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TODAY'S EDITION

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STUDENT EDITION
WEDNESDAY, NOVEMBER 17, 2021

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STATE OF ECONOMY
IT MAY TAKE SEVERAL YEARS TO RECOVER LOSS OF OUTPUT DUE TO THE PANDEMIC: RBI

The pandemic caused loss of output of over a tenth of annual GDP of a normal year. Recovering this lost output may take several years, said RBI deputy governor Michael Patra. Moreover, as countries moving back to normalisation of policy will involve global spillovers, India cannot be immune, he added. The agglutination of supply disruptions, the health crisis, an unparalleled mass migration and a hostile global environment has caused a considerable loss of output - over a tenth of annual GDP of a normal year" said Patra.

India is currently one of the fastest-growing major economies in the world. In purchasing power parity (PPP) terms, India is the third-largest economy in the world. Projections show that by 2040 India will be the second largest economy in the world

Climate change may force AEROPLANES TO FLY HIGHER

Climate change is having an increasing impact on the structure of the Earth's atmosphere, and may cause planes to fly higher to avoid turbulence, a new study shows. The research draws on decades of weather balloon observations and specialised satellite measurements to quantify the extent to which the top of the lowest level of the atmosphere - called tropopause - is rising.

MATTER OF CONCERN

1 The analysis of weather balloon observations alarmingly showed that the tropopause has increased in height at a steady pace since 1980: about 58-59 metres per decade

2 Of these, 50-53 metres per decade is attributable to human-induced warming of the lower atmosphere

3 This trend has continued even as the influence from stratospheric temperatures has waned, demonstrating that warming in the troposphere is having an increasingly large impact

4 The satellite observations taken since 2000 verified that the height of the tropopause has increased over the past two decades

ROLE OF TROPOPAUSE
AMID FLIGHT

■ The height of the tropopause, an atmospheric region that divides the dense and turbulent troposphere from the overlying and more stable stratosphere, ranges from about 5 miles above the Earth's surface at the poles to 10 miles at the equator, depending on the season

■ The location of the tropopause is of interest to commercial pilots who often fly in the lower stratosphere to avoid turbulence, and it plays a role in severe thunderstorms, whose overshooting tops sometimes drive the tropopause higher and draw down air from the stratosphere

■ The steadily increasing height of the tropopause in recent decades does not significantly affect society or ecosystems, but it illustrates the wide-ranging impacts of greenhouse gas emissions

■ Previous scientific studies have shown that the tropopause is rising. This was not only because of climate change, but also because of cooling in the stratosphere caused by ozone epletion gases

■ These gases shrank the stratosphere through the destruction of the stratospheric ozone layer, although restrictions against their emission in more recent years have caused the atmospheric concentrations of these gases to decline

CHINA IS NOW WORLD'S RICHEST nation, ahead of US

Global wealth tripled over the last two decades, with China leading the way and overtaking the US for the top spot worldwide. That's one of the takeaways from a new report by the research arm of consultants McKinsey & Co that examines the national balance sheets of 10 countries representing more than 60% of world income.

Net worth worldwide rose to $514 trillion in 2020, from $156 trillion in 2000, according to the study. China accounted for almost one-third of the increase. Its wealth skyrocketed to $120 trillion from a mere $7 trillion in 2000, the year before it joined the World Trade Organisation, speeding its economic ascent

■ The US, held back by more muted increases in property prices, saw its net worth more than double over the period, to $90 trillion

■ In both countries – the world's biggest economies – more than two-thirds of the wealth is held by the richest 10% of households, and their share has been increasing, the report said

■ As computed by McKinsey, 68% of global net worth is stored in real estate. The balance is held in such things as infrastructure, machinery and equipment and, to a much lesser extent, so-called intangibles like intellectual property and patents

First edition of Fit India quiz to have 2 prelim rounds

The first edition of the Fit India Quiz launched earlier this year will have two preliminary rounds so that students get a chance to avail either one or both the opportunities to take the test, a government statement said. After the two rounds, a combined merit list of both the tests will be prepared to shortlist the students for the next stage. Students who have appeared twice have the advantage of the best score out of the two tests being considered, it added. The date and time for the second preliminary round would be announced shortly, the statement said.

The main aim of the quiz is to create awareness among students about India's rich sporting history, its centuries-old indigenous sports and the national and regional sporting heroes

■ The winners of the preliminary round will take part in the state round in December and its winners will then go on to participate at the national level in January-February, 2022

■ The winners of the quiz at each level will have a chance to win cash prizes, along with the honour of being called the country's first Fit India state or national level quiz champion, it said

Full vaccination likely to provide immunity against Covid-19 for a year

The World Health Organisation (WHO) on Monday asserted that the effects of Covid-19 vaccines are likely to last for a year or possibly longer. It also added that the vaccination of vulnerable population has led to "uncoupling" between infections and deaths. Dr Soumya Swaminathan, chief scientist, WHO also asserted that vaccination is necessary, adding that the natural infection after getting exposed does generate immunity. "In some people, it is strong, it can last for a long time. In others, it may be not that strong. In about 10 to 20 per cent of people, you can't even detect antibodies after infection," she said.

IN OTHER NEWS

European nations launch new measures to curb Covid resurgence
With Europe now the epicentre of the Covid-19 pandemic, countries across the continent are introducing new measures to curb the resurgence, including several curbs for unvaccinated people. The German capital of Berlin has banned unvaccinated people from entering restaurants, bars, cinemas and other entertainment venues. In Austria, as of Monday unvaccinated people were only allowed to leave their apartments for essential reasons such as purchasing groceries, visiting a doctor or pharmacy, or going to work.

Seven host cities for 2022 T20 World Cup
Seven Australian cities, including Melbourne, Sydney, Brisbane, Perth and Adelaide, will host the ICC Men's T20 World Cup from October 16 to November 13 next year. The other two cities which will in all likelihood host the Round 1 matches include Geelong and Hobart with the iconic Melbourne Cricket Ground hosting the final. The semi-finals will be held at the Sydney Cricket Ground and Adelaide Oval on November 9 and 10, respectively.

Twitter no longer autoloads new tweets on web
Micro-blogging site Twitter will no longer automatically refresh timelines on the web with new tweets and users can now decide when they want to load new tweets.Twitter acknowledged that in the past, tweets would often disappear from view mid-read when a user's timeline would automatically refresh. Now, users can load new tweets when they want to by clicking on the tweet counter bar at the top of their timelines, reports TechCrunch.

02

"A man who carries a cat by the tail learns something he can learn in no other way."
MARK TWAIN

A2Z OF CONCEPTS
WEDNESDAY, NOVEMBER 17, 2021

Beginning the journey of learning in an alphabetical order, Times NIE takes you through one concept from each subject every week
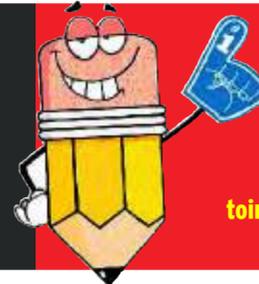
TEACHERS, IF YOU HAVE A CONCEPT THAT CAN CHANGE A CLASSROOM, SHARE IT ON
toinie175@gmail.com WITH YOUR PHOTOGRAPH

CLASSROOMS TO EXPERIENCE ZONES

BIOLOGY

XEROPHYTE

Any plant adapted to life in a dry or physiologically dry habitat (salt marsh, saline soil, or acid bog) by means of mechanisms to prevent water loss or to store available water are called Xerophytes (xero meaning dry, phyte meaning plant). They can survive in an environment with little availability of water or moisture.

DID YOU KNOW Succulents (plants that store water) such as cacti and agaves have thick, fleshy stems or leaves. Other xerophytic adaptations include waxy leaf coatings, the ability to drop leaves during dry periods, the ability to reposition or fold leaves to reduce sunlight

FEATURES OF XEROPHYTES

Adaptations of xerophytes include reduced permeability of the epidermal layer, stomata and cuticle to maintain optimal amounts of water in the tissues by reducing transpiration, adaptations of the root system to acquire water from deep underground sources or directly from humid atmospheres and succulence, or storage of water in swollen stems, leaves or root tissues. The typical morphological consequences of these adaptations are collectively called xeromorphisms.

Types

■ **EPHEMERAL ANNUALS:** These plants are also called as drought evaders or drought escapers. They do not withstand dry seasons but actually avoid them. Few examples are Argemone mexicana, Solatium xanthocarpum.

■ **SUCCULENT:** These plants grow in habitats with less or no water. They store water whenever it is available. Eg: Euphorbia and Opuntia.

■ **NON-SUCCULENT PERENNIALS:** These are drought resistant and called as true xerophytes. They possess a number of morphological, anatomical and physiological characteristics, which enable them to withstand critical dry conditions. Calotropis, Acacia, Casuarina and Nerium.

ACTIVITY: HOW CACTUS STORES WATER

WHAT YOU NEED:
Sponge; Glass of Water

WHAT YOU DO:
■ Take a sponge and cut it in the shape of a cactus.
■ Now dip the cactus in a glass of water.

WHAT HAPPENED:
Observe how the water gets soaked up by the sponge and if you let it be, the sponge can retain the water for at least another day. The cactus has spongy parts that works on the same mechanism.

PHYSICS

X-RAY

X-rays are a form of electromagnetic radiation, similar to visible light. Unlike light, however, X-rays have higher energy and can pass through most objects, including the body. Medical X-rays are used to generate images of tissues and structures inside the body. If X-rays travelling through the body also pass through an X-ray detector on the other side of the patient, an image will be formed that represents the "shadows" formed by the objects inside the body.

HOW X-RAY WORKS

One type of X-ray detector is photographic film, but there are many other types of detectors that are used to produce digital images. The X-ray images that result from this process are called radiographs.

IF A PERSON GETS AN X-RAY

The person who will take the X-ray picture is called the technologist. They'll help you get ready for the X-ray by telling you how to stand, sit, or lie down, and might strap down the part of your body they need a picture of. This strap will be like the seatbelt to hold you in place during the X-ray exam. For your X-ray exam, you will get a gown to wear. The technologist may also have you wear a protective neck covering, or they might put a heavy blanket on parts of your body that they don't need a picture of to protect you from getting too much radiation. X-rays use a small amount of radiation, electromagnetic waves that can go through your skin, to take pictures of the inside of your body.

DID YOU KNOW WC Röntgen reported the discovery of X-rays in December 1895 after seven weeks of assiduous work during which he studied the properties of this new type of radiation able to go through screens of notable thickness. He named them X-rays to underline the fact that their nature was unknown

LANGUAGE

XENIAL

By Kartik Bajoria
Jaipur-based Communication Skills Educator & Writer

It is important to understand and appreciate that when we communicate, we must always come across as polite, generous, sensitive individuals. Particularly, when one is in a situation when one has to deliver some bad news, or be critical, or furnish a complaint, one must try to be xenial.

Xenial simply means warm. Let us look at a very plausible example from one's everyday life. Say you have visited a restaurant and your food arrives undercooked! You need to complain to the waiting staff or chef. One way of doing this is to create a fuss about it, s c r e a m, shout and say something like - "I am appalled at this shoddy service. This is supposed to be a top-class restaurant where you are charging the earth for the meal but serving poor quality food!" You may get your dish replaced but it will leave the proverbial bitter after-taste in everyone's mouth – for you have soured the situation by being 'unkind' in your communication. Chances are that as is human tendency, your aggression is met with a defensive stance by the restaurant management. If on the other hand, you remain xenial and say "I'm terribly sorry to be critical but I think my food is a touch undercooked, perhaps you could take a look?" – your politeness will go a long way in the staff being much more receptive to your complaint, manifesting in them gladly fixing, even replacing your dish! That is the power of being xenial.

MATHS

By Sandeep Srivastava
Educator since 20 yrs, he specialises in making Maths easy and fun

X FOR X-GEN (PERMUTATIONS)

More options exist for us all, than ever in the past! Many more permutations of possibilities exist today for all kinds of situations. We will be exploring this topic more through examples.

Permutation, in general, means each of several possible ways in which a set or number of things can be ordered or arranged, whereas, we use the word 'combination' without thinking if the order is important, say, a combination of ideas.

This salad is a combination of cucumber, tomato, onion and cheese, wherein the order in which the four are combined is immaterial. We may put tomatoes first and cucumbers last or we may start with cucumber.

An interesting everyday usage where the distinction between permutation and combination is ill-applied is when talking about security codes. Whereas saying 'This lock is a combination of the digits 1,2,3' may be grammatically correct, to be precise, it's wrong. Here the order of using these digits is important. The lock may just open with 123 and not 321. Hence, mathematically the code is not the combination of 1,2,3 but a permutation of the same digits.

The two are very practically useful mathematical models. They help us quickly compute the total number of realistic choices available when selecting, or arranging, a set of things from a collection of such things is required. Thus, we also use permutations and combinations in computing probability, the two concepts significantly reduce computational effort in finding probability, in some situations.

Why are permutations important?
To do that, let's first talk about factorials.

For any positive integer n, the continued product of first n natural numbers is called factorial n, denoted by n!, or ▲n. We define 0! = 1. Thus, n ! = n (n – 1) (n – 2) ......3.2.1. When n is negative or a fraction, n! is not defined.

For example, if one needs to arrange 5 different books on a shelf. Let's see how many ways we can arrange them. The first book has 5 choices where it can be put, and say we put it in the first slot from the left ('5'). We are now left with 4 more slots. And for each of the 5 choices there are now 4 possible books for the second slot from the right ('4'). And so on for the rest of the books.

Hence, all the 5 books can be arranged in 5 x 4 x 3 x 2 x 1 = 120 ways on the book shelf or we say they can be arranged in 5! ways.

The number of arrangements of n different objects taken all at a time is shown by the symbol ^nP_n= n! And in general,

$^nP_n = n! = 1; ^nP_r = n. {_{n-1}}P_r . P!; 0!=1! \frac{1}{(-r)} =0$ or $(-r)!= «$

What if we want to arrange things but not all the things? Let's say we have 10 action figures but only have space on the shelf for 6 of them. How many different ways can we display the figures?

We could calculate it by saying that there are 10 figures to choose from for the first position on the shelf, then 9 figures to choose from for the second position, 8 for the third position, and so on. This is 10×9×8×7×6×5 ways of placing six of the ten figures on a shelf.

A small arithmetical jugglery will give us the following mathematical expression –

$$\frac{(10 \times 9 \times 8 \times 7 \times 6 \times 5)(4 \times 3 \times 2 \times 1)}{4 \times 3 \times 2 \times 1} = \frac{10!}{4!}$$

which we can rewrite as: $\frac{10!}{4!} = \frac{10!}{(10-6)!}$

and now we have everything in terms of what we knew (picking 6 things from a population of 10 things) and this is what a permutation is:

$$P_{rn} = \frac{n!}{(n-k)!} ; n = population, k = picks$$

We know that 10!=3,628,800 and 4!=24, and we can easily calculate the final count of permutations:

$$\frac{10!}{4!} = \frac{10!}{(10-6)!} = \frac{3628800}{24} = 151,200$$

Let's take another example. There are 8 participants (identified as A, B, C, D, E, F, G, H) in a 100-metre race competing for first, second and third positions. So, how many ways can the medals be awarded amongst them?

For the first position, there are 8 choices out of A, B, C, D, E, F, G, or H. Now the competition is among the remaining 7, i.e., B, C, D, E, F, G, or H for the second position (if A was in the first position). The third position would be grabbed by either B, D, E, F,G or H, i.e., 6 choices, if C secured the third position.

Hence, the total number of choices for the three medals = 8 x 7 x 6 = 336. Let's reframe this as:

$$\frac{8 \times 7 \times 6 \times (5 \times 4 \times 3 \times 2 \times 1)}{(5 \times 4 \times 3 \times 2 \times 1)} = \frac{8!}{5!} = \frac{8!}{(10-3)!}$$

Hence, for the 8 participants, to find the number of ways 3 positions can be filled (and the order of the participants matter), we apply $\frac{8!}{(8-3)!}$
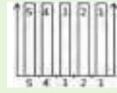
Number of permutations with repetition
(1) The number of permutations (arrangements) of n different objects, taken r at a time, when each object may occur once, twice, thrice,........up to r times in any arrangement = The number of ways of filling r places where each place can be filled by any one of n objects.

The number of permutations = The number of ways of filling r places = (n)r.

For example, the number of 4-digit number which can be made using the digits 1 to 7 if repetition is allowed is the number of ways of filling these 4 places with any of the 7 digits. The first place has 7 options, the second has 7 options too and so on, all 4 places have 7 options to be filled from, which makes it 7 X 7 X 7 X 7 = 74 ways.

(2) The number of arrangements that can be formed using n objects out of which p are identical (and of one kind), q are identical (and of another kind), r are identical (and of another kind) and the rest are distinct is $\frac{n!}{p! \cdot q! \cdot r!}$

Suppose we have to arrange 5 balls in a row, of which 3 are green and the other 2 are red, as in the space below:

We can put the green balls in any of the spaces, where the order doesn't matter and therefore, can be done in $\frac{5!}{3! \, 2!}$ ways. Suppose, this is how we take one of the arrangements as,

Thus, the remaining 2 places can be filled up by the 2 red balls in just 1 way,

Therefore, the total arrangements that are possible are $\frac{5!}{3! \times 2 \times 1}$

Example: In a library there are 3 books on fairy tales, 4 novels and 5 activity books. In how many ways can we arrange these so that books of each kind are together in one place?

By themselves the 3 fairy tale books can be arranged and put together in 3! ways. Suppose the fairy tale books are numbered A, B, C. The possible ways those can be put together are ABC, ACB, BAC, BCA, CAB and CBA, i.e., 6 (=3!) ways.

Similarly, the 4 novels can be arranged in 4! ways and the 5 activity books can be arranged in 5! ways.

Hence, all of them together can be arranged in 3! x 4! x 5! =17280 ways.

Since there is no order mentioned, so the 3 sets of books (i.e., fairy tales, novels and activity books) can be arranged in 3! ways.

So, these books can be arranged in any order with books of each kind together in 3! x 17280 ways = 103680 ways.

ECONOMICS

X-EFFICIENCY

Producing OUTPUT at the minimum possible cost. This is not enough to ensure the best sort of economic EFFICIENCY, which maximises society's total CONSUMER plus PRODUCER SURPLUS, because the quantity of output produced may not be ideal. For instance, a MONOPOLY can be an X-efficient producer, but in order to maximise its PROFIT it may produce a different quantity of output than there would be in a surplus-maximising market with PERFECT COMPETITION.

HISTORY

XUANZANG

Onkar Singh Rathore writes for Times NIE about interesting events and terms from History. The author is interning at the 'History Diaries' – an initiative to revamp the current pedagogical system of History through tours, drama in schools

Xuanzang also known as the 'Prince of Pilgrims' was a well-known Chinese Buddhist monk, who visited India during the reign of King Harshavardhana. He was born in China in 602 AD and following his elder brother's footsteps, he became a Buddhist monk at the age of 20. To know more about Buddhism, at the age of 30, he secretly left China and reached India, crossing the treacherous mountainous regions.

HIS TRAVELS

In India, he visited almost all the sacred places associated with the life of Buddha. He visited Kashmir, Punjab, Sarnath, Kushinagar, Bodhgaya, Kapilvastu and also traversed through Deccan, Odisha and Bengal. To gain knowledge about the Indian subcontinent, he spent five years at the University of Nalanda, where he studied logic, grammar, Sanskrit, and also yoga from the Yogacara school of Buddhism.

AS BUDDHISM GREW...

During the time of his visit to India, Xuanzang narrated that Patliputra lost its former glory, and Prayag and Kanauj became important cities.

King Harsha admired Xuanzang and his devotion for Buddha, and honoured him in Kanauj religious assembly. He also arranged for his safe return to China along with strong military escort within the frontiers. Xuanzang carried back with him around 150 pieces of Buddha's relics, statues made of gold, silver and sandalwood, and over 600 manuscripts loaded on the back of 20 horses. He translated over 70 Buddhist works before he died in 664 AD.