physics task of mid-November 2019.

Edited at 5pm 18.11.2019.

s is your student number.

For group task s = 19107089.

k = s mod 10000. T = s mod 100.

m35 = s mod 35. m25 = s mod 25. m20 = s mod 20. m17 = s mod 17.

m10 = s mod 10. m9 = s mod 9. m8 = s mod 8. m7 = s mod 7. m6 = s mod 6.

m5 = s mod 5. m4 = s mod 4. m3 = s mod 3. m2 = s mod 2.

Midterm part:

1 section:

1. Why do you need physics?

2. Do what you like in physics.

3. Will moving or static egg crack? Explain dynamic coefficient and attack vs. defense.

4. Explain efficiency of truck and trolley.

5. Do big or small wheels give more power?

6. Why does cat sit on its curved legs?



7. Do your project.

8. What is physics of social media?

9. Study physics of songs.

10. Solve Zimmermann problem:

http://74.72.151.186/Contest/Nearness

http://azspcs.com/Contest/Nearness

Solve for m20 + 6.

Improve these solutions:

https://physics16.weebly.com/uploads/5/9/8/5/59854633/4students\_reversing\_nearness\_sep2019.docx

If you cannot register here then submit your solutions to me.

11. What is fractal?

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

12. Explain Magnus effect.

https://en.wikipedia.org/wiki/Magnus\_effect

13. Apply for American citizenship:

https://www.dvlottery.state.gov/

14. Apply for scholarships, grants, fellowships of USA, Europe, Canada, Australia, Japan, etc.

15. Study

https://physics15.weebly.com/

https://physics16.weebly.com/

https://physics18.weebly.com/

16.Study math as method of physics.

17. What is least constraint principle?

https://en.wikipedia.org/wiki/Gauss%27s\_principle\_of\_least\_constraint

18. Discuss physics news.

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

https://en.wikipedia.org/wiki/Capital\_of\_Indonesia

https://en.wikipedia.org/wiki/UEFA\_Euro\_2020\_qualifying

https://en.wikipedia.org/wiki/Yemeni\_Civil\_War\_(2015%E2%80%93present)

https://en.wikipedia.org/wiki/Kashmir\_conflict

https://en.wikipedia.org/wiki/2019\_Abqaiq%E2%80%93Khurais\_attack

https://en.wikipedia.org/wiki/Islamic\_State\_of\_Iraq\_and\_the\_Levant

https://en.wikipedia.org/wiki/Al-Qaeda

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

https://en.wikipedia.org/wiki/Rohingya\_people

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

https://en.wikipedia.org/wiki/Kosovo\_War

https://en.wikipedia.org/wiki/Jamal\_Khashoggi

https://en.wikipedia.org/wiki/Basuki\_Tjahaja\_Purnama

https://en.wikipedia.org/wiki/May\_1998\_riots\_of\_Indonesia

https://en.wikipedia.org/wiki/Indonesian\_mass\_killings\_of\_1965%E2%80%9366

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

https://en.wikipedia.org/wiki/Julian\_Assange

https://en.wikipedia.org/wiki/Chelsea\_Manning

https://en.wikipedia.org/wiki/Edward\_Snowden

https://en.wikipedia.org/wiki/Noam\_Chomsky

https://en.wikipedia.org/wiki/Annexation\_of\_Crimea\_by\_the\_Russian\_Federation

https://en.wikipedia.org/wiki/War\_in\_Donbass

https://en.wikipedia.org/wiki/Ukrainian\_crisis

19. Study general concepts of mechanics, oscillation, fluid mechanics, thermodynamics, optics, electromagnetism, quantum physics and cosmology.

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

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

https://en.wikipedia.org/wiki/Fluid\_mechanics

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

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

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

https://en.wikipedia.org/wiki/Quantum\_mechanics

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

20. How is physics used in computer science?

-

2 section:

21. What is Bernoulli principle?

https://en.wikipedia.org/wiki/Bernoulli%27s\_principle

22. What is econophysics?

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

23. What is solid mechanics?

https://en.wikipedia.org/wiki/Solid\_mechanics

24. Explain drone physics.

https://en.wikipedia.org/wiki/Unmanned\_aerial\_vehicle

25. Give mechanics conservation laws.

https://en.wikipedia.org/wiki/Conservation\_law

26. Explain physics of quantum cryptography and public key cryptography.

27. Prepare to Dota2 gaming competition:

http://www.dota2.com/international/overview/

28. What is chaos?

https://en.wikipedia.org/wiki/Chaos\_theory

29. Give Newton laws.

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

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

31. Find x and y for projectile with x0 = y0 = 0, v0 = T m/s, t = T seconds, A = T degrees.

Find maximum distance and maximum height.

https://physics16.weebly.com/uploads/5/9/8/5/59854633/projectile309task2019.txt

32. Find the angular speed and total acceleration for the rotational motion of the material point around the circumference with radius of T meters and constant linear speed of s meters per second.

https://physics16.weebly.com/uploads/5/9/8/5/59854633/omega\_acceleration309task2019.txt

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

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

34. Calculate the Schwarzschild radius for the k grams desk.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/radius4schwarzschild.txt

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

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

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

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

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

 Find the displacement after s seconds at m meters.

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

38. The thermal expansion rate α is 1/k. The temperature change is T degrees.

 a. Find the extension of m meters rod due to the temperature change.

 b. Find the approximate volume change of m meters cubed cube due to the temperature change.

 http://physics16.weebly.com/uploads/5/9/8/5/59854633/thermal4expansion.txt

39. There are two bodies in a thermodynamically isolated system: C1 m1 T1 and C2 m2 T2. Find the resulting temperature T. m1 = k, m2 = 2k. C1 = k/11, C2 = k/222, T1 = k/111, T2 = k/22

http://physics16.weebly.com/uploads/5/9/8/5/59854633/result4temperature.txt

40. Enjoy physics.

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3 section:

41. Is black or white clothes warmer? Why?

42. How does guitar string move?

43. Explain power pyramid: USA, UK, EU, Australia, New Zealand, Japan, Korea, Singapore, Malaysia, Indonesia, China, India, Russia, etc.

44. Why are some civilizations more successful than the others?

45. Why are some people very massive?

46. What are Brownian motion, random walk and how are they linked to Zimmermann problem?

47. Predict results of 2019 rugby world cup:

https://en.wikipedia.org/wiki/2019\_Rugby\_World\_Cup

48. Explain good country index.

https://en.wikipedia.org/wiki/Good\_Country\_Index

49. Estimate the distances between the atoms of element number T in the periodic table of elements.

https://physics16.weebly.com/uploads/5/9/8/5/59854633/distance\_between\_particles\_for\_many\_atoms2019oct.txt

http://physics16.weebly.com/uploads/5/9/8/5/59854633/distance\_between\_particles.txt

50. Solve number puzzle for 3 + m8 digits.

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/codesums0-9.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-9sums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1-8code1-8sums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/0-6codesums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1dx4de5dnumberpuzzle.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/2dx3de5dnumberpuzzle.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-9numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code0-8numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-8numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code0-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-5numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-4numberpuzzles.txt

51. Hack password.

https://calculus1only.weebly.com/

https://calculus1only.weebly.com/uploads/5/9/8/5/59854633/password-hacking-game-rules.docx

https://calculus1only.weebly.com/uploads/5/9/8/5/59854633/guessinput.txt

52. Why can crazy people be good for physics?

53. Who is internet troll?

54. Analyze these topics:

https://en.wikipedia.org/wiki/Greta\_Thunberg

https://en.wikipedia.org/wiki/2019\_Papua\_protests

https://en.wikipedia.org/wiki/2019\_Trump-Ukraine\_controversy

55. Why is there less freedom in the world?

56. Will Trump be impeached? Why?

57. How do we help Indonesia?

58. Scattering:

m3 = 0: What color is the Sun?

m3 = 1: Why are clouds white?

m3 = 2: Why is the sky blue?

59. Find the force between two charges of L and T Coulombs, m meters apart.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/coulomb\_force.txt

60. Solve the simplified Maxwell Equations for c = 300000000-s, red light. Take amplitude 1 V/m. Find the intensity of electric field after s seconds at m meters.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/maxwell\_equations\_solution.txt

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4 section:

61. Why is there terror?

62. Suppose a star has a surface temperature of 4k degrees. What are the wavelength and the color this star appears?

http://physics16.weebly.com/uploads/5/9/8/5/59854633/color4black4body.txt

63. Calculate the final speed after absolutely inelastic collision of two balls of masses L kg and T kg, moving with velocities s m/s and k m/s respectively.

 http://physics16.weebly.com/uploads/5/9/8/5/59854633/inelastic4collision.txt

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

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

65. Find the acceleration of a simple pulley for two masses: L kg and T kg.

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

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

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

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

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

67. Calculate the largest prime number.

68. Find the center of mass of k equal masses k meters apart located on a straight line.

 http://physics16.weebly.com/uploads/5/9/8/5/59854633/center\_of\_mass\_of\_k\_masses.txt

69. Use 2p mod n to pass secret.

Calculate 2T mod 19 and exchange secret information with your friend.

70. Why is monopoly bad?

71. Explain tensor of inertia for drone, etc.

72. Do Bernoulli experiment.

73. Explain physics Nobel Prize 2019.

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

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

75.

m4 = 0: What visible light is the fastest? Why?

m4 = 1: What visible light is the most noticeable? Why?

m4 = 2: What visible light has the most energy? Why?

m4 = 3: What visible light is the most absorbed? Why?

L = 6: 76. What is quantum money?

L = 7: 77. Are massless or mass-full particles used in quantum information? Why?

78. Find V1 for the transformer if V2 = T volts, N1 = k and N2 = s.

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

79. T kilowatts of electric power is sent to a town from a power plant. The transmission lines have the total resistance of 0.1T Ohms. Calculate the power loss if the power is transmitted at:

(a) 0.03k Volts (b) s Volts

http://physics16.weebly.com/uploads/5/9/8/5/59854633/losses4transmitting4power.txt

80. A circular coil of wire has a diameter of 0.002k cm and contains 10 loops. The current in each loop is 3A, and the coil is placed into 2TESLA external magnetic field. Determine the maximum and minimum torque exerted on the coil by the field.

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

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5 section:

81. Calculate the series and the parallel circuits with e.m.f. of T Volts and the resistors L+1, 2 and 3 ohms respectively.

http://physics18.weebly.com/uploads/5/9/8/5/59854633/series\_parallel\_circuits.txt

82. Find the electrical current i in the circuit for R = T, L = 1/k, C = 1/s, ω = k, and εm = T.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/2054\_ch21a.pdf

83. A man 0.25k mm tall stands in front of a vertical plane mirror. His eyes are 10 cm bellow the top of his head. What are the sizes and the best location of the smallest possible mirror so that he can see his entire body?

http://physics16.weebly.com/uploads/5/9/8/5/59854633/height4mirror.txt

84. For convex mirror with a radius of curvature of 0.002k meters, determine the location of the image and its magnification for an object 0.0012k meters from the mirror.

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

85. A spy satellite camera can recognize T cm objects from the altitude of n meters. If diffraction was the only limitation (the wave length Lambda = 0.1k nanometers), determine what diameter lens the camera has.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/satellite4spying.txt

86. Find the frequency and the period of the harmonic oscillator. L = k μH and C = T μF.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/rlc4circuit4natural4frequency4period.txt

87. Find energy and momentum of photon of s Hz frequency.

88. Calculate the energy and momentum of a photon for Lambda = 0.05k nanometers.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/energy4photon.txt

89. Determine the wavelength of an electron that has been accelerated through the potential difference of T Volts.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/wavelength4electron.txt

90. Calculate the wavelength of k grams desk moving T centimeters per second.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/waves4matter.txt

91. What is the matter wave length of T gram book?

92. Find the energy level and angular momentum for hydrogen according to the Bohr Model.

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

93. Find the annihilation energy of k grams of matter.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/energy4binding.txt

94. If your velocity would be $v=\left(1-\frac{1}{e+2}\right)c$ then how would your height, mass, and time change?

e = m8.

Assess how velocity affects height and mass.

s = 19107012

e = s Mod 8

c = 10 ^ 8

v = c \* (1 - 1 / (e + 2))

factor = Sqr(1 - v ^ 2 / c ^ 2)

inversefactor = 1 / factor

MsgBox factor

MsgBox inversefactor

https://physics16.weebly.com/uploads/5/9/8/5/59854633/special\_relativity\_change\_time\_mass\_height2019oct.txt

95. Calculate the remaining mass (it is NOT 0) of the decaying substance after k seconds if the decay ratio is T and initial mass is s. Calculate the half-life.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/code4nuclear4decay4half4life.txt

96. Perform correlation and regression analyses of the periodic table for T+2 elements and for m7 + 3 elementary particles.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/correlations4periodic4table.xlsx

http://physics16.weebly.com/uploads/5/9/8/5/59854633/regression4periodic4table.txt

http://physics16.weebly.com/uploads/5/9/8/5/59854633/evergy4lifetime.xlsx

http://physics16.weebly.com/uploads/5/9/8/5/59854633/regression4elementary4particles4energies4life4times.txt

m3 = 0: 97. What particles mediate electromagnetic interaction?

A. electrons

B. protons

C. positrons

D. photons

m3 = 1: 98. What particles mediate strong interaction?

A. neutrons

B. gluons

C. photons

D. protons

m3 = 2: 99. How many times is Electromagnetic Force weaker than the Strong Force?

A. 137

B. 758

C. 3592

D. 126434

100. Find the energy of the photon with the frequency of s Hz.

E2 = (mc2)2 + (pc)2.

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Final part:

6 section:

Same as in calculus:

Significant figures:

101. How many significant figures are there in your student number?

102. How many significant figures are there in your T number?

103. 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 |

104. Find the wavelength for v = k m/s and f = T Hz.

Errors:

105. Calculate the compound errors for x = s, dx = 1/T; y = T, dy = 1/k.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/compound\_errors.txt

Same as in calculus:

Forced vibration with damping:

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

Is there resonance?

m = m35

L = m10

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

107. Ty'' + Ly = sin(ωx)

Find resonant ω.

-

108. Find velocity and acceleration for one-dimensional motion with the equation x = -k + Lt + Tt2.

109. Find angular velocity and linear acceleration for v = T m/s and R = k meters.

110. Find velocity and acceleration at T degrees latitude. Earth Radius = 6371.009km.

s = 19107016

T = s Mod 100

RE = 6371.009

Pi = 4 \* Atn(1)

omegaE = 2 \* Pi / 24

Angle = T \* Pi / 180

R = RE \* Cos(Angle)

v = R \* omegaE

a = R \* omegaE ^ 2

MsgBox v

MsgBox a

https://physics16.weebly.com/uploads/5/9/8/5/59854633/latitude4velocity4acceleration2019nov.txt

111. Add, subtract and multiply the vectors (T,k) and (L,s).

-

Same as in calculus:

112. Find dot-product of tensor and vector $\left[\begin{matrix}L&T\\a&m\end{matrix}\right]\left(\genfrac{}{}{0pt}{}{e}{q}\right)$

a = m25

e = m8

L = m10

m = m35

q = m17

T = m100

Dim t(2, 2), v(2), r(2)

s = 19107016

a = s Mod 25

e = s Mod 8

L = s Mod 10

m = s Mod 35

q = s Mod 17

tt = s Mod 100

t(1, 1) = L

t(1, 2) = tt

t(2, 1) = a

t(2, 2) = m

v(1) = e

v(2) = q

r(1) = t(1, 1) \* v(1) + t(1, 2) \* v(2)

r(2) = t(2, 1) \* v(1) + t(2, 2) \* v(2)

MsgBox r(1)

MsgBox r(2)

https://calculus17.weebly.com/uploads/7/7/9/0/77906190/tensor\_times\_vector2019nov.txt

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Waves:

113. T Watts lamp emits electromagnetic radiation in all directions. Assuming a lamp to be a point source, calculate the intensity of the radiation:

a. at distance of 1 m from the lamp.

b. at distance of 2 m from the lamp.

114. Waves from a source have an amplitude of 5 cm and an intensity of T Wm-2.

a. The amplitude of the waves is increased to 10 cm. What is their intensity now?

b. The intensity of the waves is decreased to 100 Wm-2. What is their amplitude?

115. Light of wavelength T nm in a vacuum travels into glass, where its speed decreases to 2×108ms-1. Determine:

a. the frequency of the light in vacuum

b. its frequency and wavelength in glass.

116. An astronomer observes light from a distant star. A particular line in its spectrum has a wavelength of T nm. When measures in the laboratory, the same spectral line has a wavelength of L nm. Determine:

a. the change in the wavelength of the spectral line

b. the speed of the star

c. the direction of the movement of the star (towards or away from the observer).

117. Explain

m3 = 0: statics

m3 = 1: kinematics

m3 = 2: dynamics

118. Explain

m4 = 0: Linear momentum

m4 = 1: angular momentum

m4 = 2: kinetic energy

m4 = 3: potential energy

119. Explain solid mechanics theorems

m3 = 0: Momentum change

m3 = 1: Angular momentum change

m3 = 2: Kinetic energy change

120. Explain

m2 = 0: direct current

m2 = 1: alternating current

Deadline is 23.11.2019.