CONCEPT™
BRAINST�ORM
Scholarship Test
2013

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Popeye the Sailor Man.

Q1. Popeye wishes to go to an island a few miles off the shore to fetch spinach. He has a boat with a big sail. To popeye's dismay there's no wind blowing that day. So he decides to act smart and fits a big table fan powered by a battery on his boat at the opposite end of the sail so that the fan blows wind into the sail. He sets the power of the fan exactly equal to the normal wind strength that prevails in that region. Will he reach the island with this fanned boat sooner or later than he would have reached with wind blowing naturally?
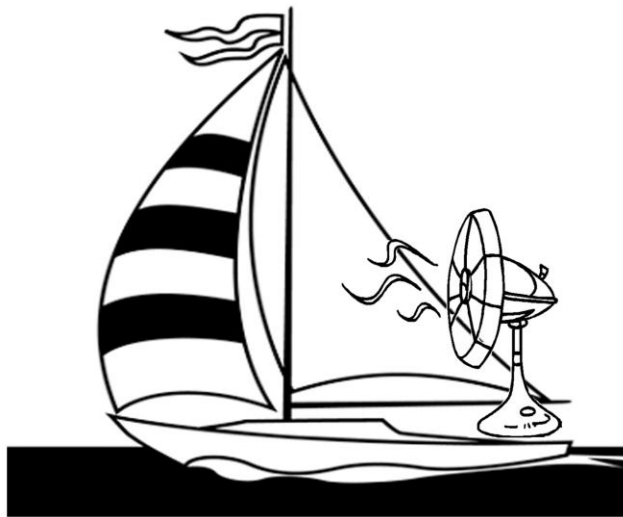
Ans:

The Bird Mystery

Q2. Some birds settle on a tree to roost at dusk. Seeing too many branches empty they first decide to sit one to a branch, but there was one bird too many. Then they sat two to a branch and one branch was free. How many birds were there and how many branches?
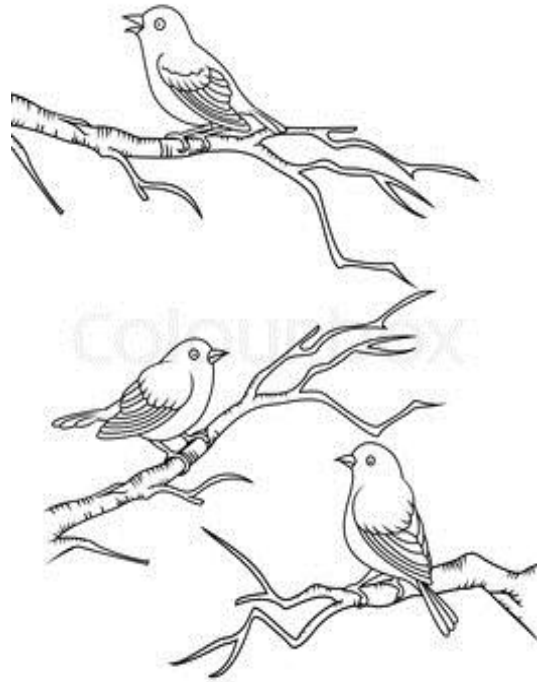
Ans:

The Marble Triangle

Q3. A few marbles are taken out from a bag of marbles and arranged in the form an equilateral triangle. The first row consists of one marble,the second row consists of two marbles,the third row consists of three marbles and so on. If 669 more marbles are added to this triangular collection then all the marbles could be arranged in a square and each side of the square would contain 8 marbles less than each side of the triangle did. How many marbles were there in the triangle?

(A) 1600   (B) 1500   (C) 1540   (D) 1690

Ans:

A Function called Modulus

Q4.There is a function in mathematics called modulus denoted by two vertical bars on either side of any quantity.
E.g. if we want to denote modulus of x we would write |x|.
By the definition it goes as :

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

Now solve for x, the given equation

$$|x - 1| + |x + 2| + 3 = 0$$

Ans:

Rational Geometry

Q5. A rational point is a point whose coordinates (x,y) are consisting of rational values of both x and y.

If we draw a circle with it's centre at $\left(\sqrt{3}, 0\right)$ and choose any radius of our choice (however big or however small) ,there is always a maximum of only two rational points on the circle irrespective of whatever is the chosen radius.

Give a comprehensive proof for this amazing yet true fact.
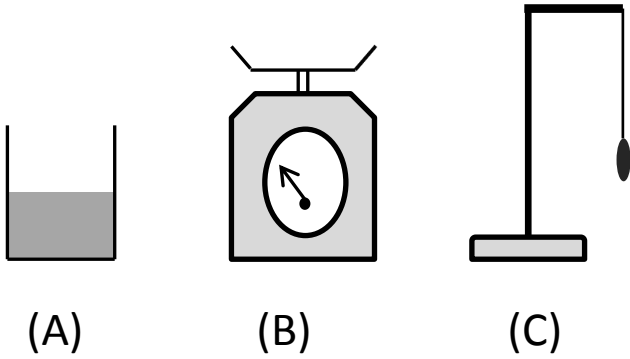
Ans:

The predictable weighing machine
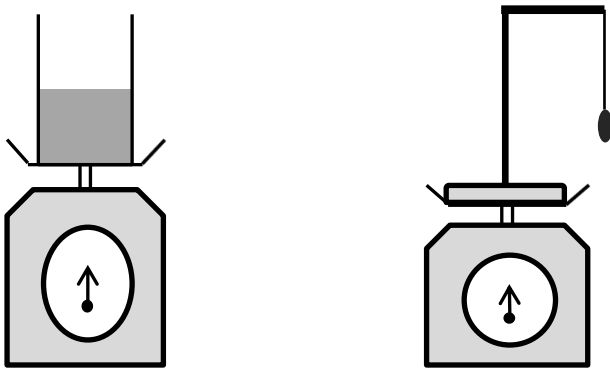
Q6. Consider three devices

A is a tank of water filled to 50% of its capacity.
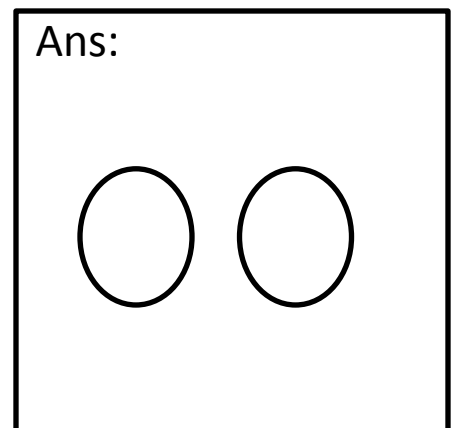B is a weighing machine with a needle point display and round scale dial.
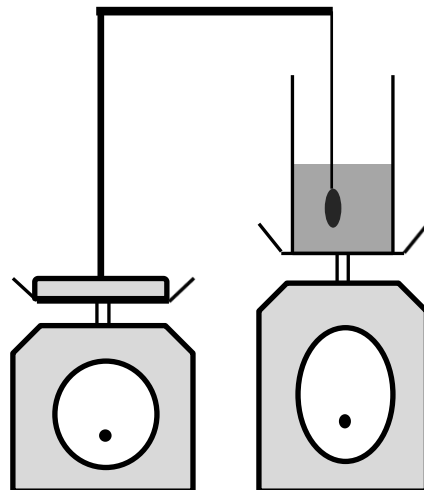C is a stone hung from a stand.

(A)   (B)   (C)

When the tank A and stand C are weighed separately the needle
pointed midway between the scale as shown.

Predict and draw the needles position in the weighing machines if the
apparatus is arranged as shown below.

Ans:

Nattha won't Die

Q7.Depressed due to poverty a farmer named Natthadas drank up a bottle of drain cleaner that he used in his cattle farm. The drain cleaner bottle had a label that read "Sodium hydroxide solution".

{Sodium hydroxide is a caustic, strongly alkaline compound used in drain cleaners. Sodium hydroxide, if ingested, will cause vomiting, prostration, and collapse after sometime.}

To ensure that he dies his elder brother Bhudia made him drink another bottle of concrete cleaner which had a label that read "Muriatric acid" on it.

{Muriatric acid is a corrosive, fuming, poisonous, highly acidic substance. If ingested, this acid corrodes the mucous membranes, esophagus, and stomach causing dysphagia, nausea, circulatory failure and death.}

To everyone's surprise Natthadas started feeling better after sometime and eventually did not fall much ill.

Give a logical explanation why he did not die and started feeling better after drinking the second bottle.

Ans:

The Liar's Club

Q8. A valuable painting was stolen from the Liars' Club, but the police are having a hard time identifying the culprit because every statement made by a member of the Liars' Club is false. Only four members visited the club on the day that the painting was stolen.

This is what they told the police:
Ann: None of us took the painting. The painting was here when I left.
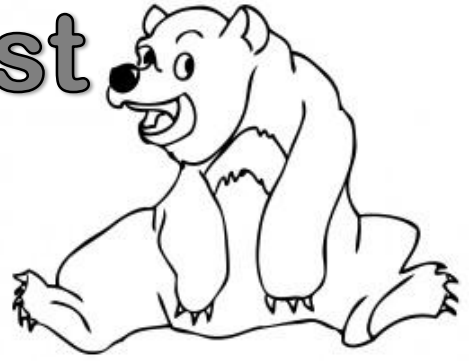Bob: I arrived second. The painting was already gone.
Chuck: I was the third to arrive. The painting was here when I arrived.
Tom: Whoever stole the painting arrived before me. The painting was already gone.

Who of these four liars stole the painting?

Ans:

A Bears breakfast

Q9.A bear walks south for one kilometer, then it walks west for one kilometer, then it walks north for one kilometer and ends up at the same point from which it started. What probably did the bear eat in breakfast that day?

(A) Fruits   (B) A baby seal   (C) Honey   (D) Deer meat

Note: You have to support your answer with logical reasoning.

Ans:

Of Rivers and Rafts

Q10. A river flows from west to east with a steady speed. On a certain point on the river floats an unmanned raft. A motor boat coming from west overtakes the raft and goes towards east for 10 minutes. After 10 minutes the boat engages reverse gear and starts coming back. On the return journey the motorboat meets the raft 3 km ahead of the point from where it overtook the raft in the onwards journey. Find out the speed of the river flow.

Note: the time taken to engage reverse gear is negligibly small. There is no effect of wind considered on the boat,river or raft.

Ans:

The Factorial Expression

Q11. A symbolic way to represent a sequential product of a number with numbers less that itself is called factorial and is denoted by the symbol "!" written after the number.
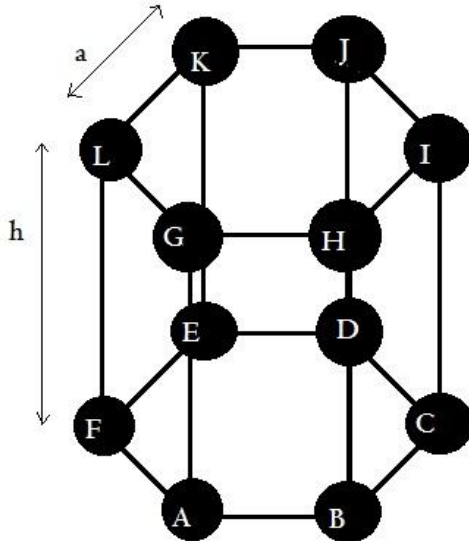
E.g. 4! = 4x3x2x1 , 7! = 7X6x5x4x3x2x1

Knowing this fact, find the L.C.M of 13! and 16!

Ans:

The 3-D molecule

Q12. If 12 atoms are placed at the edge of a 3-D hexagon with side length a and height h then which set of atoms will be at an equal distance from A as shown in the fig.

(A) E and I
(B) H and F
(C) L and C
(D) K and I
(E) L and I

Ans:

The stripped lens effect

Q13. Mark and Mike (well known wildlife photographers) went to a photography expedition). There they tracked a beautiful white wild horse. Both of them clicked a snap of the animal. Mark's camera lens was normal and clean but Mike's camera lens had black strips drawn on it with a permanent marker. Which of the following could be the outcome when they process their photographs.


(A) Marks photograph will be of a white horse and Mike's photograph will look like a zebra.
(B) Marks photograph will be of a white horse and Mike's photograph will look like a black horse.
(C) Both mark's and mike's photographs will be that of a white horse.
(D) Information is insufficient to ascertain any of the above statements.

Ans:

The Lazy Bug

Q14. A hungry bug sitting at the corner "A" of a cubical room of length L, width B and height H. On the diagonally opposite corner "G" there is a piece of the bug's favorite food. The bug doesn't have wings and cannot fly. Trace the path for the bug if the bug wants to reach it's food in the shortest possible time.

Assume that the bug moves with constant speed.
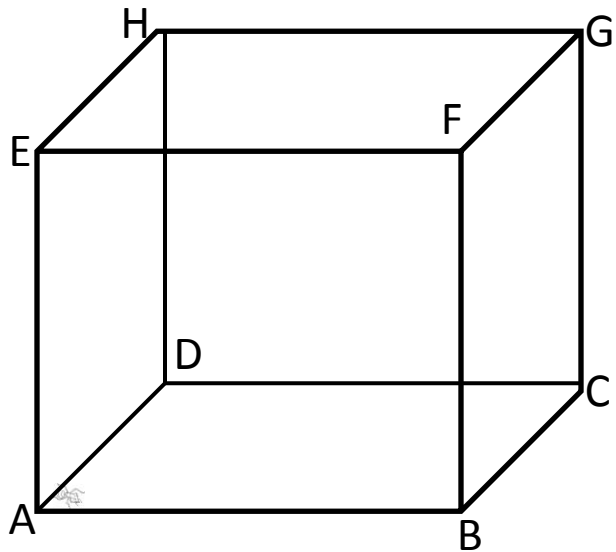
Ans:

The Magnet Detector

Q15. If you are in a dark empty room and are given two identical bars (same mass,same size ,same weight and same texture). One of them is a bar magnet and the other one is an iron bar.There is nothing else in the room. You have to come out of the room with the magnet and leave the iron bar behind.

Find a way to identify the magnet bar and the iron bar.

Ans:

Water to ice expansion

Q16. You must have noticed the small gap left in bottles of soft drinks. The gap is not to save a few ml of drinks but for a different reason.
The reason being that most of these drinks are 98% water and water expands upon freezing unlike most other things which contracts upon freezing.
As an experimental data you have an information that the density of water is highest at a temperature of 4 degree celcius.

Based on the information above, draw a graph depicting Volume vs Temperature for water. (volume on y-axis and temperature on x-axis)

Ans:

****End of question paper****