Task 2 in physics:

s is your student number.

k = s mod 10000.

T = s mod 100.

L = s mod 10.

m4 = s mod 4.

1. What do you want from this physics course?

2. What are the base units?

en.wikipedia.org/wiki/SI\_base\_unit

3. Express unit of force through the base units.

Use Second Law of Newton F = ma.

4. Show that ta has units of v.

t is time.

a is acceleration.

5. Explain the example of:

m4 = 0: accurate and precise.

m4 = 1: accurate and NOT precise.

m4 = 2: NOT accurate and precise.

m4 = 3: NOT accurate and NOT precise.

en.wikipedia.org/wiki/Accuracy\_and\_precision

6. Give the number of significant figures of the number for your T.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1: 8778000 | 2: 0.000567 | 3: 80600 | 4: 0.00067900 | 5: 346000 |
| 6: 0.000673 | 7: 95328000 | 8: 943258000 | 9: 0.000774 | 10: 9900 |
| 11: 987890 | 12: 0.0000561 | 13: 94034600 | 14: 900653540 | 15: 0.005469 |
| 16: 4365600 | 17: 0.003268 | 18: 456700 | 19: 467000 | 20: 0.0000676 |
| 21: 36.00800 | 22: 65.00 | 23: 0.00000 | 24: 7890000 | 25: 0.0003 |
| 26: 65765700 | 27: 0.000500 | 28: 56456000 | 29: 0.00056 | 30: 6756700 |
| 31: 674670 | 32: 0.00654 | 33: 434500 | 34: 0.020450 | 35: 8760076 |
| 36: 0.0065400 | 37: 5689400 | 38: 0.000600 | 39: 5930300 | 40: 0.007700 |
| 41: 4920010 | 42: 4090330 | 43: 0.0750000 | 44: 490304457 | 45: 0.0060700 |
| 46: 4790650 | 47: 0.0006277 | 48: 50403460 | 49: 0.0060600 | 50: 490400600 |
| 51: 000000 | 52: 589500 | 53: 96400800 | 54: 0.0045045 | 55: 358000500 |
| 56: 0.00143 | 57: 32122000 | 58: 1258000 | 59: 0.001474 | 60: 51200 |
| 61: 187890 | 62: 0.000021 | 63: 94034100 | 64: 200653540 | 65: 0.005419 |
| 66: 4362600 | 67: 0.003268 | 68: 412700 | 69: 427000 | 70: 0.0000671 |
| 71: 174170 | 72: 0.00214 | 73: 434300 | 74: 0.020410 | 75: 8230021 |
| 76: 0.0012400 | 77: 2189400 | 78: 0.000200 | 79: 1930300 | 80: 0.003200 |
| 81: 1920010 | 82: 4020330 | 83: 0.0120000 | 84: 490304432 | 85: 0.0060300 |
| 86: 000000 | 87: 589100 | 88: 92400800 | 89: 0.0041045 | 90: 358000200 |

7. Where can classical mechanics be used?

8. Solve the elastic collision problem for u1 = k, u2 = k/2, m1 = k, m2 = 2k.

u1 = 1

u2 = -1

m1 = 1

m2 = 1

'

v1 = ((m1 - m2) \* u1 + 2 \* m2 \* u2) / (m1 + m2)

v2 = v1 + u1 - u2

'

MsgBox v1

MsgBox v2

http://physics16.weebly.com/uploads/5/9/8/5/59854633/linear2elastic4collision.txt

9. Prove that V2 = $V\_{0}^{2}$+2a(x – x0).

10. Prove that derivative of kinetic energy with respect to velocity is equal to momentum.

11. Find the velocity at time = T seconds, for angle of release A = T degrees, initial velocity V0 = T meters per second, x0 = y0 = 0 meters for projectile.

s = 19107016

T = s Mod 100

v0 = T

g = 10

Pi = 4 \* Atn(1)

A = T \* Pi / 180

x0 = 0

y0 = 0

Vx = v0 \* Cos(A)

Vy = v0 \* Sin(A) - g \* T

MsgBox Vx

MsgBox Vy

https://physics15.weebly.com/uploads/3/0/2/7/30272185/velocityofprojectile23sept.txt

12. Calculate total time of the motion and time for maximum height for angle of release A = T degrees, initial velocity V0 = T meters per second, x0 = y0 = 0 meters for projectile.

s = 19107016

T = s Mod 100

v0 = T

g = 10

Pi = 4 \* Atn(1)

A = T \* Pi / 180

x0 = 0

y0 = 0

totalTime = 2 \* v0 \* Sin(A) / g

time4maximumHeight = totalTime / 2

MsgBox totalTime

MsgBox time4maximumHeight

https://physics15.weebly.com/uploads/3/0/2/7/30272185/timeofprojectile23sept.txt

13. Compare efficiency of truck and trolley.

Use what we discussed in our class about pulling trolley and rotating wheels of truck.

14. Is moving or stationary egg more likely to crack after the collision?

15. Air purifier purifies 5 cubic meters of air. How many such air purifiers are needed for a room 5×5×10meters?

OneAirPurifier = 5

AllAir = 5 \* 5 \* 10

MsgBox AllAir / OneAirPurifier

https://physics15.weebly.com/uploads/3/0/2/7/30272185/volumeforairpurifier23sept.txt

16. Explain the laws of Newton.

en.wikipedia.org/wiki/Newton%27s\_laws\_of\_motion

17. What is mass?

18. Explain the Bernoulli experiment (blowing bellow the paper).

19. Find the center of mass of 2 equal masses k meters apart.

s = 17108073

k = s Mod 10000

centerOfMass = k / 2

MsgBox centerOfMass

https://physics15.weebly.com/uploads/3/0/2/7/30272185/centerofmass23sept.txt

20. Can I pull myself out of mud? Why?

21. Prove that derivative of kinetic energy with respect to velocity is equal to momentum.

**One dimensional motion**

22. Find the acceleration of a simple pulley and tension in the rope for two masses: L kg and T kg.

n = 15108097

k = n Mod 10000

t = n Mod 100

'

g = 10

'

m1 = t \* k / n

m2 = 2 \* k

'

m1 = 1 / k

m2 = 2 \* k

'

a = (m2 - m1) \* g / (m1 + m2)

tt = m1 \* (g + a)

tt = m2 \* (g - a)

'

MsgBox a

MsgBox tt

http://physics16.weebly.com/uploads/5/9/8/5/59854633/problem4pulleys.txt

youtube.com/watch?v=kvCnjVSpuv0

23. Calculate friction force F = μN. μ = 1/T. N = k.

https://en.wikipedia.org/wiki/Friction

s = 19107012

T = s mod 100

K = s mod 10000

mu=1/T

N=k

F=mu\*N

MsgBox F

https://physics15.weebly.com/uploads/3/0/2/7/30272185/frictionforce23sept.txt

24. A dust particle with mass of 0.00001kg and speed of 5 m/s is subjected to a force of 0.00001N of the filter. How much time will it take to stop the particle?

Use the equations mv = Ft and t = mv/F

mass = 0.00001

speed = 5

force = 0.00001

tTime = mass \* speed / force

MsgBox tTime

https://physics15.weebly.com/uploads/3/0/2/7/30272185/airpurifierproblem23sept.txt

25. Biker of mass T kg starts moving from rest. Friction coefficient μ = 1/T. What is the maximum velocity after T seconds?

Use the equations mv = Ft and v = Ft/m

s = 19107012

T = s Mod 100

k = s Mod 10000

mu = 1 / T

m = T

g = 10

N = m \* g

F = mu \* N

v = F \* T / m

MsgBox v

https://physics15.weebly.com/uploads/3/0/2/7/30272185/bikerfrictionmaxspeed23sept.txt

**Statics**

26. Find the hangover for the s blocks in the blocks stacking problem.

n = 15108097

h = 0

For k = 1 To n

h = h + 1 / k

Next k

ho = h / 2

MsgBox ho

http://physics16.weebly.com/uploads/5/9/8/5/59854633/hangover.txt

youtube.com/watch?v=Gaua\_V9Fse4

27. Explain free-body diagram.

28. Find acceleration of a mass at the inclined plane with

A = T degrees and the friction coefficient μ = 1/T.

s = 19107012

T = s Mod 100

Angle = 4 \* Atn(1) \* T / 180

g = 10

mu = 1 / T

acceleration = g \* (Sin(Angle) - mu \* Cos(Angle))

MsgBox acceleration

youtube.com/watch?v=8xOU25PWx8M

https://physics15.weebly.com/uploads/3/0/2/7/30272185/sept23rampinclinedplane.txt

https://physics16.weebly.com/uploads/5/9/8/5/59854633/ramp4inclined4plane2019oct.txt

http://physics16.weebly.com/uploads/5/9/8/5/59854633/inclined4plane.txt

29. What is your weight?

MyMass = 75

g = 10

MyWeight = MyMass \* g

MsgBox MyWeight

https://physics15.weebly.com/uploads/3/0/2/7/30272185/weightonearththroughmass23sept.txt

30. Find F = ma, M = Jε, for m = a = J = ε = T.

s = 19107012

T = s Mod 100

m = T

a = T

J = T

epsilon = T

F = m \* a

MomentOfForce = J \* epsilon

MsgBox F

MsgBox MomentOfForce

https://physics15.weebly.com/uploads/3/0/2/7/30272185/forceandmomentofforce23sept.txt

31. Find linear accretion due to rotation for a person on planet with period of rotation of 24 hours and radius s millimetres.

s = 17108073

R = s / 1000

Pi = 4 \* Atn(1)

omega = 2 \* Pi / (24 \* 60)

a = R \* omega \* omega

MsgBox a

https://physics15.weebly.com/uploads/3/0/2/7/30272185/rotationallinearacceleration23sept.txt

32. If the mass rotates on rope and rope breaks, what will be velocity of the mass?

33. Calculate the difference in weight on the pole and on the equator of the Earth. Take the difference in the distance from the centre of the Earth as 21km.

GG = 6.6740831 \* 10 ^ (-11)

M = 5.9722 \* 10 ^ 24

R1 = 6.378 \* 10 ^ 6

m2 = 1

F1 = GG \* M \* m2 / R1 ^ 2

MsgBox F1

R2 = R1 + 21000

F2 = GG \* M \* m2 / R2 ^ 2

MsgBox F2

differenceInWeights = Abs(F1 - F2)

MsgBox differenceInWeights

https://physics15.weebly.com/uploads/3/0/2/7/30272185/differenceingravityforceduetodistance23sept.txt

34. Find gravity acceleration g, orbital velocity Vo and escape velocity Ve for planet with mass s billion tons and radius s millimetres.

s = 17108073

GG = 6.6740831 \* 10 ^ (-11)

M = 10 ^ 12 \* s

R = s / 1000

g = GG \* M / R ^ 2

MsgBox g

Vo = Sqr(g \* R)

MsgBox Vo

Ve = Sqr(2 \* g \* R)

MsgBox Ve

https://physics18.weebly.com/uploads/5/9/8/5/59854633/g1orbital1velocity1escape1velocity13oct2017.txt

35. Compare rotation and translation.

36. Explain energy, work and power.

37. Explain conservation laws.

Forced vibration with damping:

38. Ty'' + my' + Ly = sin(Tx)

Is there resonance?

m = m35

L = m10

http://www.wolframalpha.com/widgets/view.jsp?id=e602dcdecb1843943960b5197efd3f2a

39. Ty'' + Ly = sin(ωx)

Find resonant ω.

s = 19107012

L = s Mod 10

T = s Mod 100

omega = Sqr(L / T)

MsgBox omega

https://physics16.weebly.com/uploads/5/9/8/5/59854633/resonant4frequency2019nov.txt

40. Give period of spring oscillator $T=2π\sqrt{\frac{m}{k}}$. m = m35. k = m10000.

s = 19107012

m = s Mod 35

k = s Mod 10000

Pi = 4 \* Atn(1)

T = 2 \* Pi \* Sqr(m / k)

MsgBox T

https://physics16.weebly.com/uploads/5/9/8/5/59854633/spring4oscillator2019nov.txt

41. Find period of pendulum $T=2π\sqrt{\frac{L}{g}}$. L = m10.

s = 19107012

L = s Mod 10

g = 10

Pi = 4 \* Atn(1)

T = 2 \* Pi \* Sqr(L / g)

MsgBox T

https://physics16.weebly.com/uploads/5/9/8/5/59854633/pendulum4period2019nov.txt

42. Solve oscillation problem y'' + yT2 = 0.

https://www.wolframalpha.com/input/?i=y%27%27+%2B+16y+%3D+0

43. Find the displacement of a harmonic oscillator after s seconds with amplitude k, frequency k and initial phase k/2.

n = 15108097

k = n Mod 10000

D = k \* Sin(n \* k + k / 2)

MsgBox D

http://physics16.weebly.com/uploads/5/9/8/5/59854633/harmonic4oscillator.txt

44. Solve the string oscillatory equation for v = T, frequency = L = m10, Amplitude = T.

 Find the displacement after s seconds at m meters.

s = 17108088

Ttt = s Mod 100

m = s Mod 35

L = s Mod 10

omega = L

A = Ttt

t = s

x = m

v = Ttt

y = A \* Sin(omega \* (t - x / v))

MsgBox y

https://physics18.weebly.com/uploads/5/9/8/5/59854633/string1wave1oscillation22oct2017.txt

45. Give interference equation for sin(ω(t – x/v)) and sin(L + ω(t – x/v)). L = m10. ω = T. t = T.

s = 19107012

L = s Mod 10

T = s Mod 100

k = s Mod 10000

omega = T

x = k

v = s

A1 = omega \* (T - x / v)

A2 = L + omega \* (T - x / v)

oscillatingvalue = 2 \* Sin((A1 + A2) / 2) \* Cos((A1 - A2) / 2)

MsgBox oscillatingvalue

https://physics16.weebly.com/uploads/5/9/8/5/59854633/interference2019nov.txt