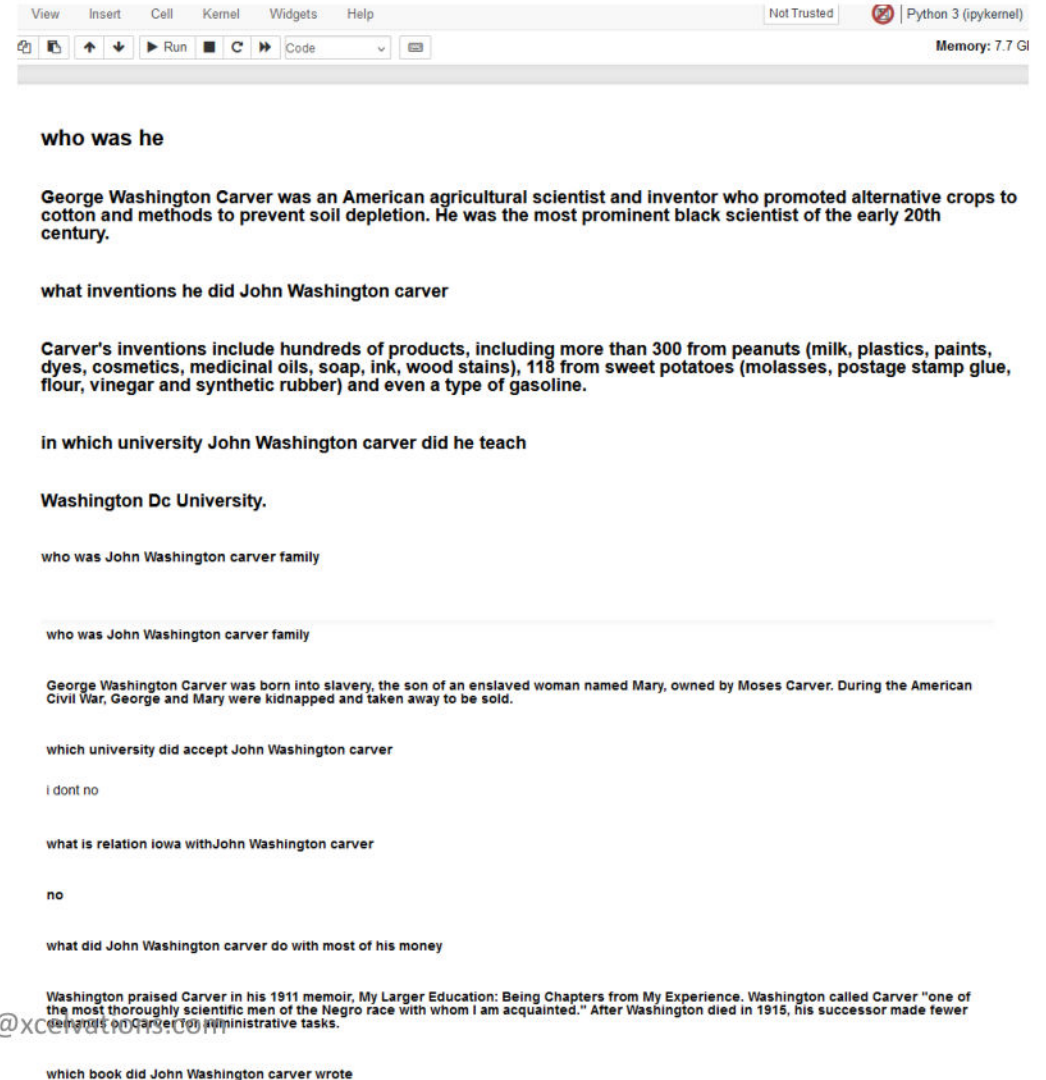
base cgs unit of
power = $\text{g cm}^2 \text{s}^{-3}$
= Calorie



They understand these advanced topics and apply them.

We mentor, while they engage in self-learning

- They search facts on net and discuss among each other and present a story on a topic
- This was time to learn about great **George Washington Carver**



View Insert Cell Kernel Widgets Help Not Trusted Python 3 (ipykernel) Memory: 7.7 Gi

who was he

George Washington Carver was an American agricultural scientist and inventor who promoted alternative crops to cotton and methods to prevent soil depletion. He was the most prominent black scientist of the early 20th century.

what inventions he did John Washington carver

Carver's inventions include hundreds of products, including more than 300 from peanuts (milk, plastics, paints, dyes, cosmetics, medicinal oils, soap, ink, wood stains), 118 from sweet potatoes (molasses, postage stamp glue, flour, vinegar and synthetic rubber) and even a type of gasoline.

in which university John Washington carver did he teach

Washington Dc University.

who was John Washington carver family

who was John Washington carver family

George Washington Carver was born into slavery, the son of an enslaved woman named Mary, owned by Moses Carver. During the American Civil War, George and Mary were kidnapped and taken away to be sold.

which university did accept John Washington carver

I dont no

what is relation Iowa with John Washington carver

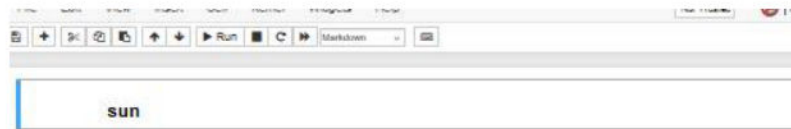
no

what did John Washington carver do with most of his money

Washington praised Carver in his 1911 memoir, *My Larger Education: Being Chapters from My Experience*. Washington called Carver "one of the most thoroughly scientific men of the Negro race with whom I am acquainted." After Washington died in 1915, his successor made fewer demands on Carver for administrative tasks.

which book did John Washington carver wrote

Almost any topic they want to learn...



sun is the center of the solar system plants orbit around the sun system plants orbit around the sun

plants

they orbit around the sun they are the biggest things orbiting the sun there are eight planets in the solar system

solar system



how much age is our solar system

our System is 4.568 billion years old

our universe is 13 billion years old



Asteroid belt

The asteroid belt was first discovered in 1801. The asteroid belt is a disc shape, located between the orbits of Mars and Jupiter. The asteroids made of rock and metal and are all irregularly shaped. the asteroids in the belts are millions or billions years old

estimated to be 4.54 billion years.



Hubble telescope, Gamma-Ray Burst Polarimeter telescope, Fermi Gamma-ray Space Telescope



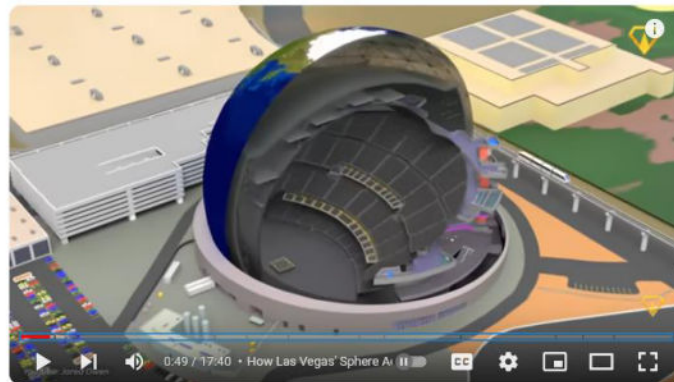
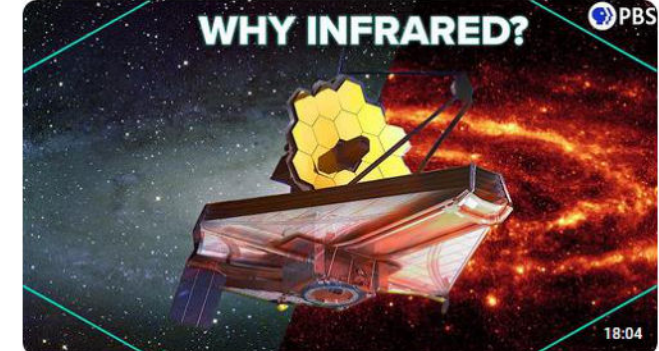
We watch documentaries and videos.



The man who tried to fake an element



The Man Who Accidentally Killed The Most People In History

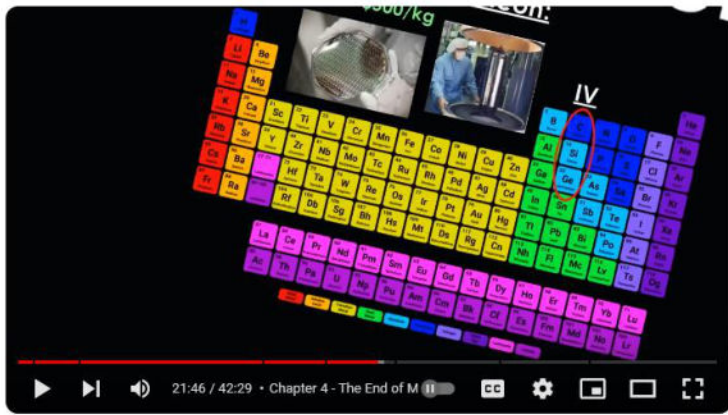


How Las Vegas' Sphere Actually Works





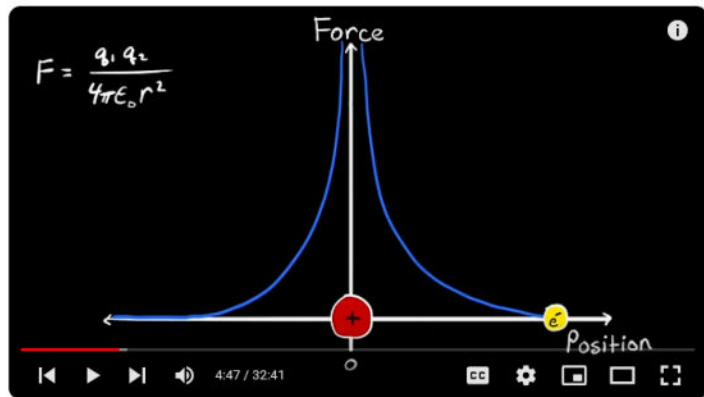
The Bogdanoffs: The Trolls who shook Physics



The man who almost faked his way to a Nobel Prize



How Science Harnesses The Incredible Power Of Diamonds | Naked Science |



The Actual Reason Semiconductors Are Different From Conductors and Insulators.



One Hour Of Mind-Blowing Mysteries Of The Atom | Full Documentary



Exploring our Mind-Blowing Universe | BBC Earth Science



We had a lot of fun too!



A collection of 2500 jokes!

We read and enjoyed them together.

This improved his English like never before. He developed the skill to read and speak with confidence. Now, he is one in the batch who makes others laugh with his witty comments and jokes.

Game: Read a Joke (Sentences)

CLEAR GRID

Little Ronnie's kindergarten class was on a field trip to their local police station where they saw pictures tacked to a bulletin board of the 10 most wanted criminals. One of the youngsters pointed to a picture and asked if it really was the photo of a wanted person.

'Yes, ' said the policeman. 'The detectives want very badly to capture him.'

Little Ronnie asked, 'Why didn't you keep him when you took his picture?'

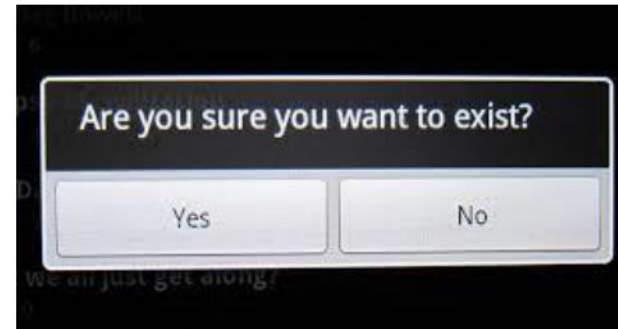
Game: Read a Joke (Sentences)

CLEAR GRID

After Sunday church, the priest would hand us each an orange and a big cookie. A little girl once lied and took two oranges, but the priest told her she mustn't lie because God is watching. Then, the girl took two cookies and lied about it. When asked why she had done that, she said because she thought that God was only watching oranges.

We have fun classes almost every week

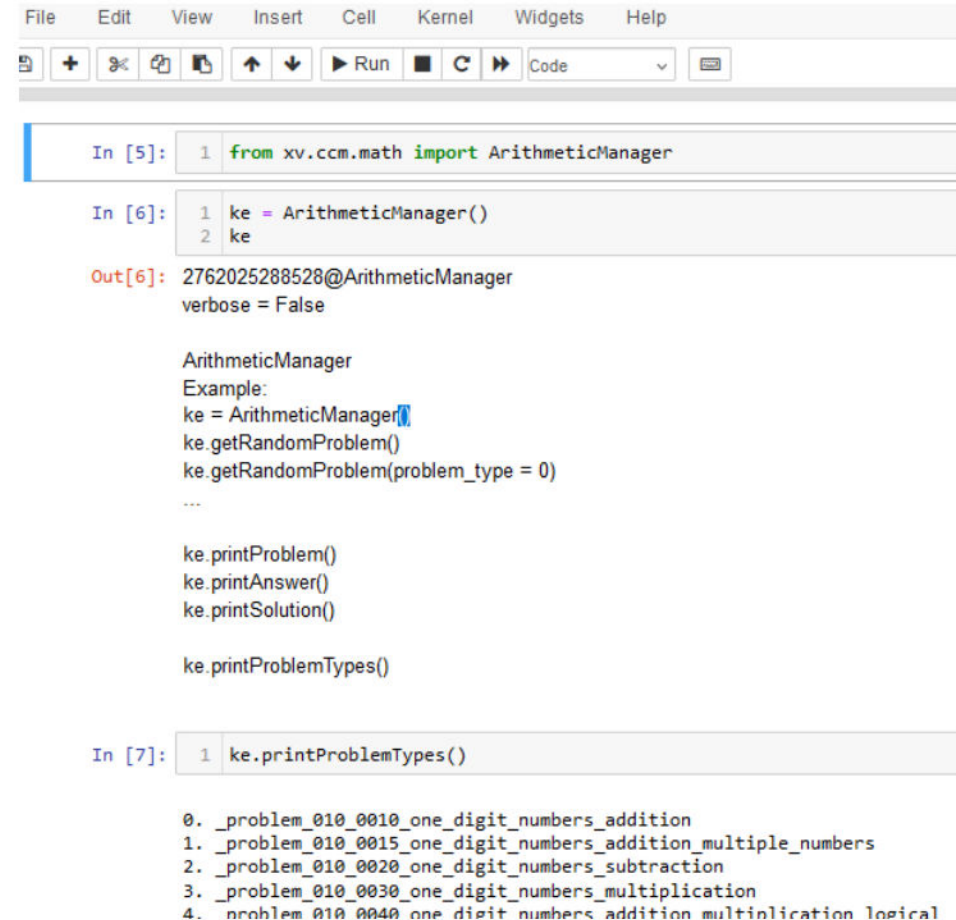
- We watch funny videos, tell/create funny stories, and draw funny cartoons.
- All of them have made him very confident about his knowledge, analysis, and English verbal and writing skills.
- He is reading the Sherlock Holmes series now!



Don't forget that everything in this document represents one year of work by a student who started with very basic skills and was like any other student of her age.

We have our own software designed to accelerate the learning process.

- The user interface is web or Jupyter Notebook.
- We start with web but quickly move to Jupyter Notebook.
- The contents have been created to ensure faster learning and are based on interconnected concepts, **eliminating memorization, homework, or additional practice.**



```
File Edit View Insert Cell Kernel Widgets Help
+ - - - - - Run - - - Code
In [5]: 1 from xv.ccm.math import ArithmeticManager

In [6]: 1 ke = ArithmeticManager()
        2 ke

Out[6]: 2762025288528@ArithmeticManager
        verbose = False

        ArithmeticManager
        Example:
        ke = ArithmeticManager()
        ke.getRandomProblem()
        ke.getRandomProblem(problem_type = 0)
        ...

        ke.printProblem()
        ke.printAnswer()
        ke.printSolution()

        ke.printProblemTypes()

In [7]: 1 ke.printProblemTypes()

0. _problem_010_0010_one_digit_numbers_addition
1. _problem_010_0015_one_digit_numbers_addition_multiple_numbers
2. _problem_010_0020_one_digit_numbers_subtraction
3. _problem_010_0030_one_digit_numbers_multiplication
4. _problem_010_0040_one_digit_numbers_addition_multiplication_logical
```

The progress card

- He sometimes attends grade 9-10 batches and does well there too.
- His school batchmates have joined us, seeing his performance.

How many students studying elsewhere can do so much in two years?

What will be the speed of rocket?

Newton's Second Law:

$$\vec{F} \propto \frac{d\vec{p}}{dt}$$

$$\Rightarrow \vec{F} = k \frac{d\vec{p}}{dt}$$

$$\Rightarrow \vec{F} = \frac{d\vec{p}}{dt} \text{ as } k=1.$$

What is outside force on rocket?
zero. as rocket is alone in space.

What was initial momentum of rocket?

$$\vec{p} = m\vec{v} = m \cdot 0 = 0$$

zero, because it was not moving.

So, what will be its momentum any time?

zero as force is zero.

So, let us solve now.

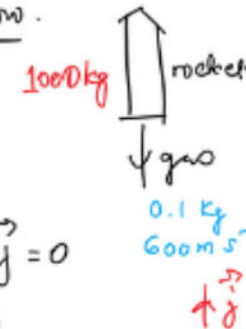
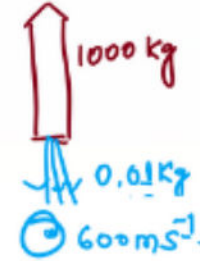
$$\vec{p} = m\vec{v}$$

$$1000 \text{ kg} \cdot \vec{v}_r + 0.1 \text{ kg} \cdot 600 \text{ m/s}^2 (-\vec{j}) = 0$$

$$1000 \vec{v}_r - 0.1 \cdot 600 \text{ m/s}^2 \vec{j} = 0$$

$$\vec{v}_r - 0.6 \text{ m/s}^2 \vec{j} = 0$$

$$\Rightarrow \vec{v}_r = 0.6 \text{ m/s}^2 \vec{j}$$



$$\frac{0.1 \cdot 600}{1000}$$



Please note that we also ensured with him

- No memorization*
- No homework**
- No extra assignments**
- Programming is an essential part of learning.

- When someone forgets something, we simply repeat it, and this time it takes one-tenth of the previous time for the same topic.

**Homework kills creativity and analytical ability of students, and they are forced to spend their time doing repetitive and boring assignments.

There is more:

- In his school, he is under a permanent gag order as he answers most questions before his batchmates.
- He used to be slow in reading and used to find it difficult to express the things he knew well. All that has changed now.
- He is reading extra-curricular books now. Right now, he is reading the Sherlock Holmes series!



It's not just him; he's merely an illustrative case.

This is not an isolated case. This is a typical story of all the students who are learning with us.



If you feel he is doing great, your kid could be in his place. We don't just teach grade 6; we cater to all school grades and college students. Moreover, we also provide advanced instruction in science, math, and AI/ML to professionals.

Feel free to call us or message us on WhatsApp at +91 75699 33343 or email us at info@xcelvations.com. You can also visit our website:

<http://www.xcelvations.com/>

