

SECTION -1
VERBAL ABILITY

PASSAGE I

Number of Questions: (Q.1 – Q.5)

Maritime chart making is usually about showing what's there. Ships need to know about rocks and shoals and reefs. They need to know where coasts are for shelter, for victualing and also—because land and not water is the mariner's greatest threat—to stop banging into them. Cartographers rarely have to deal with what's not there.

But in 1875, the great ocean surveyor Captain Sir Frederick Evans faced just such a task. For four and a half centuries, the Pacific Ocean had been filling up with phantom islands—false sightings, hopeful imaginings, brazen inventions, icebergs, pumice rafts, navigational errors. Evans applied a rigour gleaned from half a lifetime at sea, surveying the waters around Australia, and from a fine scientific mind: his treatise on magnetic deviation in iron ships was the standard text for years.

As the new chief hydrographer to the Royal Navy, he set to work on the latest chart of the Pacific Ocean. He filled his pen with red ink and—like Moses destroying the golden calf—consigned 123 islands to the topographical fire. So zealous was his eradication that three of them turned out later to exist after all.

Evans's vanished islands represent one of our most persistent responses to the physical world. The words "fantasy" and "island" have always been natural partners. An isolated piece of land in a watery vastness is an image that resides deep in the collective unconscious. Frailty and isolation, possibility and lotus-eating combine in it to suggest something fundamental about our place on this Earth. John Donne was wrong when he wrote "No man is an island". We're all islands.

From Bacon's Atlantis to More's Utopia and Barrie's Neverland, non-existent islands have been places where mortal constraints can be shaken off, the greatest pleasures indulged. Top-end tourist islands still offer something similar.

In the 15th and 16th centuries, hopes of finding the mythical island of Hy-Brasil in the Atlantic Ocean filled the gaze of many an explorer, Cabot and Columbus among them. Bogus accounts of the island sang of its virtues. The Elizabethan manuscript "Voyage to O'Brazeel" tells of a people living in perfect Christian virtue and happiness. Even long after the Atlantic had been criss-crossed, belief in the island and its qualities persisted. In 1668, a quack doctor in Ireland built a lucrative practice on his tale of having been abducted and taken to Hy-Brasil; in the Library of the Royal Irish Academy is his book of miraculous cures, "The Book of O'Brazil".

Evans's 1875 amendments to Pacific Ocean Chart 2683 were a triumph of empiricism over wishful thinking, of strict cartography over the old tendency to embellish the real world with wild imaginings. But as the years passed it turned out that his red pen had left intact many false islands.

To the north-west of Hawaii on the chart is Morrell Island (its "PD" caption signals its position as doubtful, rather than its existence). It was named after Captain Morrell, whose accounts of his early-19th-century voyages were immensely popular. They were also somewhat playful with the truth. Morrell Island was still there in "The Times Survey Atlas" of 1922; even in the 1980s, it could be seen in prominent letters on globes in the offices of Lufthansa.

Two of the most enigmatic Pacific Islands were among the first recorded by Europeans. Los Buenos Jardines were written up for the only time in 1529 and although there was always a question mark over them, they were deleted by the International Hydrographic Bureau only in 1973. Appealing details from the original account helped to sustain the hope that they existed. In his book "Lost Islands", Henry Stommel wrote of them: "One cannot help suspecting that there was something else restraining the eraser: perhaps a touch of romantic conviction that such an idyllic pair of tropical islands should not die."

One island was un-discovered as recently as 2012. Sandy Island, off New Caledonia, was the size of Manhattan. But then a survey ship steamed—slowly, for fear of running aground—through its position and found the depth of water to be 1,300 metres. It is reassuring somehow that Sandy Island, first reported just months after Evans's purge, appeared on charts throughout the 20th century, and even on Google Earth.

Perhaps Utopia, too, is still out there.

Q.1 A good title to this passage could be

- (a) cartophilia
- (b) deleted islands
- (c) the search for utopia
- (d) The Book of O'Brazil

Q.2 According to the passage, maps are necessary for seafarers to

- i. know where there are possible obstacles to their paths
- ii. identify islands to dock where they may be able to get food and shelter
- iii. identify where there are deep currents that may affect their path

- (a) (i) only
- (b) (i) and (ii) only
- (c) (i) and (iii) only
- (d) (i) (ii) and (iii)

Q.3 This article is

- (a) a descriptive article on how maps are made
- (b) about following Sir Evan's trail of deleting fictitious islands from maps
- (c) a search for exotic tourist islands
- (d) a lament on cartographers not having located Utopia yet

Q.4, When the author says "Evans's vanished islands represent one of our most persistent responses to the physical world" he is referring to

- (a) human tendency to "destroy the golden calf"
- (b) human tendency to wish obstacles away from their path
- (c) human tendency to indulge in pleasure at top end tourist islands
- (d) human tendency to fantasize islands as places where "mortal constraints can be shaken off".

Q.5. From this article, the reader can infer that:

- (a) Sir Evans was successful in his task of removing phantom islands from the map of the Pacific Ocean
- (b) Sir Evans was over zealous in his task, and as a result, deleted many real islands
- (c) The process of adding imaginary islands to (and subsequently deleting from) will continue because of human nature
- (d) Sir Evans may have had a little romantic conviction, that led him to not delete many non-existent islands from the map

SECTION - II **QUANTITATIVE ABILITY**

Q.1. Consider a function f , given by $f(x) = 4x^3 - 6x^2 - 72x + 30$. Which of the following statements is true about f ?

- (a) f is strictly increasing only in the interval $(-\infty, -2)$.
- (b) f is strictly decreasing only in the interval $(-2, 3)$
- (c) f increases at an increasing rate in the interval $(3, \infty)$
- (d) f decreases at an increasing rate in the interval $(-2, 3)$

Q.2. The maximum value of $|z|$ when z satisfies the condition $\left|z + \frac{2}{z}\right| = 2$ is

- (a) $\sqrt{3} - 1$
- (b) $\sqrt{3}$
- (c) $\sqrt{3} + 1$
- (d) $\sqrt{2} + \sqrt{3}$

Q.3. Consider a grid of nine blocks as shown in the figure below. How many distinct triangles with area > 0 can be constructed using blocks on the grid as vertices?



- (a) 27
- (b) 48
- (c) 76
- (d) 84

Q.4. A can solve 90% of the problems and B can solve 70% given in a Mathematics book. What is the probability that at least one of them will solve a problem selected at random from that Mathematics book?

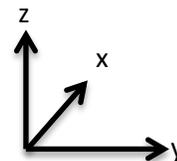
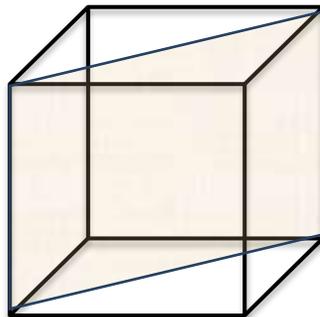
- (a) 0.16
- (b) 0.20
- (c) 0.63
- (d) 0.97

Q.5. In how many ways can a party of 4 men and 4 women be seated at circular table so that no two women are adjacent?

- (a) 48
- (b) 144
- (c) 256
- (d) 576

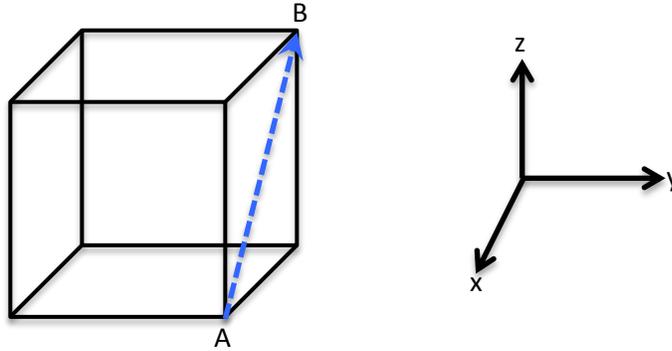
SECTION III
ENGINEERING ABILITY

Q.1. What is the plane being drawn in figure below?



- (a) $(\bar{1}10)$
- (b) $(10\bar{1})$
- (c) $(01\bar{1})$
- (d) $(0\bar{1}1)$

Q.2. What are the Miller indices of the direction AB indicated in the lattice?



- a) $\langle 11 \rangle$
- b) $\langle 10 \rangle$
- c) $\langle \bar{1}1 \rangle$
- d) $\langle \bar{1}01 \rangle$

Q.3. Addition of boron (B) atoms in an intrinsic silicon makes silicon

- (a) p-type
- (b) n-type
- (c) crystalline
- (d) piezoelectric

Q.4. Copper (Cu) atom has one unpaired electron ($4s^1$). Cu is:

- (a) ferromagnetic
- (b) diamagnetic
- (c) anti-ferromagnetic
- (d) paramagnetic

Q.5. High strength and significant ductility can be achieved by

- (a) Precipitation
- (b) Solid solutioning
- (c) Grain refinement
- (d) Cold working