1. The fastest growing plant on record is a *Hesperoyucca whipplei* that grew 3.7 m in 14 days. What was its growth rate in micrometers per second?

A) 0.26 B) 0.89 C) 1.3 D) 2.0 E) 3.1

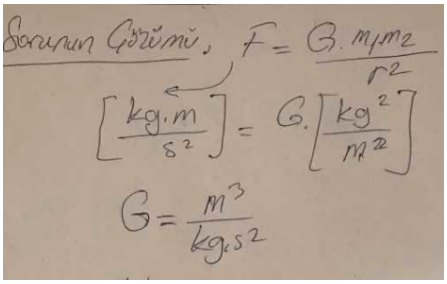
$$\frac{(3.7\,\text{m})(10^6\,\mu\text{m/m})}{(14\,\text{day})(86400\,\text{s/day})} = 3.1\,\mu\text{m/s}.$$

2. Newton's law of universal gravitation is represented by

$$F = \frac{GMm}{r^2}$$

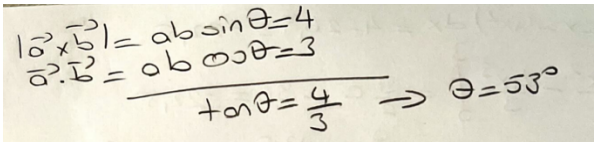
Here ***F*** is the magnitude of the gravitational force exerted by an object on another, ***M*** and ***m*** are the masses of the objects, and ***r*** is the distance between them. Force has the **SI** units kg.m/s^2. What is the **SI** unit of the proportionality constant ***G***?

A) m^3/ kg.s^2 B) m^2/ kg.s C) m/ kg.s D) m/ kg.s^2 E) m^3/ kg.s



3. If $\vec{a}\cdot\vec{b} = 3$ and $|\vec{a}\times\vec{b}| = 4$, what is the angle (in degree) between the two vectors $\vec{a}$ and $\vec{b}$?

A) 60 B) 53 C) 45 D) 37 E) 30



4. When vector **B** is added to the vector **C** = 3**i**+ 4**j**, the result is a vector in the positive y direction whose magnitude is equal to the magnitude of **C**. What is the magnitude of **B**?

A) 5.6 B) 1.3 C) 3.2 D) 4.8 E) 8.9

$\vec{R} = \vec{B} + \vec{C}$

$R_x\hat{i} + R_y\hat{j} = (B_x + C_x)\hat{i} + (B_y + C_y)\hat{j}$

$R_x = 0 \Rightarrow B_x + C_x = 0 \Rightarrow B_x = -C_x \Rightarrow \boxed{B_x = -3}$

$R_x^{\,2} + R_y^{\,2} = C_x^{\,2} + C_y^{\,2}$

$R_y^{\,2} = 9 + 16 = 25 \Rightarrow R_y = 5$

$R_y = B_y + C_y \Rightarrow 5 = B_y + 4 \Rightarrow \boxed{B_y = 1}$

$B = \sqrt{B_x^2 + B_y^2} = \sqrt{(-3)^2 + (1)^2}$

$\boxed{B \cong 3.2}$

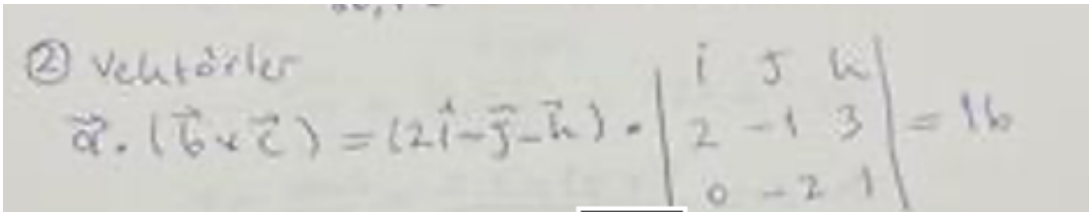
5. Two vectors, of magnitudes 20 and 50, are added. Which one of the following is a possible answer for the magnitude of the resultant vector?

A) 10 B) 20 C) 40 D) 80 E) 100

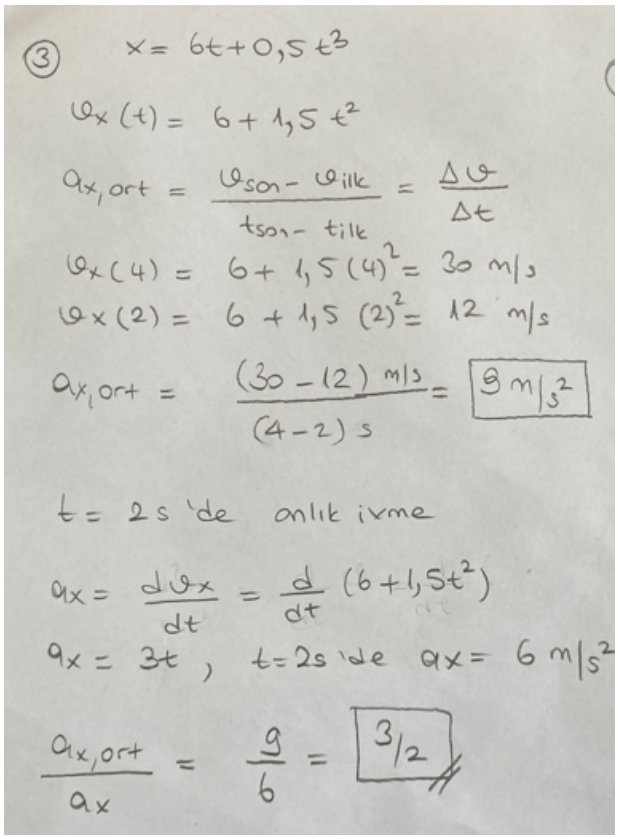
Minimum condition: 50-20=30
Maximum condition: 50+20=70
The result of addition must be between 30 and 70

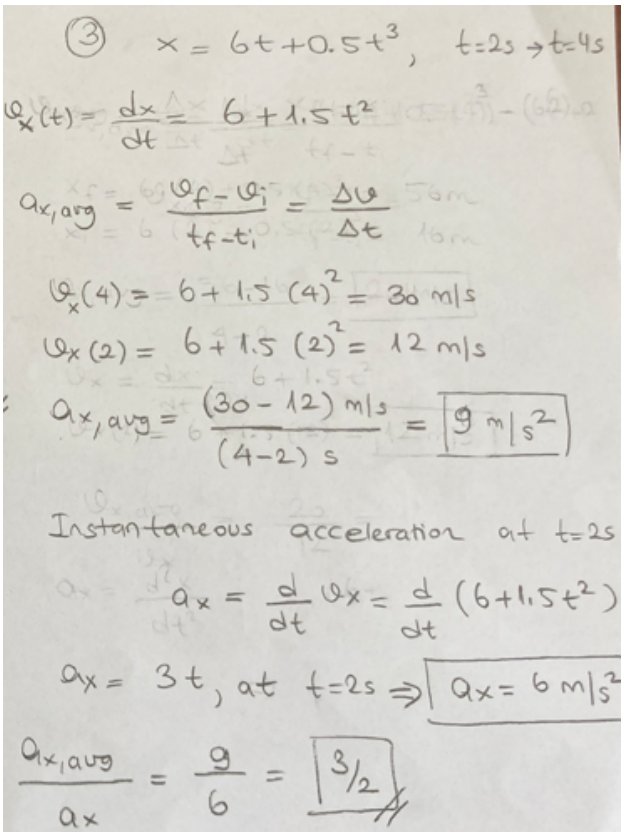
6. The vectors $\vec{a} = 2\hat{i} - \hat{j} - \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{c} = -2\hat{j} + \hat{k}$ are given. What is the result of the product of $\vec{a} \cdot (\vec{b} \times \vec{c})$?

A) 4 B) 8 C) 12 D) 16 E) 20



7. The position of a particle moving along the x-axis is given as $x = 6t+0.5t^3$, where t; seconds and x; is in meters. What is the ratio of the average acceleration of this object between t=2 s and t=4 s to its instantaneous acceleration at t=2 s?
A) 2/3 B) 1 C) 3/2 D) 4/3 E) 3/4





8. A student throws a set of keys vertically upwards at his sister at a window located 4 m above. The sister held the keys after 2 s. At what initial velocity were the keys thrown? (g=10m/s^2)
A) 2 B) 8 C) 12 D) 21 E) 40

$$x = v_0 t - \frac{1}{2} g t^2$$
$$4 = v_0 2 - \frac{1}{2} 9{,}82^2$$
$$v_0 = 12\ m/s$$

9. A balloon is ascending vertically with a constant speed of 8 m/s. At a height of 400 m a package is released from the balloon. What is the vertical distance (in m) between the balloon and the package after 5s? (g=10m/s^2)
A) 20B) 40 C) 65 D) 85 E) 125

$y_b - y_o = v_o t = 40\,m$
$y_p - y_o = v_o\, t - 1/2\, g t^2 = -85\text{m}$
$\Delta y = y_b - y_p$
$\Delta y = 40 - (-85) = 125\,m$

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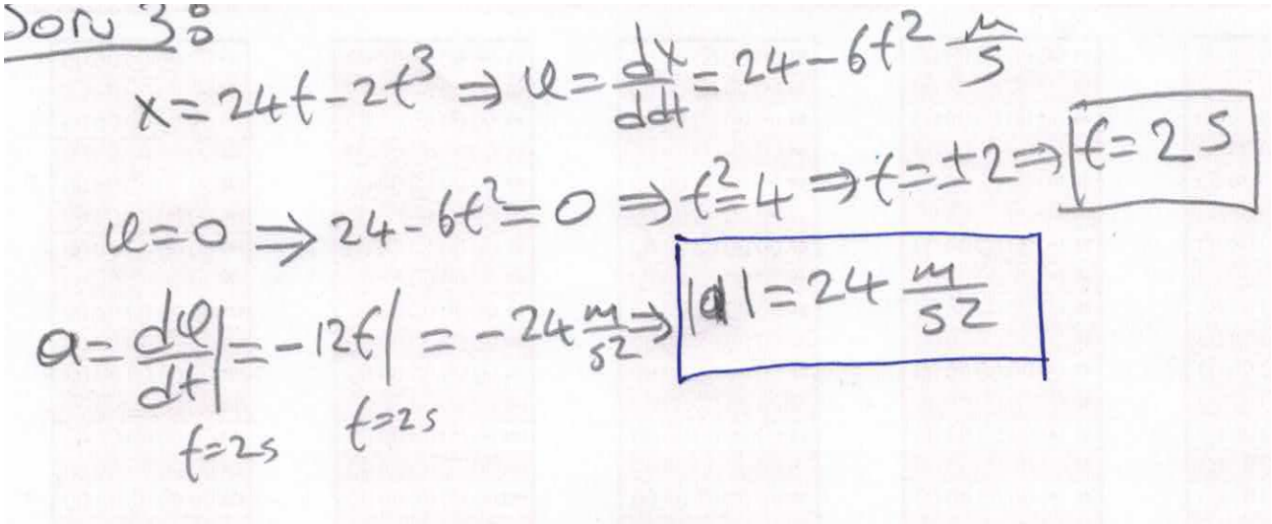
10. A car traveling at 136 km/h slows down with an acceleration of 5 m/s^2 by pressing the brake. How long does it take to reach 90 km/h (in s)?

A) 1 B) 1.4 C) 2 D) 2.6 E) 3

$$v = v_0 - at$$
$$t = \frac{v_0 - v}{a} = \frac{(136 - 90)(\frac{10^3 m}{3600 s})}{5} = 2.6\ s$$

11. A particle moving along the x axis has a position given by $x = (24t - 2t^3)$ m, where t is measured in s. What is the magnitude of the acceleration (in m/s^2) of the particle at the instant when its velocity is zero?

A) 0 B) 12 C) 24 D) 36 E) 48

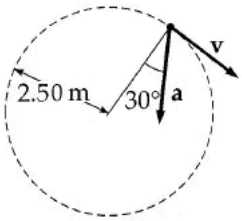


12. A basketball is thrown in such a way that its horizontal range is equal to five times its maximum height. What is the angle (in degree) of projection?. Atış açısı kaç derecedir?

A) 25.3 B) 38.7 C) 45.0 D) 53.1 E) 77.5

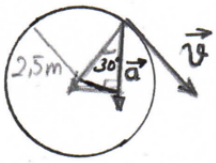
$R=5\ h_{max}$ burada R ve h_{max} yazılıp sadeleştirme yapılırsa $\tan\theta = 4/5$ ve $\theta = 38.7^0$

13. The figure shows the net acceleration ($a=15.0\ m/s^2$) and velocity of a particle moving clockwise around a 2.5 m radius circle at a given moment. Which of the following is the velocity of the particle at this instant (in m/s)?



A) 2.35 B) 5.70 C) 6.20 D) 7.50 E) 9.15

Yandaki şekilde, belli bir anda 2,5 m yarıçaplı daire çevresinde saat yönünde hareket eden bir parçacığın net ivmesini ($a = 15 m/s$) ve hızını göstermektedir. $\vec{v}$ hızının büyüklüğünü bulunuz



GÖZÜM $a_r = a \cdot \cos 30° \cong 12,99 \simeq 13\ m/s^2$

$$a_r = \frac{v^2}{r} \Rightarrow v^2 = a_r \cdot r = (13 m/s^2)(2,5m)$$

$$\Rightarrow v^2 = (13 m/s^2)(2,5m)$$

$$v = \sqrt{32,5} = 5,70\ m/s.$$

Doğru şık: B

14. Passengers on a carnival ride move at constant speed in a horizontal circle of radius 5 m, making a complete circle in 4 s. What is their acceleration in m/s^2?

A) 2 B) 4 C) 8 D) 12 E) 16

$R = 5\ m \quad T = 4\ s$

$$2\pi R = v T$$

$$v = \frac{2\pi R}{T} = \frac{2 \times 3,14 \times 5}{4}$$

$v = 7,9\ m/s$

$$a_r = \frac{v^2}{R}$$

$$a_r = \frac{(7,9)^2}{5}$$

$a_r = 12\ m/s^2$

15. A stone from a 45m high bridge over a river falls from rest on a small boat moving at a constant speed on the river. Since the boat is 9 m away from the meeting point when the stone starts to fall, what should the speed of the boat (m/s)? ($g=10m/s^2$)

A) 2 B) 3 C) 6 D) 8 E) 10

Kayık için

$x = vt$

$t = \frac{x}{v}$

taş için

$y = \frac{1}{2}gt^2$

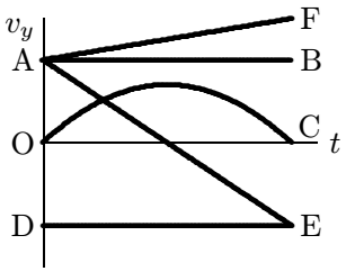
$t = \sqrt{\frac{1}{2}g\frac{x^2}{y}}$

$t = \sqrt{\frac{1}{2}9{,}8\frac{9^2}{45}}$

$t = 2{,}97s$

16.

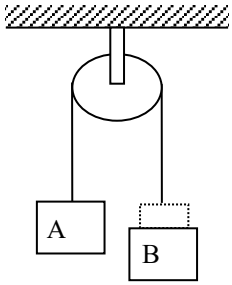
Which of the curves on the graph below best represents the vertical component v_y of the velocity versus the time t for a projectile fired at an angle of 45° above the horizontal?



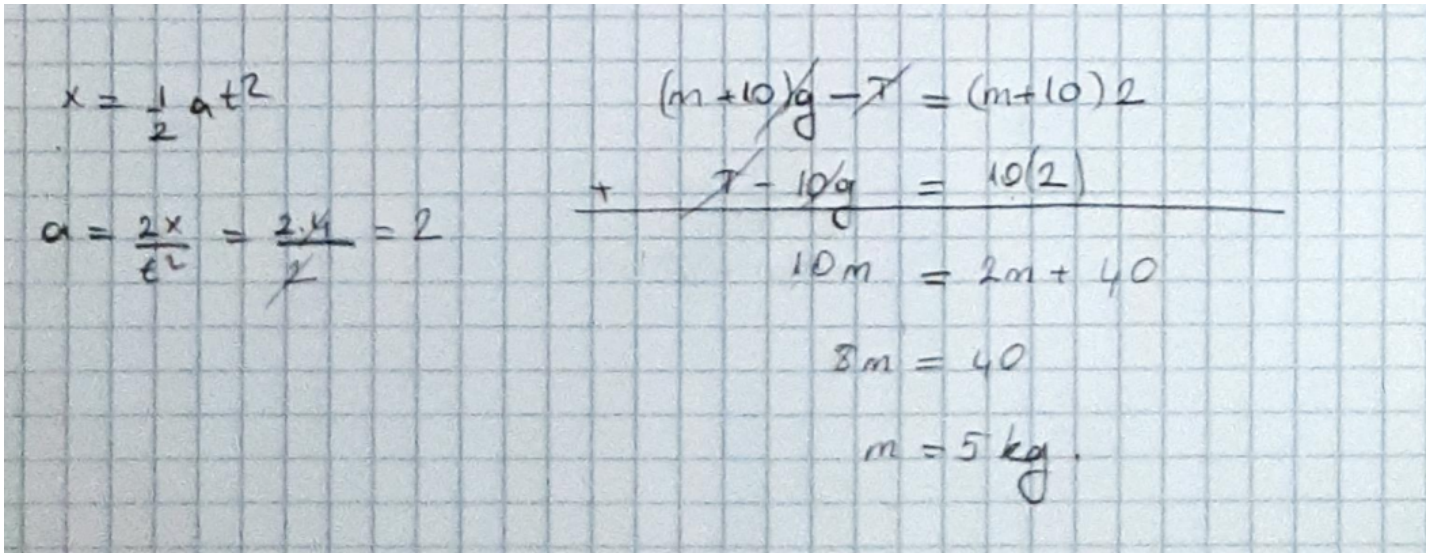
A) OC B) DE C) AB D) AE E) AF

Cevap D

17. Two objects either of which weights 10 N are connected by a rope of negligible mass. Find the weight to be added to one of the objects in order to reach 4 m in 2 s. Neglect the mass and friction of the pulley? ($g=10m/s^2$)



A) 1
B) 2
C) 3
D) 4
E) 5



18. A 1.5 kg model helicopter has a velocity of 5**j** m/s at t=0. It is accelerated at a constant rate for two seconds (2.0 s) after which it has a velocity of (6**i**+12**j**) m/s. What is the magnitude of the resultant force (in N) acting on the helicopter during this time interval?

A) 4,8 B) 6,9 C) 8,2 D) 10,1 E) 12,6

We can easily set up a coordinate system in which the *x*-axis ($\hat{\mathbf{i}}$ direction) is horizontal, and the *y*-axis ($\hat{\mathbf{j}}$ direction) is vertical. We know that $\Delta t = 2.00s$ and $\Delta v = (6.00\hat{\mathbf{i}} + 12.00\hat{\mathbf{j}}\ \text{m/s}) - (5.00\hat{\mathbf{j}}\ \text{m/s})$. From this, we can calculate the acceleration by the definition; we can then apply Newton's second law.

Solution

We have

$$a = \frac{\Delta v}{\Delta t} = \frac{(6.00\hat{\mathbf{i}} + 12.00\hat{\mathbf{j}}\text{m/s}) - (5.00\hat{\mathbf{j}}\ \text{m/s})}{2.00\ \text{s}} = 3.00\hat{\mathbf{i}} + 3.50\hat{\mathbf{j}}\text{m/s}^2$$

$$\sum \vec{\mathbf{F}} = m\vec{\mathbf{a}} = (1.50\ \text{kg})(3.00\hat{\mathbf{i}} + 3.50\hat{\mathbf{j}}\ \text{m/s}^2) = 4.50\hat{\mathbf{i}} + 5.25\hat{\mathbf{j}}\ \text{N}.$$

The magnitude of the force is now easily found:

$$F = \sqrt{(4.50\ \text{N})^2 + (5.25\ \text{N})^2} = 6.91\ \text{N}.$$

19.
Which of the following statements is/are correct?

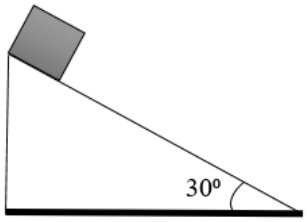
I. The force of gravity acting on an object is called the mass of the object.
II. Consider a body acted on by no net force. If it is at rest, it will remain at rest. If it is moving, it will continue to move with constant velocity.
III. The coefficient of friction is a dimensionless number.

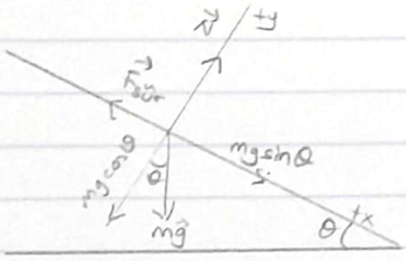
A) I, II and III
B) I and II
C) II and III
D) I and III
E) Yalnız III

Because it is the definition of weight, the I is wrong, the others are correct.

20. The 25 kg object in the figure slides down a rough surface at a constant speed on a slope of 30°. What is the value of the coefficient of kinetic friction between the object and the surface?

A) 0,2
B) 0,6
C) 0,9
D) 1,7
E) 2,5





$\theta = 30°$

$\mu_k = ?$

$\Sigma F_y = N - mg\cos\theta = ma_y = 0$

$\Sigma f_x = mg\sin\theta - f_{sür} = ma_x \Rightarrow$

$f_{sür} = N\mu_k$

$N = mg\cos\theta$

$mg\sin\theta - mg\cos\theta\,\mu_k = 0$

$$\mu_k = \frac{mg\sin\theta}{mg\cos\theta} = \frac{\sin\theta}{\cos\theta} = \tan\theta$$

$\theta = 30° \Rightarrow \mu_k = \tan 30°$

$\mu_k = 0,58$

$\mu_k \simeq 0,6$