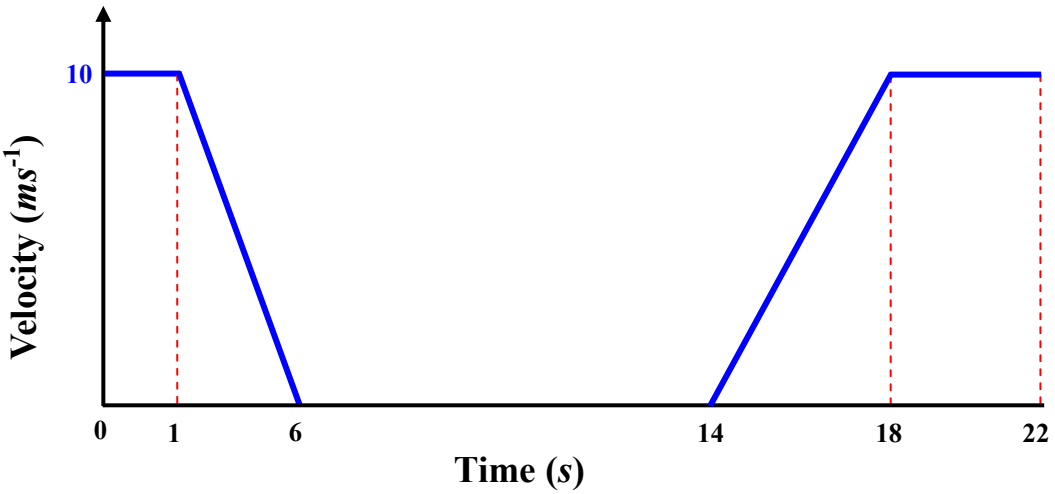
Round One

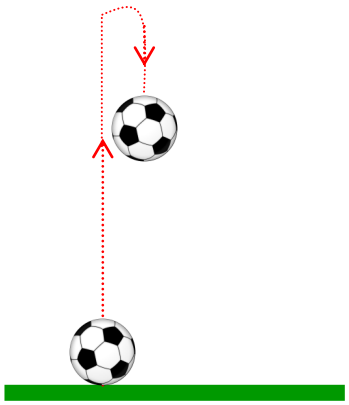
1.



The sketch models the velocity-time graph of a bus as it stops to pick up passengers at a bus stop.

Calculate the total distance travelled by the bus in 22 seconds?

2. A ball is thrown vertically upwards with an initial velocity of 20 ms^{-1}.



How far does it travel in the first three seconds of its motion?

(use $g = 10\ ms^{-1}$)

3. In 1st March 2008 a book called "The Shadow of the East" was returned to a library in Naas, Co Kildare. It had been due to be returned on January 1st 1934.
The library charges a fine of 60c per week for overdue books.

(Use 365.25 days in a year)

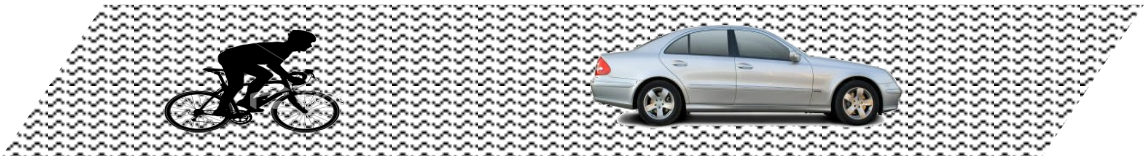
Calculate, to the nearest euro, how big a fine the person who returned the book should have paid.

(a) €2379 **(b) €2319** **(c) €2313** **(d) €2322** **(e) €2450**

Round Two

1. A tractor is overtaken by a car along a straight road. The tractor is travelling at 11 ms^{-1} and the car appears to be travelling at 20 ms^{-1} to the tractor driver.

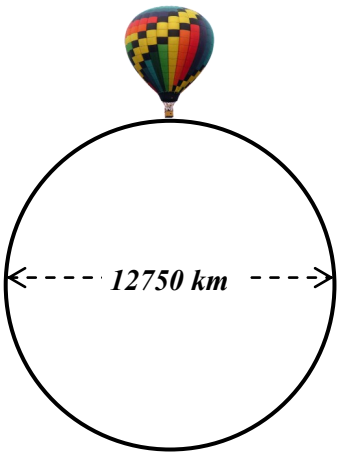
Calculate the speed of the car as it appears to a cyclist travelling in the same direction at 3 ms^{-1} .



2. A particle ***A*** has a position vector $(20\boldsymbol{i} + 30\boldsymbol{j})$ *m* and a velocity of $(10\boldsymbol{i} - 5\boldsymbol{j})$ ms^{-1}.
A second particle ***B*** starts at $(35\boldsymbol{i} + 75\boldsymbol{j})$ *m* with a velocity of $(7\boldsymbol{i} - 14\boldsymbol{j})$ ms^{-1}.

Find the time at which the particles collide.

3. On 2 July 2002, Steve Fossett completed the first solo balloon circumnavigation of the world after 13½ days. Assuming the balloon travelled along a circle of diameter 12,750 km.

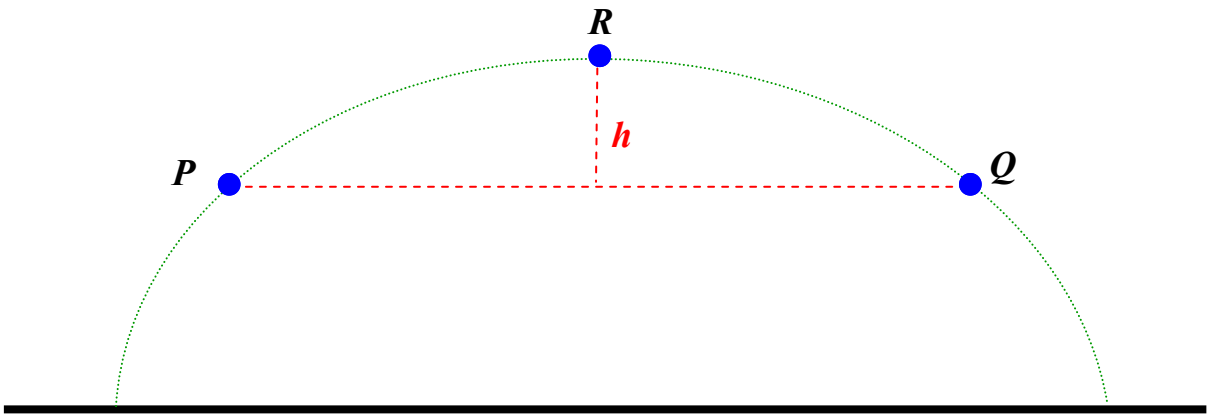


Roughly what was the average speed of the balloon in km/h?

(A) 12 (B) 40 (C) 75 (D) 120 (E) 300

Round Three

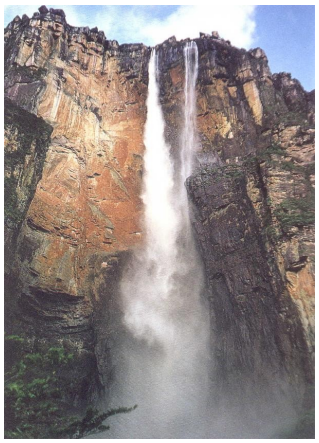
1.



A projectile on a horizontal plane passes through two points ***P*** and ***Q*** which are the same height above the plane. It takes the particle 6 seconds to travel from ***P*** to ***Q***.

When the particle is at its maximum height at R, how high above the line PQ is the particle?

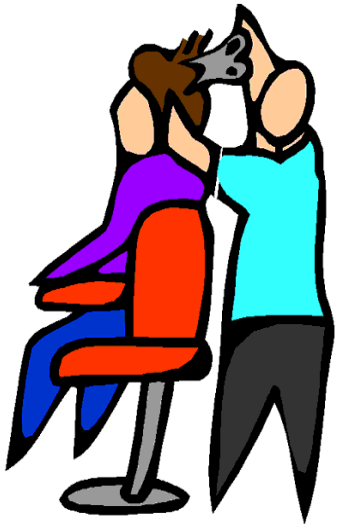
2. The Angel Falls in Venezuela is the highest waterfall in the world at 980 m.



If the water lands 28 m from the foot of the waterfall , determine the initial speed of the water, assuming it is horizontal.

(use g=10 ms^{-2})

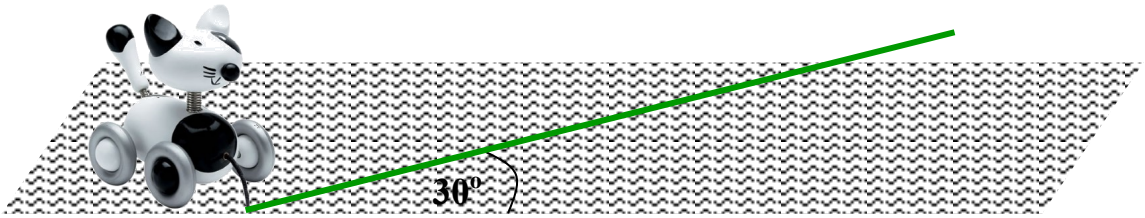
3. Three customers in a barbers shop each need a haircut and a shave. There are two barbers working and they both work at the same speed. Each takes a quarter of an hour for a Haircut and five minutes for a shave.



They are both in a hurry to be off, how quickly can they finish the work?

(A) 60 min
(B) 45 min
(C) 20 min
(D) 30 min
(E) None of the previous choices

Round Four

1. 

A toy cat on wheels has a mass of 3 kg. The cat is pulled along by a taut string inclined at 30^o above the horizontal. The cat is accelerated along the floor at 3 m/s^{-2} .

Calculate the tension in the string correct to one place of decimals.

2. A maths teacher leaves his briefcase on top of his car. The mass of the briefcase is 4kg since it contains a set of exercise books. The coefficient of the friction between the briefcase and the roof of his car is 3/14.

What is the acceleration of the car so that the briefcase is just on the point of falling off.

(Answer to one place of decimals , use $g = 10\ ms^{-2}$)

3. Inspector Remorse had a difficult year in 2004. A crime wave in Camford meant that he had 20% more cases to solve than in 2003, but his success rate dropped. In 2003 he solved 80% of his cases, but in 2004 he solved only 60% of them.

What was the percentage change in the number of cases he solved in 2004 compared with 2003?

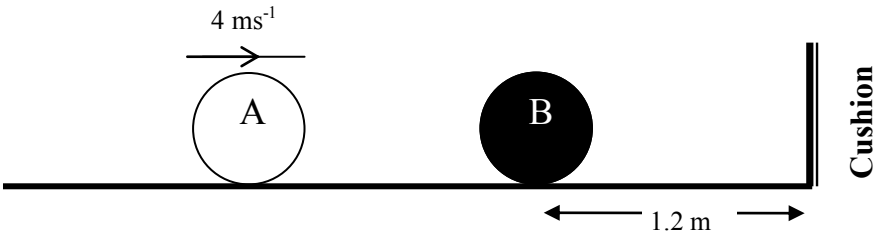
(A) Down by 10% **(B) Down by 8%** **(C) No Change** **(D) Up by 8%** **(E) Up by 10%**

Round Five

1. A hotel waiter is momentarily distracted and walks into a stationary serving trolley. The mass of the waiter and the trolley are 90 kg and 40 kg respectively. Before the collision the waiter is walking at 1.5 m s^{-1} and afterwards his speed is reduced to 0.9 m s^{-1}

   What will the speed of the trolley be immediately after the impact?

2. A small snooker ball ***A*** moves at 4 m/s on a horizontal table. It strikes an identical ball ***B*** at rest on the table. The ball ***B*** is at a distance of 1.2 metres from a vertical cushion. The impact is along the line of centres and normal to the cushion. The next collision takes place at a distance of 0.3 metres from the cushion. If the coefficient of restitution between the balls is ½. ***How far apart are the spheres when B hits the cushion?***



3. It takes two weeks to clean 3312 panes of glass in the 6000m^2 glass roof of the British Museum, a task preformed once every two years.

Assuming that all the panes are equilateral triangles of the same size, roughly how long is the side of each pane?

(A) 50 cm (B) 1 m (C) 2 m (D) 3 m (E) 4 m

Round Six

1. A car is moving along a straight road with uniform acceleration. The car passes a checkpoint ***A*** with a speed of 12 ms^{-1} and another check-point ***C*** with a speed of 32 ms^{-1}. The distance between ***A*** and ***C*** is 1100 m.

   Given that *B* is the mid point of *AC*, find in ms^{-1} to one decimal place, the speed with which the car passes *B*.

2. Particle ***A*** falls from rest from a point ***p*** under gravity, when ***A*** has fallen through 20 m particle ***B*** is released from ***p*** with an initial velocity of 40 m/s.

   At what distance from the point *p* do the two collide? (g = 10 m/s^2)

3. A ball is dropped out of a classroom window on to the yard 3.51 meters below. Every time the ball hits the ground it rebounds to two thirds of its previous height.

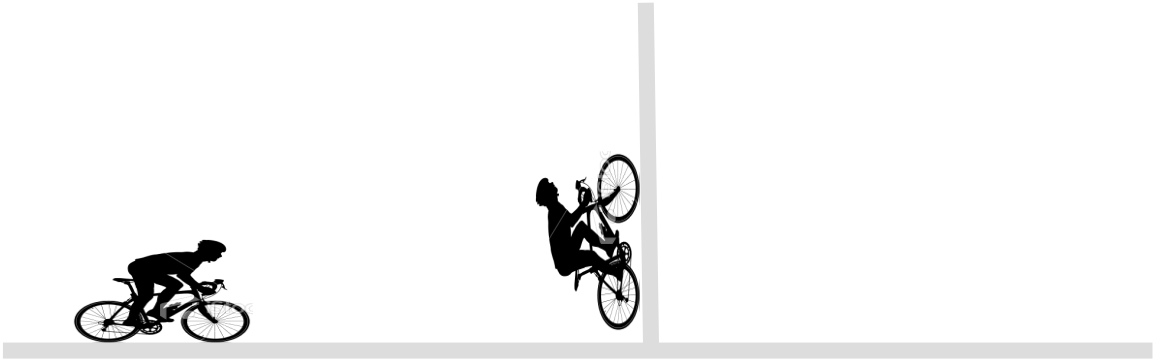
   How far has the ball travelled when it hits the ground for the third time.

   (A) 10.53m (B) 14.82 m (C) 7.41 m (D) 11.31 m (E) none of these

Round Seven

1. At an instant cyclist ***A*** is travelling at 3 m/s due east along a straight road. Another cyclist ***B*** is travelling due north along a straight road at 5 m/s. ***A*** begins to accelerate at 0.1 m/s^2 and immediately B decelerates at 0.2 m/s^2.

   Calculate the relative speed of the two cyclists 10 seconds after the change of their velocities



2. A private airport at Edenderry is 65 km due west of Weston airport, Lucan. In still air a small plane can fly at 90 km/hr and there is a constant wind blowing from the north at 30 km/hr.

   Calculate to the nearest minute, the minimum time for the journey , neglecting take-off and landing times.

Edenderry

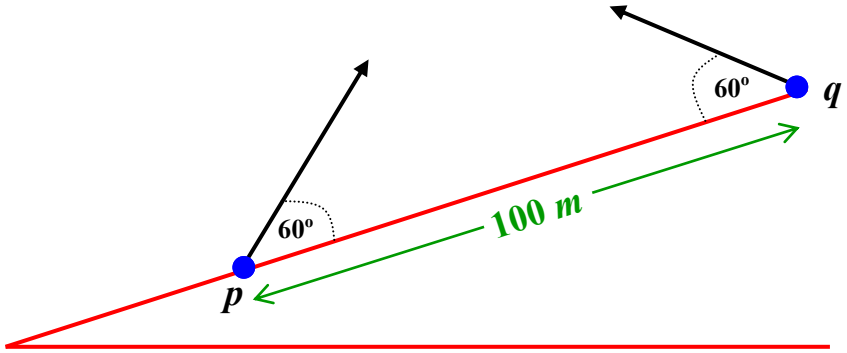
Lucan

3. At Ulan Bator market yesterday, you could buy a white elephant or 99 wild geese for the same number of Tugriks **(**the Mongolian currency). Today, the price of a white elephant has fallen by 10%.

   How many wild geese are now worth the same as one white elephant?

   (A) 81 (B) 90 (C) 98.01 (D) 99 (E) 121

Round Eight



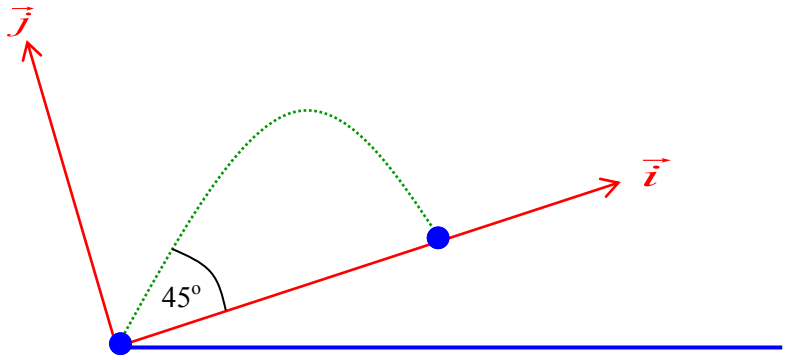
1. A particle is projected from a point ***p*** up an inclined plane at the same time a particle is projected from point ***q*** at an angle of 60^0 to the plane down the plane. Both particles are projected with the same speed.

   If the particles meet after 10 seconds and the distance from *p* to *q* is 100m, find the initial speed of the projection.

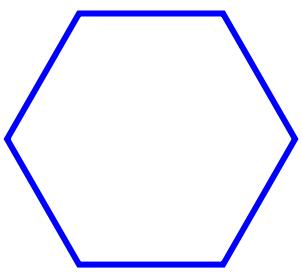
   [$g = 10\ m/s^2$]

2. A particle is projected up an inclined plane with initial velocity 60 m/s**.** The line of projection makes an angle of 45^0 with the inclined plane and the inclined plane makes an angle $\tan^{-1}(½)$ with the horizontal. If the particle strikes the plane at right angles. Find the time of flight?

   (Answer to the nearest ½ second, $g = 10\ m/s^2$)



3. How many diagonals are in a hexagon?



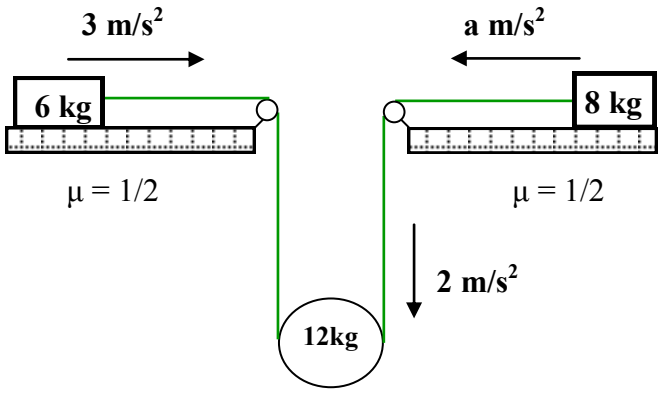
(A) 6 (B) 12 (C) 8 (D) 4 (E) 9

Round Nine

1. The diagram shows a man of mass 70 kg standing in a lift and carrying a suitcase of mass 8 kg in his hand. The magnitude of the contact force between the man and the floor of the lift is ***R*** newtons and that between the suitcase and the mans hand is ***S*** newtons.

When the life is accelerating upwards at 2 m/s , the ratio $R:S = X : 4$, Calculate the value of X. **($g = 10\ m/s^2$)**

2. As given in the diagram, the 6 kg mass has accelerates of 3 m/s^2. The 12 kg mass has an acceleration of 2 m/s^2.



Find the acceleration of the 8 kg mass. The coefficient of friction at both tables is ½

3. A candle will burn for 1000 hours. If I light it at midday on Sunday, on which day will it burn out?

(A) Mon (B) Thur (C) Fri (D) Sat (E) Sun

Round Ten

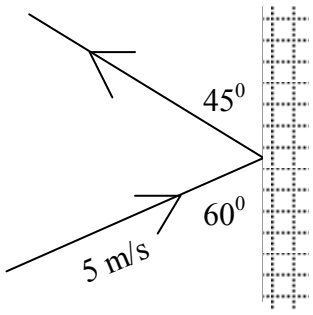
1. A smooth sphere ***P*** collides with an identical smooth sphere which is at rest. Before the collision ***P*** has a velocity of $4\vec{i} + 5\vec{j}$ *m/s*

   As a result of the impact ***P*** is deflected through an angle of 90^0.

   Calculate to the nearest m/s the speed of ***P*** after the collision.

   (impact is along the $\vec{i}$ axis)

2. A particle with a speed of 5 m/s strikes a smooth vertical wall at an angle of 60^0 and rebounds at an angle of 45^0, calculate the speed after impact correct to one place of decimals.



3. In the Co Leitrim cricket league, a team scores 5 points for a win, 2 for a draw and 0 if it loses. Dromahair cricket club has played 20 games in this league and has scored 21 points.

   What is the smallest possible number of games it could have lost?

   (A) 11 (B) 12 (C) 13 (D) 14 (E) 15

Tie Breaker

1. A driver jumps off a 5m high diving board. The driver enters the water 1.5 s later. Taking $g = 10\ ms^{-2}$, work out;

   The speed he generates in his jump, correct to one decimal place.

2. Elisa swims laps in the pool. When she first started, she completed 10 laps in 25 minutes. Now she can finish 12 laps in 24 minutes. By how many minutes has she improved her lap time?

   (A) ½ (B) ⅔ (C) 1 (D) 2 (E) 3

3. Circle ***X*** has a radius of π, Circle ***Y*** has a circumference of 8π. Circle ***Z*** has an area of 9π. List the circles in order from smallest to largest radius.

   (A) ***X,Y,Z*** (B) ***Z,X,Y*** (C) ***Y,X,Z*** (D) ***Z,Y,X*** (E) ***X,Z,Y***

ANSWERS

Round 1

1. **95**
2. **25**
3. **2322=D**

Round 2

1. **28**
2. **5 s**
3. **120=D**

Round 3

1. **45**
2. **2 m/s**
3. **30 min=D**

Round 4

1. **10.4 N**
2. **2.1 m/s**
3. **Down 10% = A**

Round 5

1. **1.35 m/s**
2. **0.8 m**
3. **2 m = C**

Round 6

1. **24.2 m**
2. **45 m**
3. **11.31 m = D**

Round 7

1. **5 m/s**
2. **46 min**
3. **81 = A**

Round 8

1. **10 m/s**
2. **9.5 seconds**
3. **9 = E**

Round 9

1. **39**
2. **7.2 m/s^2**
3. **Sun=E**

Round 10

1. **8 m/s**
2. **3.5 m/s**
3. **11 = A**

Tie Breaker

1. 4.2 m/s 2. A=1/2 3. *Z,X,Y* = B