AIMCAT 2018

VARC

DIRECTIONS *for questions 1 to 5:* The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

In 1985, the chemist Steven A. Benner sat down with some colleagues and sketched out a way to expand the alphabet of DNA. He has been trying to make those sketches real ever since. Recently, Dr. Benner and a team of scientists reported success: in a paper, published in Science, they said they have in effect doubled the genetic alphabet.

Natural DNA is spelled out with four different letters known as bases — A, C, G and T. Dr. Benner and his colleagues have built DNA with eight bases — four natural, and four unnatural. They named their new system Hachimoji DNA (hachi is Japanese for eight, moji for letter). Crafting the four new bases that don't exist in nature was a chemical tour-de-force. They fit neatly into DNA's double helix, and enzymes can read them as easily as natural bases, in order to make molecules…

Hachimoji DNA could have many applications, including a far more durable way to store digital data that could last for centuries ... It also … [offers] the possibility that the four-base DNA we are familiar with may not be the only chemistry that could support life.

The four natural bases of DNA are all anchored to molecular backbones. A pair of backbones can join into a double helix because their bases are attracted to each other. The bases form a bond with their hydrogen atoms. But bases don't stick together at random. C can only bond to G, and A can

only bond to T. These strict rules help ensure that DNA strands don't clump together into a jumble. No matter what sequence of bases are contained in natural DNA, it still keeps its shape.

But those four bases are not the only compounds that can attach to DNA's backbone and link to another base — at least on paper. Dr. Benner and his colleagues thought up a dozen alternatives.

…Dr. Benner's initial forays impressed other chemists...[like] Floyd E. Romesberg, of the Scripps Research Institute in San Diego…[who] decided to try to create his own bases.

Dr. Romesberg chose not to make bases that linked together with hydrogen bonds; instead, he fashioned a pair of oily compounds that repelled water. That chemistry brought his unnatural pair of bases together…Dr. Romesberg and his colleagues fashioned enzymes that could copy DNA made from both natural bases and unnatural, oily ones. In 2014, the scientists engineered bacteria that could make new copies of these hybrid genes.

In recent years, Dr. Romesberg's team has begun making unnatural proteins from these unnatural genes. He founded a company, Synthorx, to develop some of these proteins as cancer drugs. At the same time, Dr. Benner […] and his colleagues succeeded in creating one pair of new bases. Like Dr. Romesberg, they found an application for their unnatural [six-base] DNA…[it] became the basis of a new, sensitive test for viruses in blood samples...

…Hachimoji DNA …might someday encode a movie or a spreadsheet. Today, movies, spreadsheets and other digital files are typically stored on silicon chips or magnetic tapes. But those kinds of storage have serious shortcomings. [T]hey can deteriorate in just years. DNA, by contrast, can remain intact for centuries. Last year, researchers at Microsoft and the University of Washington managed to encode 35 songs, videos, documents, and other files, totalling 200 megabytes, in a batch of DNA molecules…

Q1. All of the following are advantages of the pathbreaking research mentioned in the passage EXCEPT that:

a) Hachimoji DNA can provide storage that will remain intact for a long time.

b) six-base DNA can help with testing for viruses present in blood samples.

c) unnatural proteins made of hybrid genes have potential as cancer drugs.

d) **hybrid genes fashioned with a pair of oily compounds can repel water.**

Number of words and Explanatory notes for RC:

Number of words: 555

Option A: Consider the sentences: '*Hachimoji DNA …might someday encode a movie or a spreadsheet. Today, movies, spreadsheets and other digital files are typically stored on silicon chips or magnetic tapes. But those kinds of storage have serious shortcomings. [T]hey can deteriorate in just years.* ***DNA, by contrast, can remain intact for centuries****.*' Hence, Option A is one of the advantages mentioned in the passage. It is not the answer.
Option B: Consider the sentences: '*Like Dr. Romesberg, they found an application for their unnatural [six-base] DNA…[it]* ***became the basis of a new, sensitive test for viruses in blood samples…***' This is an advantage that has been mentioned in the passage. Option B is not the answer.
Option C: Consider the sentences: '*Dr. Romesberg's team has begun* ***making unnatural proteins from these unnatural genes****. He founded a company, Synthorx,* ***to develop some of these proteins as cancer drugs****.*' This advantage has been mentioned in the passage. Hence, Option C is not the answer.
Option D: Consider the sentences: '*Dr. Romesberg chose not to make bases that linked together with hydrogen bonds; instead, he fashioned a pair of oily compounds that repelled water. That chemistry brought his unnatural pair of bases together…Dr. Romesberg and his colleagues fashioned enzymes that could copy DNA made from both natural bases and unnatural, oily ones. In 2014, the scientists engineered bacteria that could make new copies of these hybrid genes.*' The hybrid genes offer advantages, true, but whether they are made the way Dr. Romesberg created them, with oily compounds that repel water, or the way Dr. Benner makes doesn't really change the nature of their advantages. Hence, Option D is the answer.

Choice (D)

Q2. Which of the following least strengthens the author's argument in favour of the Hachimoji DNA?

a) Six-base DNA and eight-base DNA have a lot of practical applications.

b) DNA molecules could offer a permanent solution for efficient long-term storage.

c) Four-base DNA is currently the only existent form known to humans.

d) **Enzymes can read unnatural DNA just as easily as natural ones.**

Number of words and Explanatory notes for RC:

Number of words: 555

Option A: This offers a reason why experiments to create the 6-base and 8-base DNA be continued. The practical applications listed out in the passage explain why the hybrid genes are a game-changer. Hence, Option A does strengthen the author's argument.
Option B: This is an advantage of the Hachimoji DNA that it can provide long-lasting storage. This can be understood from 'Today, movies, spreadsheets and other digital files are typically stored on silicon chips or magnetic tapes. But those kinds of storage have serious shortcomings.' Hence, this option strengthens the author's argument. Option B is not the answer.
Option C: Consider the sentence: '*It also … [offers] the possibility that the four-base DNA we are familiar with may not be the only chemistry that could support life.*' From this we can understand that the statement that four-base DNA is the only existent form known to humans, doesn't really add much value to the author's argument. Even if we are unaware of other number of bases, it doesn't rule out that possibility. Hence, Option C doesn't strengthen the author's argument.
Option D: If this is true, it only makes the case stronger to create the unnatural DNA to extend the uses of the DNA and the genes. Hence, Option D indirectly strengthens the author's argument. The enzymes reading the bases is a corroboration of the claims of scientists working on an 8-base DNA. Choice (C)

Q3. The author's explanation for why DNA strands don't end up in a confused tangle is that:

a) once a double helix is formed, it cannot be extended further.

b) the bases of molecular backbones only stick to other select bases.

c) hydrogen atoms are involved in the bonding of the bases.

d) **very few permutations are possible with just four bases.**

Number of words: 555

Consider the sentences: '*The four natural bases of DNA are all anchored to molecular backbones. A pair of backbones can join into a double helix because **their bases are attracted to each other**. The bases form a bond with their hydrogen atoms. But bases don't stick together at random. **C can only bond to G, and A can only bond to T. These strict rules help ensure that DNA strands don't clump together into a jumble**. No matter what sequence of bases are contained in natural DNA, it still keeps its shape.'*

Option A: The extension of the double helix and its capabilities hasn't been discussed in the passage. Hence, Option A is not the answer.

Option B: From '*But bases don't stick together at random. **C can only bond to G, and A can only bond to T***', it is clear that the tangles don't happen because bases stick only through select bases. They can't connect randomly. Hence, Option B is the answer.

Option C: If it were purely dependent on Hydrogen, scientists like Dr Romesberg wouldn't have bene able to use other ways to connect the bases. *Dr. Romesberg chose not to make bases that linked together with hydrogen bonds; instead, he fashioned a pair of oily compounds that repelled water.* Hence, Option C is not the answer.

Option D: Scientists, according to the passage, have been able to make 6-base and 8-base DNA as well. So, this option doesn't really offer a choice as to why DNA strand don't end up in tangle. Option D is not the answer. Choice (B)

Q4. The author surmises that four-base DNA may not be the only chemistry supporting life because:

a) it is impossible to connect natural bases to other hybrid bases.

b) the bases C and A can only bond to G and T respectively.

c) hydrogen atoms help in forming bonds between bases.

d) **it is now known that A, C, G and T are not the only compounds that can attach to DNA's backbone.**

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the sentences: '***Crafting the four new bases that don't exist in nature was a chemical tour-de-force. They fit neatly into DNA's double helix, and enzymes can read them as easily as natural bases, in order to make molecules***... *Hachimoji DNA could have many applications, including a far more durable way to store digital data that could last for centuries ...* ***It also ... [offers] the possibility*** *that the four-base DNA we are familiar with may not be the only chemistry that could support life.'*

The author surmises so, based on the last sentence of the preceding para that the creation of four new bases and the enzymes being able to read them as easily as they read natural bases indicates it might be possible that there is something outside the four-base DNA we are familiar with.

Option A: If this were impossible, we wouldn't have been able to witness the pathbreaking experimentation that led to creation of hybrid genes - '***T. Dr. Benner and his colleagues have built DNA with eight bases — four natural, and four unnatural***. *They named their new system Hachimoji DNA (hachi is Japanese for eight, moji for letter). Crafting the four new bases that don't exist in nature was a chemical tour-de-force.* ***They fit neatly into DNA's double helix, and enzymes can read them as easily as natural bases***, *in order to make molecules…'* Hence, Option A is not the answer.

Option B: This explains why the DNA strands don't end up in a tangle. It doesn't explain why the four-base DNA may not be the only chemistry supporting life. Hence, Option B is not the answer.

Option C: That hydrogen atoms help in the bonding doesn't really cast any light on why four-base DNA may not be the only life-supporting chemistry. In fact, scientists have even managed to replace hydrogen with other compounds. Hence, Option C is not the answer.

Option D: Since, these are not the only bases that can help DNA attach to each other, and since unnatural bases have been created as well, it leads to the possibility that four-base DNA is not the only one existent in nature. Hence, Option D is the answer.

Choice (D)

Q5. Which of the following is not a factor that made the expansion of DNA alphabet possible?

a) New bases could fit into DNA's double helix.

b) Enzymes could read new bases as easily as they did the natural ones.

c) Bases could be linked together with alternatives other than hydrogen bonds.

d) **Bases don't stick together at random and are driven by strict rules.**

Number of words and Explanatory notes for RC:

Number of words: 555

Option A: Consider the sentences: 'Crafting the four new bases that don't exist in nature was a chemical tour-de-force. They fit neatly into DNA's double helix …' From this, we can understand that new bases fitting into DNA's double helix has helped in the expansion of the DNA alphabet. Option A is not the answer.
Option B: From '…and enzymes can read them as easily as natural bases, in order to make molecules', we can understand that this ability of the enzymes contributes to the expansion of DNA alphabet. In fact, this leads to the author saying 'It also … [offers] the possibility that the four-base DNA we are familiar with may not be the only chemistry that could support life.' Hence, Option B is not the answer.
Option C: Consider the sentences: 'Dr. Romesberg chose not to make bases that linked together with hydrogen bonds; instead, he fashioned a pair of oily compounds that repelled water. *That chemistry brought his unnatural pair of bases together*…Dr. Romesberg and his colleagues fashioned enzymes that could copy DNA made from both natural bases and unnatural, oily ones. In 2014, *the scientists engineered bacteria that could make new copies of these hybrid genes*.' This proves that bases being linked together without hydrogen makes expansion of DNA alphabet easier. Hence, Option C is not the answer.
Option D: This explains why the DNA strands don't clump together. It is natural, and the phenomena already exists. Hence, it doesn't explain why the DNA alphabet can be expanded. Option D is the answer. Choice (D)

DIRECTIONS *for questions 6 to 10:* The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

[Artificial intelligence] (AI) is poised to make high-fidelity forgery inexpensive and automated, leading to potentially disastrous consequences…Automated forgery is already prevalent on social media...Twitter has uncovered thousands of automated accounts linked to Russia in the months preceding the 2016 election, according to The Washington Post. Facebook estimated that fake news spread by Russian-backed bots from January 2015 to August 2017 reached potentially half of the 250 million Americans who are eligible to vote.

…The problem extends far beyond bots. [Recent] advances in image processing have enabled the creation of realistic fake video. Researchers demonstrated this…with AI-generated video of former President Barack Obama speaking phrases that were previously only audio clips. Then came "deepfakes," AI-generated videos of entirely new facial expressions of a target person created by stitching together two faces in an eerily convincing way... A viral video of Obama issuing a warning about deepfakes was, itself, a fake.

… The adage “on the Internet, nobody knows you’re a dog” implies that you cannot be certain of the author or origin of most items you receive via email, through social media, or even by phone. This Internet blindness is the basis for “phishing” — cyber-attacks where a communication purporting to be from a trusted source induces you to reveal private information such as a password or credit card number. Today, the text of automatically generated phishing e-mails is easy to spot as phony, but AI is about to change that.

Historically, society has relied on signatures to ensure authenticity...Marks, stamps, and seals evolved into handwritten text as literacy became widespread, and references to signing documents appear throughout history.

On the Internet, we rely on digital signatures. A digital signature is a computer method (based on cryptography) of ensuring that an item wasn’t tampered after it was signed. Services like DocuSign certify contracts using digital signatures. Automated messages between websites can also be authenticated by digital signatures, but digital signatures are not widely used to certify the authorship of e-mails, social media posts, images, videos, etc.

… [We] need to act to make digital signatures de rigueur as a means of authentication of digital content. First, we need to certify signatures, which can be done by central authorities, or via more democratic computer methods such as encryption and blockchain. Second, we need to make the acts of signing and verifying signatures as seamless as possible. Signing should be enabled by default in our email software, word processor, smartphone cameras, and in any production of digital content. Our browsers, social-media applications, and other media-reading software should highlight whether content is signed, and by whom. Finally, and perhaps most challenging, we need to promulgate the norm that any item that isn’t signed is potentially forged. We don’t accept checks that aren’t signed — the same should hold for digital content.

Of course, we want to preserve the option of anonymity so that digital signatures aren’t used to suppress dissent or discourage whistleblowers. Moreover, we want to allow for pseudonyms so that an author can choose to hide their identity but still be recognized as a particular individual or organization. Digital signatures will not prevent a bot from masquerading as some person, but the signatures will stop the bot from impersonating you, and from disseminating content that you didn’t author in your name ...

Q6. The author mentions ‘deepfakes’ to suggest that:

a) powerful people like Obama can claim that their videos have been faked.

b) the words spoken by a famous person can be switched with a different audio clip.

c) one cannot entirely trust the authenticity of videos.

d) **audios can be tampered with more easily than videos.**

Number of words and Explanatory notes for RC:

Number of words: 548

Option A: Deepfakes can be made using any person. Obama was simply mentioned as an example. Also, whether powerful people would claim their videos have been faked or not is in the aftermath of the damaging videos. The author mentions it just to highlight the sinister possibilities. Hence, Option A is not the answer.
Option B: This is not a deepfake. A deepfake is when entirely new facial expressions are stitched to make the video look genuine. Hence, Option B is not the answer.
Option C: This is the reason why the author even has to talk about deepfakes – to highlight the impending issue. Consider the sentences: '*Then came "deepfakes," AI-generated videos of entirely new facial expressions of a target person created by stitching together two faces in an eerily convincing way...*' The author also mentions that '*[Recent] advances in image processing have enabled the creation of realistic fake video'*. So it is difficult to identify whether the realistic video is indeed real. Hence, Option C is the answer.
Option D: The author wouldn't discuss deepfakes (tampered videos) to talk about audios or how easily they can be tampered with. If anything, the author warns people of the problems we can face because of tampered videos. Hence, Option D is not the answer. Choice (C)

Q7. The author asserts in the last para that digital signatures can prevent bots from:

a) impersonating the person who uses the signatures.

b) disseminating content anonymously.

c) masquerading as a real person.

d) **spreading fake news.**

Number of words and Explanatory notes for RC:

Number of words: 548

Consider the sentences: '*Digital signatures will not prevent a bot from masquerading as some person, but* ***the signatures will stop the bot from impersonating you, and from disseminating content that you didn't author in your name*** ...' So, the author indicates that bots cannot be stopped from masquerading as some random/anonymous person. But, a person who uses digital signatures is definitely safe from bots.

Option A: This can be understood from the passage. Those who use digital signatures can prevent bots from impersonating as them. Their identity won't be attributed to something that didn't originate from them. Hence, Option A is the answer.

Option B: While signatures can protect an individual who uses them, they cannot stop the bots from doing what the bots were created to do: masquerade as individuals and spread fake news. Hence, Option B is not the answer.

Option C: From '*Digital signatures will not prevent a bot from masquerading as some person',* we can understand that this choice is not apt. Signatures can stop individuals who use them. They are more like an individual protection from the viciousness of bots. However, they are not a solution to the problem of all bots. Option C is not the answer.

Option D: Bots are used to spread fake news and will go on about it one way or the other. Digital signatures can only stop bots from disseminating content in one's own name. The bots may impersonate others (who don't use digital signatures). Hence, Option D is not the answer. Choice (A)

Q8. Which of the following statements about anonymity will the author most likely agree with?

a) Anonymity defeats the purpose of imposing digital signatures to prevent forgery.

b) Anonymity encourages dissenters to turn into whistleblowers for the greater good.

c) Anonymity allows a particular individual or organisation to avoid taking responsibility for whatever has been published.

d) **Anonymity can ensure that digital signatures don't discourage whistleblowers.**

Number of words and Explanatory notes for RC:

Number of words: 548

Consider the sentences: '*Of course, **we want to preserve the option of anonymity** so **that digital signatures aren't used to suppress dissent or discourage whistle blowers**. Moreover, **we want to allow for pseudonyms** so that an author can choose to hide their identity but still be recognized as a particular individual or organization.*'
Option A: This choice seems to suggest that the author is against anonymity as it goes against the essence of digital signatures. However, that is not true as understood from the underlined portions above. The author is in favour of anonymity and believes it is possible despite the usage of digital signatures. Hence, Option A is not the answer.
Option B: This fundamentally reverses the cause-effect relationship in the passage. The author believes that digital signatures could be used to suppress/discourage whistle-blowers. That doesn't necessarily mean that the presence of an option to remain anonymous will encourage whistle-blowers. Hence, Option B isn't the link the author is trying to establish, even if it may be implied subsequently.
(Note: Read up about Affirmation of the Consequent fallacy).
Option C: The advantage of anonymity is that one could hide one's identity by choosing pseudonyms and still be recognised as a particular individual or organisation. The author doesn't necessarily imply that one need not take responsibility for what one has posted/published under the garb of anonymity. That would again defeat the purpose, because it will make fakes possible and prevalent. Hence, Option C is not the answer.
Option D: The author believes that individuals or organisations who indulge in dissent will be discouraged to do so unless they are allowed to remain anonymous. In other words, anonymity makes sure digital signatures aren't used to find out/punish the whistle-blowers (or the threat of being found out doesn't discourage them). Hence, Option D is the answer. Choice (D)

Q9. Which of the following is not a step suggested by the author as a way of perpetuating the habit of using digital signatures?

a) The authenticity of documents without digital signatures should be questioned.

b) It should be easy to find out whether the content has been signed or not.

c) The process of signing digital content should be integrated seamlessly.

d) **Production of digital content should mandatorily impose signing.**

Number of words and Explanatory notes for RC:

Number of words: 548

Option A: Consider the sentences: '*Finally, and perhaps most challenging,* ***we need to promulgate the norm that any item that isn't signed is potentially forged***. *We don't accept checks that aren't signed—the same should hold for digital content*.' The author suggests that we question the authenticity of any document that doesn't have a digital signature. This is a method suggested by the author. Hence, Option A is not the answer.

Option B: Consider the sentences: '*Our browsers, social-media applications, and other media-reading software should* ***highlight whether content is signed, and by whom***.' From this, it can be understood that developing a mechanism to identify whether content has been signed or not is a step suggested by the author. Hence, Option B is not the answer.

Option C: Consider the sentences: *Second,* ***we need to make the acts of signing and verifying signatures as seamless as possible***. *Signing should be enabled by default in our email software, word processor, smartphone cameras, and in any production of digital content*. From this, it can be understood that the author believes creating a digital signature and verifying it should be as smooth as possible to encourage people to adopt it as a habit. Option C is not the answer.

Option D: From the sentences - *Finally, and perhaps most challenging, we need to promulgate the norm that* ***any item that isn't signed is potentially forged***. *We don't accept checks that aren't signed—the same should hold for digital content* - we can understand that the author believes signing digital content should be a sign of authenticity. However, the author clearly never says, it should be mandatory. If that were the case, the author wouldn't have discussed anonymity. Hence, Option D is the answer. Choice (D)

Q10. The author mentions the adage 'on the internet, nobody knows you are a dog' to demonstrate that:

a) authenticity of content cannot be assured without relying on digital signatures.

b) cyber-attacks are commonplace because of internet blindness.

c) items received on internet could be apocryphal.

d) **private information shouldn't be given away on emails or social media.**

Number of words and Explanatory notes for RC:

Number of words: 548

Consider the sentences: '*The adage "on the Internet, nobody knows you're a dog" implies* ***that you cannot be certain of the author or origin of most items you receive*** *via email, through social media, or even by phone... Today, the text of automatically-generated phishing e-mails is* ***easy to spot as phony, but AI is about to change that.***' The adage means that on the internet it is hard to identify who the author is or what the origin of an item is. One way of spotting the answer is to look for the tone. The tone of the right answer is negative as the adage is negative (Nothing on internet is reliable).

Option A: This choice is a positive suggestion to make content more reliable. It offers a solution but doesn't explain the meaning of the adage or why the author used it. Hence, Option A is not the answer.

Option B: The focus is not on just cyber-attacks or phishing. The focus is on the bigger picture – that internet blindness hides the origin of an item. Hence, Option B is not the answer.

Option C: Apocryphal means something whose origin is unclear or unknown (or dubious). This word summarises the adage. The author is trying to highlight that items received on the internet may be of dubious origin or from unknown or unconfirmed sources. Hence, Option C is the answer.

Option D: This is more an advice/solution as to how to deal with the internet blindness. The author is merely demonstrating, using the adage, how the authenticity of items on internet cannot be established easily. Hence, Option D is not the answer.

Choice (C)

DIRECTIONS *for questions 11 to 14:* The passage given below is accompanied by a set of four questions. Choose the best answer to each question.

In 2010, photographer Rose-Lynn Fisher published a book of remarkable images that captured the honeybee in an entirely new light. By using powerful scanning electron microscopes, she magnified a bee's microscopic structures by hundreds or even thousands of times in size, revealing startling, abstract forms that are far too small to see with the naked eye. Now, as part of a new project called "Topography of Tears," she's using microscopes to give us an unexpected view of another familiar subject: dried human tears.

"I started the project about five years ago, during a period of copious tears, amid lots of change and loss — so I had a surplus of raw material," Fisher says. After the bee project and one in which she'd looked at a fragment of her own hip bone removed during surgery, she'd come to the realization that "everything we see in our lives is just the tip of the iceberg, visually," she explains. "So, I had this moment where I suddenly thought, 'I wonder what a tear looks like up close?'"

When she caught one of her own tears on a slide, dried it, and then peered at it through a standard light microscope, “It was really interesting. It looked like an aerial view, almost as if I was looking down at a landscape from a plane,” she says. “Eventually, I started wondering — would a tear of grief look any different than a tear of joy? And how would they compare to, say, an onion tear?”

This idle musing ended up launching a multi-year photography project in which Fisher collected, examined and photographed more than 100 tears from both herself and a handful of other volunteers, including a new-born baby.

Scientifically, tears are divided into three different types, based on their origin. Both tears of grief and joy are psychic tears, triggered by extreme emotions, whether positive or negative. Basal tears are released continuously in tiny quantities (on average, 0.75 to 1.1 grams over a 24-hour period) to keep the cornea lubricated. Reflex tears are secreted in response to an irritant, like dust, onion vapours or tear gas.

All tears contain a variety of biological substances (including oils, antibodies and enzymes) suspended in saltwater, but as Fisher saw, tears from each of the different categories include distinct molecules as well. Emotional tears, for instance, have been found to contain protein-based hormones including the neurotransmitter leucine enkephalin, a natural painkiller that is released when the body is under stress.

Additionally, because the structures seen under the microscope are largely crystallized salt, the circumstances under which the tear dries can lead to radically dissimilar shapes and formations, so two psychic tears with the exact same chemical makeup can look very different, up close. “There are so many variables — there’s the chemistry, the viscosity, the setting, the evaporation rate and the settings of the microscope,” Fisher says.

As Fisher pored over the hundreds of dried tears, she began to see even more ways in which they resembled large-scale landscapes, or as she calls them, “aerial views of emotion terrain.”

“It’s amazing to me how the patterns of nature seem so similar, regardless of scale,” she says. “You can look at patterns of erosion that are etched into earth over thousands of years, and somehow they look very similar to the branched crystalline patterns of a dried tear that took less than a moment to form.”

Q11. The difference between onion tears and emotional tears is that:

a) the former are psychic tears, whereas the latter are basal tears.

b) the former are triggered by emotions, whereas the latter are triggered by irritants.

c) the former are psychic, whereas the latter are triggered by irritants.

d) **the former are reflex tears, whereas the latter are psychic tears.**

Number of words and Explanatory notes for RC:

Number of words: 565

Option A: The former are reflex tears, whereas the latter are psychic tears. Basal tears are tears which keep the cornea lubricated and they haven't been mentioned here. Hence, Option A is not the answer.
Option B: Onion tears are reflex tears which are triggered by irritants. Emotional tears are psychic tears which are triggered by emotions. This option states the reverse. Hence, Option B is not the answer.
Option C: Onion tears are reflex tears and not psychic tears. Emotional tears are triggered by emotions and not by irritant. Hence, Option C is not the answer.
Option D: According to the passage '***Both tears of grief and joy are psychic tears***, *triggered by extreme emotions, whether positive or negative'*. So, emotional tears (tears of grief and joy) are psychic tears. '***Reflex tears are secreted in response to an irritant***, *like dust,* ***onion vapours*** *or tear gas.'* Hence, Option D is the answer.

Choice (D)

Q12. Fisher uses the expression 'aerial views of emotion terrain' as a metaphor for

a) the emotions, she goes through when studying tears.

b) the science behind the emotions that trigger tears.

c) the variables in the terrain that cause varying tear patterns.

d) **tear patterns after they have dried.**

Number of words and Explanatory notes for RC:

Number of words: 565

Option A: The description is not about her emotions or what she feels because the word 'terrain' clearly refers to what structure she sees in the microscope. Hence, Option A is not the answer.
Option B: There is no indication to believe that the author was pointing to or referring to science in any way. Hence, Option B is not the answer.
Option C: All of the patterns have been referred to as aerial views and not just one or two. So, if all of them have been called so, there is no reason to believe that the author is referring to the 'variables' that cause different patterns. Hence, Option C is not the answer.
Option D: The emotional terrain refers to the dried-up tear patterns viewed from a microscope. Terrain is land. Emotional terrain is a metaphor. The structure of the tears as seen from above in a microscope has been compared to a terrain as seen from a height. The word 'emotional' is a reference to the emotions that trigger tears. Hence, Option D is the answer. Choice (D)

Q13. Two psychic tears with the same composition can have dissimilar terrains under the microscope because of all of the following EXCEPT:

a) the viscosity and the evaporation rate of the tear drops could be different.

b) the percentage of crystallized salt is large.

c) the settings of the microscope may not be the same.

d) **there are several variables that influence the pattern of a dried tear.**

Number of words and Explanatory notes for RC:

Number of words: 565

Consider the sentences: '*Additionally, because the structures seen under the microscope are largely crystallized salt,* ***the circumstances under which the tear dries can lead to radically dissimilar shapes and formations****, so two psychic tears with the exact same chemical makeup can look very different, up close. "There are so many variables—there's the* ***chemistry, the viscosity, the setting, the evaporation rate and the settings of the microscope****," Fisher says.'*

Option A: Viscosity and the evaporation rate have been mentioned above as parameters included as '***circumstances***' under which the tear dries and forms radically dissimilar shapes and formations. Hence, Option A is not the answer.

Option B: While the dried tear structure is crystallized salt, it hasn't been mentioned that the percentage of crystallized salt is a parameter. (We do not even know if there is something called percentage of crystallized salt.) Hence, Option B is the answer.

Option C: Settings of the microscope have been mentioned as one of the parameters that affect what one observes ***under the microscope***. So, even if the microscope settings don't directly affect the pattern of the dried tear, they affect what one sees in the microscope. Hence, Option C is not the answer.

Option D: Dried tear patterns are not all the same because there are many parameters that influence the final result and any of those parameters could differentiate one dried tear from the other. Hence, Option D is not the answer. Choice (B)

Q14. Fisher calls everything we see in our lives as just the tip of the iceberg because:

a) there's lot more to microscopic structures than what meets the eye.

b) we miss out on all the patterns and detail unless we take a look up-close.

c) all patterns of nature look similar under the microscope.

d) **what is visible to the naked eye is starkly in contrast to the microscopic view.**

Number of words and Explanatory notes for RC:

Number of words: 565

Consider the sentences: '*By using powerful scanning electron microscopes, she magnified a bee's microscopic structures by hundreds or even thousands of times in size, revealing startling,* ***abstract forms that are far too small to see with the naked eye***.
After the bee project and one in which she'd looked at a fragment of her own hip bone removed during surgery, she'd come to the realization that "everything we see in our lives is just the tip of the iceberg, ***visually****," she explains. "So, I had this moment where I suddenly thought, 'I* ***wonder what a tear looks like up close****?'"*
Option A: 'A lot more than what meets the eye' is an idiomatic expression that means what we see is not the whole picture. However, the author uses the expression 'tip of the iceberg' not to talk about what we don't see in the microscopic structures. The author uses it to talk about how we see a lot more under the microscope than with the naked eye. Hence Option A is not the answer.
Option B: Visually everything we see is just a small fraction of what actually exists and can be seen under a microscope. That's why the author believes everything we see is just the tip of the iceberg. The author demonstrates it by talking about bee's microscopic structures which could be thousands of times bigger, showing startling abstract forms. Hence, Option B is the answer.
Option C: This is not true, and in fact, the opposite of what the author is trying to convey here. What we see is just a minor fraction of the reality, the tip of the iceberg. Hence, Option C is not the answer.
Option D: We just see things with greater clarity, and also find a lot of things we wouldn't otherwise have been able to view. However, the author doesn't indicate that there is a contrast between what we see without and with the microscope. Hence, Option D is not the answer. Choice (B)

DIRECTIONS *for questions 15 to 19:* The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

For years, the luxury industry has waged a battle against counterfeiters. It has invested heavily in ultra-sophisticated tech solutions which use the latest advances in nanotechnology, Internet of Things (IoT), and AI to authenticate products. It lobbies governments to extend enforcement bodies' powers to seize and destroy fake goods, to prosecute buyers and dealers, and to block access to websites that sell counterfeit goods. And then there are the lawyers: LVMH, a luxury goods conglomerate, alone employs at least 60 lawyers and spends $17 million annually on anti-counterfeiting legal action.

These efforts are not paying off. The total trade in fakes is estimated at around $4.5 trillion, and fake luxury merchandise accounts for 60% to 70% of that amount, ahead of pharmaceuticals and

entertainment products … Perhaps 40% of the sales in luxury fakes take place online, as today's counterfeiters milk the ubiquity and anonymity of the internet space to the last drop. For every e-commerce platform like Alibaba that cracks down on fakes, a new one emerges that allows goods to be shipped directly from manufacturers.

So what should luxury goods companies be doing instead? We interviewed 32 professionals across four panels: luxury executives, representatives of luxury industry associations, experts on anti-counterfeiting from academia and the public sector, and executives from the music and pharmaceuticals industries, which have been more successful than luxury goods firms in fighting against counterfeiting.

What we hear suggests that luxury firms' failure to contain the growth in counterfeiting is rooted in a hollowing out of their brands. Many luxury brands have become symbols of status and privilege but not much else. The emphasis across the industry has been on signalling rather than delivering luxury; intangible over tangible product attributes; and the logo over all other markers of quality.

This philosophy has been consistently applied to supply chains, manufacturing, and pricing: By relocating production to low-cost countries, luxury firms severed the centuries-old association of luxury goods with their historical places of origin. The outsourcing also led to relaxed control over supply chain, design, and manufacturing just as counterfeiters were putting unprecedented pressure on each of these processes.

At the same time, despite the cost savings, luxury products' sticker prices have risen dramatically. At first, the idea was to cushion the impact of the growing traffic of Chinese tourists buying abroad and reselling at home. But the hikes escalated rapidly and by 2014, a Chanel handbag cost 70% more than it had just five years earlier. Other brands followed suit, raising prices at more than twice the rate of the mainstream market. Buoyed by initial success of this pricing strategy, many firms also phased out their more affordable, entry-level brands. For example, Dolce & Gabbana in 2012 discontinued its profitable but less expensive D&G brand.

Because of these developments, luxury brands have become disconnected from their physical products, which reduces customer concerns about buying fakes. Does spending $2,500 on a branded item made in China look smart when you can get a made-in-China fake version (possibly

from the branded company's supplier) that looks pretty much the same? The anonymity of the new digital distribution networks for fakes only makes the decision easier.

This suggests that luxury sector's solution to the counterfeiting challenge lies less in fighting counterfeiters and more in rediscovering what made the brands great in the first place.

Q15. Which of the following can be inferred from the second para of the passage?

a) Trading fake luxury merchandise is easier than trading entertainment products.

b) The authenticity of items propagated on the internet cannot be trusted.

c) e-commerce platforms can intervene and prevent the trading of fakes.

d) **direct shipping of goods from manufacturers to customers allows replacing originals with fakes**

Number of words and Explanatory notes for RC:

Number of words: 554

Option A: Consider the sentence: '*The total trade in fakes is estimated at around $4.5 trillion, and fake luxury merchandise accounts for 60% to 70% of that amount, ahead of pharmaceuticals and entertainment products.*' This sentence only gives us the quantitative percentage, but that doesn't confirm the ease of trading fake luxury merchandise. The reverse is quite possible – that pharmaceuticals are cheaper and hence the percentage of the total trade in fakes is lower despite ease of trading them. The passage doesn't give us that information. Hence, Option A is not an inference, and not the answer.

Option B: Consider the sentence: *Perhaps 40% of the sales in luxury fakes take place online, as today's counterfeiters* ***milk the ubiquity and anonymity of the internet space*** *to the last drop*. These lines are not connected to 'authenticity' of an item. Also, the option confuses selling goods on the internet with spreading something on the internet. Hence, this option cannot be inferred from the passage.

Option C: Consider the sentence: ***For every e-commerce platform like Alibaba that cracks down on fakes****, a new one emerges that allows goods to be shipped directly from manufacturers.* From the underlined portion it is clear that e-commerce platforms can take action (crack down) against fakes or to curtail the trade. Hence, Option C can be inferred.

Option D: From '*a new one emerges that allows goods to be shipped directly from manufacturers',* we can understand that while some e-commerce platforms are trying to stop fakes, there are other ecommerce platforms that propagate it and this has been equated to '***shipping of goods directly from manufacturers***' indicating that the shipping is adversely affecting all efforts at stopping fakes (in other words, the direct shipping is helping fakes). However, we do not know how it can be done, and 'swapping of original with fake items' is just a conjecture unsupported by the para. Hence, Option D cannot be inferred. Choice (C)

Q16. The author mentions LVMH employing at least 60 lawyers to demonstrate that:

a) the luxury industry invests substantially on anti-counterfeiting legal action.

b) it is difficult to wage a legal battle against counterfeiters.

c) prosecuting buyers and dealers of fake goods is an expensive ordeal.

d) **the legal efforts undertaken by the luxury industry are not paying off.**

Number of words and Explanatory notes for RC:

Number of words: 554

Consider the pattern in the first para: '*For years, the luxury industry has waged a battle against counterfeiters. It* ***has invested heavily in ultra-sophisticated tech solutions*** *which use the latest advances in nanotechnology, internet of things (IoT), and AI to authenticate products. It* ***lobbies governments to extend enforcement bodies' powers to seize and destroy fake goods****, to prosecute buyers and dealers, and to block access to websites that sell counterfeit goods.* ***And then there are the lawyers****: LVMH alone employs at least 60 lawyers and spends $17 million annually on anti-counterfeiting legal action.'* From this we can understand that employing lawyers is one of the steps (apart from tech solutions and lobbying for more powers to enforcement bodies) taken by luxury industry to fight counterfeiters.

Option A: The example states that one company alone employs so and so amount of money, indicating it is substantial. The example's purpose is therefore to prove how much, in terms of wealth, goes into anti-counterfeiting legal action. Hence, Option A is the answer.

Option B: The numbers provided to show how much effort goes into fighting fakes and their trade doesn't justify whether it is an easy battle or difficult battle. The tone simply indicates how serious some firms are when it comes to fighting the trade of fakes. How successful they have been (mostly not) isn't really demonstrated by explicitly talking about the expenses. Hence, Option B is not the answer.

Option C: No connection has been drawn between expenses and prosecuting counterfeiters (the steps taken against them include ***lobbying for more powers to enforcement bodies***). So, we cannot establish that prosecuting buyers/dealers is an expensive ordeal. Hence, Option C is not the answer.

Option D: While this is true and has been mentioned in the passage, the example of LVMH was not provided for this purpose. That is because such an example need not talk about the expenses. Simply mentioning about the failure is enough. Mentioning the amount of money spent wouldn't add value at all. Hence, Option D is not the answer.

Choice (A)

Q17. By hollowing out of brands, the author means that:

a) luxury brands charge a premium for the logo alone.

b) luxury brands are not maintaining the intangible aura that was their hallmark.

c) luxury brands do not offer value for money.

d) **luxury brands focus more on the brand name than on the quality of the product.**

Number of words and Explanatory notes for RC:

Number of words: 554

The author's intentions are obvious in the statements: '*What we hear suggests that luxury firms' failure to contain the growth in counterfeiting is rooted in a hollowing out of their brands.* ***Many luxury brands have become symbols of status and privilege*** *but not much else. The* ***emphasis across the industry has been on signalling rather than delivering*** *luxury;* ***intangible over tangible product attributes****; and the logo over all other markers of quality.*'

Option A: While the logo has been mentioned to prove that luxury brands are cashing in on the brand recall and brand name of the logos, the hollowing out is a much bigger idea and is not just about the logo, but a bunch of other parameters. Hence, option A is not the answer.

Option B: The author is complaining that luxury brands aren't taking care of the tangible attributes while chasing the intangible. Hence, this option contradicts the essence of the para. Option B is not the answer.

Option C: The discussion is more aligned to whether luxury brands are simply focusing on the prestige and status instead of providing value. However, money is not a part of the argument made by the author. Whether the prices are justified or not is a separate debate taken up in the passage, but that's not with the same context - where we are discussing that brands are getting hollowed out. So, the argument is not so much whether they are providing value for money. The argument is more in line with whether they are focusing more on the prestige symbol than on the value they offer. Hence, Option C is not the answer.

Option D: Consider the sentences: '*Many luxury brands have become* ***symbols of status and privilege*** *but not much else. The emphasis across the industry has been on signalling rather than delivering luxury; intangible over tangible product attributes; and the logo over all other markers of quality...This philosophy has been consistently applied to supply chains, manufacturing, and pricing: By relocating production to low-cost countries, luxury firms severed the centuries-old association of luxury goods with their historical places of origin.* ***The outsourcing also led to relaxed control over supply chain, design, and manufacturing just as counterfeiters were putting unprecedented pressure on each of these processes***.' The author states that luxury brands are focusing on signalling, on the prestige (the showy bit) and not on the quality of the products, which may be slipping. Hence, Option D is the answer.

Choice (D)

Q18. The author will not approve of all of the following measures taken by a luxury brand, Amnesia, to increase its profits EXCEPT:

a) Instead of manufacturing its leather goods in Italy, whose leather was originally responsible for the company's success, Amnesia has shifted manufacturing operations to Vietnam to lower its product prices.

b) Amnesia is now listing its apparel on ecommerce websites, something it hasn't done since its inception a few decades ago.

c) Amnesia has doubled the price of its highly popular lower-end handbags.

d) **Amnesia has allocated more budget for marketing the brand than for providing customer service.**

Number of words and Explanatory notes for RC:

Number of words: 554

Option A: The author talks about luxury brands losing touch with their origins, which is what has been depicted in this choice. The author will not approve of luxury brands moving out of the original places of their products merely to cut costs. Hence, Option A is not the answer.
Option B: The author talks about factors which have disconnected brands from their products - '*Because of these developments, luxury brands have become disconnected from their physical products*'. It is not possible to establish from the passage whether ecommerce websites would take the brands further away from their physical products. Hence, Option B is something that the author may not have a problem with. Hence, Option B is the answer.
Option C: The author has clearly expressed ***displeasure at the way prices have been spiked by brands***. Hence, this is not a step that the author would approve of. Yes, the passage talks about phasing out lower-end products to sell higher-end ones. Yet, lower-end, or higher-end, the price raise is something the author will disagree with, especially if it is steep. Hence, the author will not approve of Option C.
Option D: Consider the sentences: '*The emphasis across the industry has been on signalling rather than delivering luxury; intangible over tangible product attributes; and the logo over all other markers of quality.*' It is clear that the author doesn't approve of the focus on 'the logo' as opposed to focusing on other markers of quality. So, Option D is not something the author would recommend as the author would rather suggest companies to focus on better quality delivery, than focusing on intangible attributes like brand prestige, status and the aura of a brand name. So, the author would pick customer service over marketing. Hence, Option D is not the answer. Choice (B)

Q19. Which of the following, if found to be true, would negate the main message of the passage?

a) Companies spending more on fighting counterfeiters than what the industry average is, have reported an increase in quarterly sales.

b) Companies spending on new product lines than on old ones have reported an increase in quarterly sales.

c) Increased spending on anti-counterfeiting exercises has led to an increased brand visibility for the company.

d) **Companies spending on fighting counterfeiters rather than on increasing satisfaction levels of customers have reported an increase in net profits.**

Number of words and Explanatory notes for RC:

Number of words: 554

The main message of the passage has been indicated in the following lines: '*This suggests that luxury sector's solution to the counterfeiting challenge lies less in fighting counterfeiters and* ***more in rediscovering what made the brands great in the first place***.'

Option A: The industry average and whether the companies are spending more or less than that has not been discussed in the passage. The author is clearly not discussing quarterly sales or industry average spending on fighting counterfeiters. Hence, Option A is not the answer as it is alienated from the main message.

Option B: Spending on various product lines isn't the issue. Spending on logos and prestige markers and ignoring value-added services is the author's concern. Hence, this option cannot be judged from the information given in the passage. Option B is not the answer.

Option C: This doesn't help us judge whether the author's message to focus less on anti-counterfeiting and more on enhancing delivery based on a brand's core values has been invalidated. Even if the statement is true, it runs parallel to the author's recommendation, neither strengths it nor weakens it, as we cannot decide whether increase in brand visibility is useful for the luxury brands or not in a tangible way. Option C is not the answer.

Option D: This option shows that the luxury brands are doing better when they focus on fighting counterfeiting rather than focusing on finding out why the brand did well (customer satisfaction originally was what would have made the brand great). This option negates the main message of the author by suggesting that anti-counterfeiting spending is indeed useful. Option D is the answer. Choice (D)

DIRECTIONS *for questions 20 to 24:* The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

Although Prime Minister Narendra Modi enjoyed many foreign policy successes during his term in office, the incoming government in New Delhi will have to confront serious challenges both around India's periphery and farther beyond. Grounded in a vision of India as a leading power in the international system, Modi has displayed an extraordinary international activism unprecedented

since Jawaharlal Nehru's long tenure, engaging India in global issues ranging from climate change to strategic realignments.

For all of Modi's achievements, however, India's strategic aims over the last half-decade were often frustrated by both contextual constraints and limited national capabilities. A successful Indian foreign policy must create external circumstances conducive to realising India's fundamental goals, namely, protecting its physical security and its decisional autonomy, enlarging its economic prosperity and its technological capabilities, and realising its status claims on the global stage.

Attaining these objectives requires New Delhi to engage at three different levels abroad: within its immediate periphery, among the world's middle powers, and with the great powers of the system…

India's problems within the subcontinent and around its immediate periphery have always been significant... Occasional diplomatic blunders notwithstanding, India's limitations in material power [and inadequate economic development] has proven to be the primary obstacle to establishing political hegemony among its smaller neighbours… By pursuing inward-looking growth, India has failed to integrate its region economically. To vivify its regional primacy, therefore, India must accumulate greater power at home and deepen interdependence with its neighbours.

…India's relations with most of the key middle powers have improved dramatically. The Modi government has especially utilised India's partnership with Japan to attract economic investments, acquire critical technology, gain support for India's permanent membership of the UN Security Council, and create an evolving intra-Asian balance to China. In addition, Modi's successful outreach to the United Arab Emirates and Saudi Arabia has enhanced India's quest for stable energy supplies and increased foreign investment while also limiting their traditional support for Pakistan.

Much to India's chagrin, however, Moscow today has ceased to be a reliable partner in balancing China within Asia as India and Russia struggle to find strategic convergence. India's relations with the middle powers remain robust apart from this exception, but these ties — despite their importance — cannot compensate for the hazards posed by India's neighbours and the great powers.

India faces problems from both great powers: intensifying threats from China and geopolitical fickleness from the United States. Hopefully the problems with the latter are a temporary feature of the current Trump administration.

The challenges embodied by China, however, are more enduring because China is still growing and is located next door. China has long recognised that India represented one of the three major Asian threats to its quest for continental, if not global, pre-eminence…China is now also intensely penetrating South Asia and the wider Indian Ocean region, further diminishing India's influence… India's relationship with the United States, therefore, matters greatly, but it remains hostage to internal anxieties...

…If India is to realise its great power ambitions, the next government will have to accelerate economic reforms, strengthen India's institutions, preserve its constitutional ethos, and protect its internal cohesion, all of which have floundered dangerously in recent years. Today, when India's claims to exceptionalism will not suffice either to protect its security or to increase its influence, its missteps within will have outsized impact abroad.

Q20. Which of the following is the author least likely to approve of as a successful foreign policy?

a) A policy that leads to doubling of the GDP, a tangible indicator of the state of the economy

b) A policy that incentivises the world's best technology companies to start manufacturing in India

c) A policy that prevents other countries from interfering in India's sovereign matters

d) **A policy that enables India's inclusion into prestigious groups of countries owing to its tangible progress**

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the sentences: '*A successful Indian foreign policy must **create external circumstances conducive to realising India's fundamental goals**, namely, **protecting its physical security** and its decisional autonomy, **enlarging its economic prosperity** and its technological capabilities, and **realising its status claims** on the global stage.*' The underlined portion explains what makes for a successful foreign policy.

Option A: If the GDP is doubled and as the ***option states, it is the indicator of the state economy***, it means, the economy is more prosperous. This is one of the fundamental goals and achieving it is a sign of a good foreign policy. Hence, Option A is not the answer, as the author will approve of it.

Option B: Enlarging technological capabilities is not necessarily the same as attracting technology companies. Hence, we cannot be sure attracting technology companies to manufacture in India would necessarily contribute to enlarging the tech capabilities (examples: space exploration/better defence systems/satellites/radars etc. Mind you the test-taker is not expected to know these. At the same time, the test taker shouldn't assume that tech capability is more foreign companies coming in, since it is not mentioned in the passage). Option B is the answer.

Option C: Maintaining decisional autonomy is indeed a fundamental goal. In other words, the country should maintain its sovereign status (independent to take its own decisions). Hence, this is something the author will approve of. Option C is not the answer.

Option D: Realising status claims on the global stage is one of the goals that has to be achieved by a successful foreign policy. This option talks about such recognition and hence, is something that the author will likely approve of. Option D is not the answer.

Choice (B)

Q21. Which of the following, if true, most weakens the author's reasons to suggest greater importance for the United States in India's foreign policy?

a) A majority of the world powers consider India to be at par with China.

b) China's growth rate has substantially slowed down and is below that of India.

c) The United States doesn't hold as much heft in world politics as China does.

d) **China aims to build a collaborative relationship with all of its neighbours, including India.**

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the sentences: '*India faces problems from both great powers: intensifying threats from China and geopolitical fickleness from the United States…China is now also intensely penetrating South Asia and the wider Indian Ocean region, further diminishing India's influence…**India's relationship with the United States, therefore, matters greatly**, but it remains hostage to internal anxieties...'* The author believes India's relationship with the United States matters because there are intensifying threats from ***the other great power, China.*** In order to weaken the author's stance, we need either to prove that China is not really a threat, and its growing influence is not really adversely affecting India.

Option A: While India may be at par with China, it doesn't really mean India doesn't need a good relationship. This choice doesn't really weaken what the author is trying to say, which is that, China's growing heft is a concern, and that India needs good relationships with the two powers, more so with the United States, since China is a little belligerent. Hence, Option A is not the answer.

Option B: The growth rate of China slowing down doesn't really mean China isn't a great power (as the author doesn't tie China's power and influence with its growth rate alone). Hence, Option B doesn't weaken the author's stance.

Option C: The United States is one of the two great powers according to the author and that would remain true even if this choice is true, that the United States doesn't hold the heft China holds. India may still need a good relationship with the United States, if its relationship with China sours. Hence, Option C is not the answer.

Option D: The main reason why the author believes India's relationship with the United States matters is because its relationship with the other great power China is rocky. This statement takes away that constraint and hence, weakens the author's reasons to suggest a healthier relationship with the United States. Option D is the answer.

Choice (D)

Q22. The author attributes India's failure to establish leadership credentials in its immediate periphery primarily to:

a) diplomatic blunders.

b) greater interdependence with its neighbours.

c) **limited material power.**

d) **China's political hegemony.**

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the following sentences: '*Occasional diplomatic blunders notwithstanding, India's* ***limitations in material power*** *[and* ***inadequate economic development****] have proven the primary obstacle to establishing political hegemony among its smaller neighbours…By* ***pursuing inward-looking growth****, India has failed to integrate its region economically.'*

Option A: The author clearly says '***Occasional diplomatic blunders notwithstanding***' – that means the diplomatic blunders apart, something else is the primary reason why India is unable to grow its influence in the immediate periphery. Hence, Option A is not the answer.

Option B: The lack of interdependence is what has curtailed India's ambitions of establishing political hegemony in its vicinity (India has failed to integrate its region economically, the author states). So, this choice clearly contradicts that factor mentioned by the author. Hence, Option B is not the answer.

Option C: This choice can clearly be understood from the line: *India's limitations in material power… have proven to be the primary obstacle to establishing political hegemony among its smaller neighbours.* From this we can understand that the "primary" obstacle for India's failure to establish political hegemony among its neighbours is "limitation in material power". Hence, Option C is the answer.

Option D: While China's growing influence has been mentioned elsewhere in the passage, the author doesn't talk about China's influence in this context, with respect to India's ineffectiveness in establishing its hegemony (leadership credentials) in the immediate periphery. Hence, Option D is not the answer. Choice (C)

Q23. Which of the following most agrees with the author's opinion on India's relationship with the United States?

a) One can't help but be cynical about the fickleness of the India-US relationship.

b) One can be optimistic that the temporary animosity between India and the US will be resolved.

c) **India's internal turmoil has adversely affected the India-US relationship.**

d) **The current Trump administration's adverse influence on the India-US relationship need not be a long-term pattern.**

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the following sentences: '*India faces problems from both great powers: intensifying threats from China and geopolitical fickleness from the United States. Hopefully* ***the problems with the latter are a temporary feature of the current Trump administration****.*' Also, the sentence: '*India's relationship with the United States, therefore, matters greatly,* ***but it remains hostage to internal anxieties...***' The underlined portions explain the author's opinion on India's relationship with the United States.

Option A: The author is not cynical; rather the author is optimistic about the future relationship. This is because the author states that '*Hopefully* ***the problems with the latter are a temporary feature'***. Hence, Option A is not the answer.

Option B: The author mentions that the relationship between the US and India is characterized by "***geopolitical fickleness***" and that it "***remains hostage to internal anxieties***". From this, we cannot infer that there exists any 'animosity' between India and the US. Hence, there is no question of whether one can be optimistic about resolving the 'animosity'. Hence, this is not the correct choice.

Option C: It is not India's anxieties that have soured the India-US relationship. The relationship, according to the author, is hostage to internal anxieties – pointing to the fact that not everything is smooth between the two countries. But that is largely owing to the Trump administration. We cannot infer that the anxieties or internal turmoil are not a consequence, rather a cause of the shaky relationship.

Option D: This choice aptly represents what the author believes is the major factor in the India-US relationship. The author also expresses hope that things will be different in the post Trump era. Hence, Option D is the answer. Choice (D)

Q24. All of the following can be inferred from the passage EXCEPT:

a) Economic prosperity and technological capabilities help a country realise its status claims on the global stage.

b) Self-centred growth runs against a country's aspirations to establish political hegemony in a region.

c) **India's internal chaos and the deterioration of constitutional ethos could dent its ambition to be recognised as a world leader.**

d) **Japan and Russia can help India counter the global influence of China.**

Option A: Consider the sentences: '*A successful Indian foreign policy must create external circumstances conducive to realising India's fundamental goals, namely, protecting its physical security and its decisional autonomy, enlarging its economic prosperity and its technological capabilities,* ***and realising its status claims on the global stage***. Each of the parameters are independent of each other and technological capabilities and economic prosperity will not have an impact on India's status claims. Rather, the author mentions all of them as objectives of a good foreign policy. Hence, Option A cannot be inferred. Option A is the answer.

Option B: Consider the sentences: '*By* ***pursuing inward-looking growth, India has failed to integrate its region economically***. *To vivify its regional primacy, therefore, India must accumulate greater power at home and* ***deepen interdependence with its neighbours***.' So, self-centred growth prevents a nation from establishing its hegemony within a particular region. Hence, Option B can be inferred.

Option C: '*If* ***India is to realise its great power ambitions***, *the next government will have to accelerate economic reforms, strengthen India's institutions,* ***preserve its constitutional ethos, and protect its internal cohesion***, *all of which* ***have floundered dangerously*** *in recent years.*' From the underlined portions, it can be understood that internal chaos and the deterioration of constitutional ethos could dent India's ambition to be recognised as a world leader. Option C is not the answer.

Option D: Consider the sentences: '*India's relations with* ***most of the key middle powers*** *have improved dramatically. The Modi government has especially utilised* ***India's partnership with Japan*** *to attract economic investments, acquire critical technology, gain support for India's permanent membership of the UN Security Council, and* ***create an evolving intra-Asian balance to China***.'

And: '*Much to India's chagrin, however,* ***Moscow today has ceased to be a reliable partner in balancing China within Asia as India and Russia struggle to find strategic convergence***.'

And: '*Attaining these objectives requires New Delhi to engage* ***at three different levels abroad****: within its immediate periphery****, among the world's middle powers****, and with* ***the great powers of the system****…*'

From these sentences we can understand, that India needs Japan and Russia to balance China's growing influence, even though they are, at best, middle powers, while China is one of the two great powers of the system. Hence, it can be inferred that Japan and Russia can help India counter the global influence of China. Option D is, therefore, not the answer.

Choice (A)

Q25. DIRECTIONS *for question 25*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. If a man could juggle a ball a thousand times, then it proved only that he ought to join the circus.
2. That brain, as well as his famously agile feet, made him a local hero in Holland and Spain and, by extension, all over football-mad Europe.
3. The true beauty of the world's most beautiful game, according to Johan Cruyff, didn't lie in tricksy technique.
4. It was great when Rudolf Nureyev said that Cruyff should have been a dancer, but Cruyff was not just using his long, lean body when he played football; he was mostly using his brain.

Sentence 1: Sentence 1 is a conditional sentence (If .... THEN)
Sentence 2: Sentence 2 has the demonstrative adjective "that brain".
Sentence 3: Sentence 3 has the proper noun "Johan Cruyff". It sounds like an introduction sentence.
Sentence 4: Sentence 4 begins with "Of course" and this can only follow another sentence. It has a clue "using his brain".
Sentence 3 is a general sentence that introduces Johan Cruyff. It clarifies that the true beauty of the world's most beautiful game didn't lie in tricksy technique. Sentences 3 and 1 form a logical block. "didn't lie in tricksy technique" in sentence 3 links with "man could juggle a ball a thousand times" in sentence 1. So, sentence 1 follows sentence 3.
Sentence 4 stresses the point made in sentence 1 and follows sentence 1. "Of course, it was great when Rudolf Nureyev said he should have been a dancer" in sentence 4 links with "If a man could juggle a ball a thousand times" in sentence 1. Also " he was not just using his long, lean body when he played football – he was mostly using his brain" in sentence 4 links with "The true beauty didn't lie in tricksy technique" given earlier in sentence 3. So, 314.
Sentences 4 and 2 form a logical block. "he was not just using his long, lean body when he played football – he was mostly using his brain" in sentence 4 links with "That brain, as well as his famously agile feet" in sentence 2. Hence 3142.

Ans: (3142)

Q26. DIRECTIONS *for question 26*: Five sentences related to a topic are given in the question below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

1. At the end of the book, Sears answers frequently asked questions from readers on living and eating in the zone.
2. You may have engaged in health habits that were not good for you in the past, but at any time, you can make a decision to change.
3. Barry Sears's answer is a classic: "Always remember that, no matter what you have eaten in the past, you are only one meal out of the zone."
4. One of the questions I especially liked was from someone who wrote, "What if you 'fall off the wagon' and you eat a large meal with dessert, or eat too much as people do over the holiday season?"
5. In the book *The Zone,* Barry Sears compares the body to a factory and the food you eat to a chemical that goes into the production process of the factory, and he teaches you how to eat in a healthy way.

Sentence 1: Sentence 1 refers to the end of the book and it has a clue "Frequently asked questions".
Sentence 2: Sentence 2 refers to "make a decision to change (a health habit)".
Sentence 3: Sentence 3 mentions the answer of Barry Sears to the question posed.
Sentence 4: Sentence 4 mentions one of the questions (posed by readers).
Sentence 5: Sentence 5 mentions the name of a book (*The Zone*) and the full name of its author (Barry Sears).
Sentence 5 describes the contents of the book *The Zone*. It is a general sentence that begins the paragraph. Sentence 5 is followed by sentence 1 which tells us what the author Barry Sears does at the end of the book.
Sentences 1 and 4 form a mandatory pair. "Sears answers frequently asked questions from readers on living and **eating** in the zone" in sentence 4 links with "One of the questions I especially liked .... **eat** a large meal with desert, or **eat** too much " in sentence 1. So sentence 4 follows sentence 1.
Sentences 4 and 3 form another mandatory pair. "One of the questions I especially liked" in sentence 4 is followed by "Barry Sears's answer is a classic." in sentence 3.
So, 5143.
Sentence 2 is the odd sentence out. It needs a precedent and more substantiation. It is not specifically related to the "question and answer" discussion mentioned in the remaining sentences. Ans: (2)

Q27. DIRECTIONS *for question 27*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. Any translator attempting to bring a work of literature into his or her own language must weigh the many considerations and find a solution that hews closely to meaning while being true to the author's style.
2. To name a few effects, we have rhythm and cadence, register, dialect, irony, humour and slang – all the elements that make up what we call an author's style.
3. Once words begin to be strung together into sentences, a host of other linguistic effects is added.
4. Language is not merely a set of signifiers and signified; words are part of culture and have both denotations and connotations, and no possible literal translation can communicate such things.

Sentence 1: Sentence 1 highlights the fact that a translator must be true to the author's style/ meaning when translating a work into his or her own language.
Sentence 2: Sentence 2 mentions some examples of linguistic effects and has the clue 'author's style'.
Sentence 3: Sentence 3 talks about a host of 'other' linguistic effects being added as words are combined into sentences.
Sentence 4: Sentence 4 mentions that elements/ features of language cannot be captured by a literal translation. {*Signifier* = a sign's physical form (such as a sound, printed word, or image) as distinct from its meaning. *Signified* = the meaning or idea expressed by a sign, as distinct from the physical form in which it is expressed}{*Denotation* = the literal or primary meaning of a word, in contrast to the feelings or ideas that the word suggests. *Connotation* = an idea or feeling which a word invokes for a person in addition to its literal or primary meaning, i.e. the secondary meaning, the overtone or nuance of a word.}
It can be understood that sentence 2 (elements that make up what we call an author's style) and sentence 1 (being true to the author's style) form a logical block. So we can infer that the sentences need to flow in the following direction: language ----> linguistic effects ----> translation.
Sentence 4 is a general sentence that can begin the para. It establishes the background: No possible literal translation can communicate the denotations and connotations of words.
Sentence 4 and sentence 3 form a mandatory pair. "words are part of culture and have both denotations and connotations" in sentence 4 links with "once words begin to be strung together into sentences" in sentence 3. So sentence 3 follows sentence 4.
Sentence 3 and sentence 2 form another mandatory pair. "a host of other linguistic effects is added" in sentence 3 links with "To name a few effects, we have rhythm and cadence, register, dialect, irony, humour and slang – all the elements" in sentence 2. So sentence 2 follows sentence 3.
Sentences 2 and 1 form another logical block. "weigh the many considerations" in sentence 1 links with "all the elements or linguistic effects that make up" in sentence 2. Sentence 1 follows sentence 2. "being true to the author's style" in sentence 1 links with "make up what we call an author's style" in sentence 2. "find a solution that hews closely to meaning" in sentence 1 closely contrasts "no possible literal translation can communicate such things" given earlier in sentence 4. Sentence 4 concludes the para.
So, 4321. Ans: (4321)

Q28. DIRECTIONS *for question 28*: The paragraph given below is followed by four alternative summaries. Choose the option that best summarises the paragraph.
In order to simplify the process of perceiving complex stimuli, we tend to classify people and events into familiar categories and assign to individual members the attributes commonly associated with those categories. This tendency to generalize from the perceived attributes of a group to the perceived attributes of an individual belonging to that group is called stereotyping. We know that there are negative stereotypes such as: Truck drivers drive recklessly, Americans are materialistic, politicians are corrupt, and management graduates are job-hoppers. However, there are positive stereotypes as well: Bengalis excel in music, Gujaratis have an uncanny sense of business, and

management graduates are industrious. Stereotyping is a pervasive perceptual process and we are all familiar with stereotypes based upon caste, religion, region, age, sex, organizational role, etc. Stereotyping often leads to erroneous impressions and judgements because the perceiver overlooks significant individual differences among the members of a group. Stereotype also makes it difficult to perceive some traits actually present in an individual which are not typically attributed to his group.

a) Some stereotypes are widely used and one need not think while using them. But perceptual tendencies inevitably lead to erroneous judgements and subjectivity because individual traits are missed for the overall labels attributed to the group.

b) Stereotypes are of two types: positive and negative. Positive stereotypes serve to simplify the process of perceiving complex stimuli. Negative stereotypes cause one to overlook significant individual differences among the members of a group.

c) **Stereotyping involves a generalizing from the perceived attributes of a group to the perceived attributes of an individual belonging to that group. Examples of stereotypes such as "Bengalis excel in music" or "politicians are corrupt" abound in our lives.**

d) **By stereotyping, we perceive that a person from a group has a whole range of characteristics and abilities that we assume all members of that group have. This social categorization can be positive or negative. Because stereotypes ignore individual differences, they can distort a person's perception and result in misconceptions.**

The content of the paragraph flows as follows:
(a) Definition of 'stereotyping'.
(b) Positive and negative stereotypes and examples.
(c) Limitations of 'stereotyping'.
These points are aptly covered in choice D which best summarises the para. Hence choice D is the correct answer.
Option A: The first sentence in choice A is out of scope. Choice A leaves out the definition of 'stereotyping'.
Option B: Choice B is distorted. All stereotypes serve to simplify the process of perceiving complex stimuli, and not just positive stereotypes. Similarly, from the last two sentences of the para, it can be observed that .... Stereotyping often leads to erroneous impressions and judgements .... (true for all stereotypes, and not just negative stereotypes). Hence choice B is not the correct answer.
Option C: While choice C is mostly true, the last bit "abound in our lives" is unjustified. Also, the limitations of 'stereotyping' have not been covered here. Choice (D)

Q29. DIRECTIONS *for question 29*: Five sentences related to a topic are given in the question below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

1. The pleasure-centered person, too soon bored with each succeeding level of "fun," constantly cries for more, and so the next new pleasure has to be better, more exciting, with a bigger "high."
2. Innocent pleasures in moderation can provide relaxation for the body and mind and can foster family and other relationships.
3. While the glitter of pleasure-centered lifestyles is graphically portrayed, the natural result of such lifestyles – on the inner person, on productivity, on relationships – is seldom accurately seen.
4. A person in this state becomes almost entirely narcissistic, interpreting all of life in terms of the pleasure it provides to the self here and now.
5. But pleasure, per se, offers no deep, lasting satisfaction or sense of fulfilment.

Sentence 1: Sentence 1 talks about the cravings of a pleasure-centered person and how he yearns for better and higher levels of fun.
Sentence 2: Sentence 2 highlights the positive benefits of innocent pleasures when they are pursued in moderation.
Sentence 3: Sentence 3 has a negative connotation: the natural result of such life-styles is seldom accurately seen.
Sentence 4: Sentence 4 has a reference to the demonstrative adjective 'this state' and the clue 'narcissistic'.
Sentence 5: Sentence 5 has the contrast conjunction 'but'. It talks about pleasures offering no permanent satisfaction or fulfillment.
On a careful analysis of the sentences, it can be observed that sentences 2 refers to "innocent pleasures", while 5 refers to the "pleasures", sentence 1 and 4 refer to "pleasure-centered person", sentence 3 refers to "pleasure-centered life-styles".
Among the five sentences, sentence 2 is the only one which talks about "innocent pleasures", while the remaining sentences talk about "pleasures" and the lifestyle of a "pleasure-centered person".
Sentence 1 is followed by sentence 4. "A person in this state" in sentence 4 links with "The pleasure-centered person, too soon bored with each succeeding level of "fun," constantly cries for more" in sentence 1. "interpreting all of life in terms of the pleasure it provides to the self here and now" in sentence 4 is parallel to "next new pleasure has to be better, more exciting, with a bigger "high."" in sentence 1. So sentence 4 follows sentence 1. Hence, 14.
Sentence 3 talks about the natural result of being "pleasure centered", which is further explained in 1 and 4. Sentence 5 starts with a contrast and talks about negative aspect of being pleasure centered. Hence, 5 can end the para, while 3 can act as an introduction.
Hence, the para can be formed in the order 3145 and 2 is the odd one out.

Ans: (2)

Q30. DIRECTIONS *for questions 30 and 31*: The passage given below is followed by four summaries. Choose the option that best captures the author's position.

Incorporating bones into the smithing process did in fact make Scandinavian swords stronger, but it wasn't magic — it was technology. What ancient smiths could not have realized is that they were in fact mixing their bog iron with carbon to make a rudimentary form of steel. Carbon is present in all organic matter, and the same is true for bones. By burning bones in a low-oxygen environment, ancient smiths would have produced bone-coal, much in the same way that burning wood in a low-oxygen environment makes charcoal. Researchers have conducted experiments that recreate the process of forging a sword using bog iron and bone-coal; the carbon from the bones can penetrate up to 3mm deep into bog iron, enough to significantly strengthen the sword.

a) **What Scandinavians did by using bones in smithing was not magic, but was the science of integrating carbon into iron to make it stronger.**

b) Ancient Scandinavian smiths understood the science behind transforming iron into a rudimentary form of steel using bone-coal.

c) **Scandinavian smiths inadvertently forged bog iron swords which were way stronger than the ordinary ones due to carbon penetration.**

d) **Bone coal when burnt in low oxygen conditions penetrates into bog iron to make it stronger.**

The para has three key ideas: Coal produced by burning bones or wood in low-oxygen environment can strengthen iron. Scandinavians applied this process for their bog iron swords. They were unaware of the scientific reason behind the process but ended up making stronger swords through carbon penetration.
Option A: This option includes all the central ideas, using bones in smithing, Scandinavians not being aware of the science, carbon making the iron stronger. Hence, it depicts the essence of the para reasonably well. While, the option doesn't exactly specific swords, it is not important to the core of the para which is largely about their inadvertent usage of bones to make stronger iron (one of the applications is stronger swords). Option A is the answer.
Option B: That the Scandinavians weren't aware of the science behind the process is evident from the sentence: What ancient smiths could not have realized is that they were in fact mixing their bog iron with carbon to make a rudimentary form of steel. So, this option is factually incorrect.
Option C: Scandinavian smiths inadvertently forged steel swords by using bones during smithing process which released carbon that penetrated the bog iron. They didn't forge bog iron swords. Hence, this option is factually incorrect, and not the answer.
Option D: While this option represents part of the idea correctly, it doesn't touch upon the other idea of the para, about Scandinavian smiths accidentally forging steel using bones. Hence, Option D is not the answer. Choice (A)

Q31. DIRECTIONS *for questions 30 and 31*: The passage given below is followed by four summaries. Choose the option that best captures the author's position.

One of the great cruelties and great glories of creative work is the wild discrepancy of timelines between vision and execution. When we dream up a project, we invariably underestimate the amount of time and effort required to make it a reality. Rather than a cognitive bug, perhaps this is the supreme coping mechanism of the creative mind — if we could see clearly the toil ahead at the outset of any creative endeavour, we might be too dispirited to begin, too reluctant to gamble between the heroic and the foolish, too paralyzed to walk the long and tenuous tightrope of hope and fear by which any worthwhile destination is reached.

a) **Underestimating the amount of time and effort required for implementing a vision protects the creative endeavour from being sabotaged by fear of the toil of execution.**

b) **The paradox of creative work is that one cannot see the toil at the time of dreaming up a vision, for if we did, we wouldn't be able to take it to the eventual destination.**

c) **It is not as easy to execute a creative vision as we deem it to be, but if we knew that at the start, we would never undertake the task in the first place.**

d) **We are never sure how much time and effort is required to execute our vision, but that is how we manage to keep our creative juices flowing despite the hardships and the risks.**

One of the great cruelties and great glories of creative work is the ***wild discrepancy of timelines between vision and execution*** (intro idea of the para). When we dream up a project, we invariably underestimate the amount of time and effort required to make it a reality (elaboration of the intro idea, so not necessary for the essence). Rather than a cognitive bug, perhaps this is ***the supreme coping mechanism of the creative mind*** (a second idea/twist in the story)— if we could see clearly the toil ahead at the outset of any creative endeavour, we might be ***too dispirited to begin, too reluctant to gamble between the heroic and the foolish, too paralyzed to walk the long and tenuous tightrope of hope and fear by which any worthwhile destination is reached*** (rhetorical expressions, none of which add value to the essence of the para).

Option A: This option essentially includes all the three points: underestimation of what it takes to execute a creative vision, the advantage of that to the creative mind, and why it is an advantage. Hence, Option A is the answer.

Option B: While this option rephrases the two core ideas (a. one cannot see the toil at the time of dreaming up a vision – underestimating our tasks, and b. if we did, we wouldn't be able to take it to the eventual destination), it misses out on one nuance – that our underestimation is a coping mechanism that helps us begin (not complete) the task. So, Option B is close but not the best representation of the essence of the para.

Option C: The para doesn't focus on the 'ease' of completing a task. We underestimate the time and effort needed to complete a task. This could be equally true for an easy as well as a difficult task. Hence, the essence of the para is not rightly represented when we state that tasks may not be 'as easy to execute as we deem them to be.' The more apt version would be that we do not estimate the right amount of time and effort (irrespective of whether the creative work is easy or difficult). Option C is not the answer.

Option D: The option tends to indicate that we make the creative juices flow by not being sure of how much time and effort we need to execute our vision. However, that is not true. What the para seems to suggest is that our not knowing that we are underestimating the time and effort helps us in the long run, as the knowledge of how arduous a task is, is demotivating. That hasn't been indicated in this para. Option D is not the answer.

Choice (A)

Q32. DIRECTIONS *for question 32 and 33*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. To reach the widest possible audience, most of them cover similar material: a miscellany of models that are not always consistent with each other or even with themselves.
2. Macroeconomics is difficult to teach, partly because its theorists disagree about so much.
3. Many professors, subsequently, must teach things they do not believe in themselves.
4. It is difficult also because the textbooks disagree about so little.

Sentence 1 is a dependent sentence hinged on a pronoun 'them' – which cover similar material.
Sentence 2 is an independent sentence that talks about macroeconomics. The word to observe here is 'partly' which talks about one half of an issue.
Sentence 3 talks about professors teaching things they don't believe in. The keyword here is 'subsequently' which implies 'as a result' or 'following this' or 'afterwards'.
Sentence 4 talks about textbooks disagreeing so little.
Connection should first be made between 2 and 4. Theorists disagree '***so much***' while textbooks disagree '***so little***'. The professors cannot just follow 'theorists' or 'textbooks'. They go by both, which represents the dilemma in 3. So, 3 should come after 2 and 4 in the logical sequence. 1 talks about 'them' covering similar material. The plural noun is more likely to be textbooks than professors, because it will be textbooks and not professors who would 'cover similar material'. Also, reach is a concern for textbooks and not professors (who teach in class – limited). Also not being consistent with each other is something you would say about textbooks and not professors. So, 41 is a pair. Ans: (2413)

Q33. DIRECTIONS *for question 32 and 33*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. "Black hole" is the rare physics term that is evocative enough to attract public attention, especially compared to the previous phrase for the concept, "gravitationally collapsed object."
2. In Dicke's mind, that hot, fetid, stinking, torturous hellhole from which few men could emerge was an apt metaphor for the cosmological singularity that acts as a physical manifestation of Dante's warning in Inferno to "Abandon hope all ye who enter here."
3. Dante was a poet, and the word "black hole" is a metaphor, but it's important to remember that pain and loss go beyond language; they are not abstractions, but very real.
4. Coined by physicist Robert H. Dicke in the early '60s, the term was appropriated from the infamous dungeon in colonial India that held British prisoners and was known as the "Black Hole of Calcutta."

Sentence 1 introduces the term 'Black Hole', and it is an independent sentence.
Sentence 2 – Two things can be observed here. One, that the author uses half-name – Dicke, which means it can only come after a sentence that has the full name (not necessarily immediately after).
Sentence 3 is an independent sentence, but the tone of the sentence has to be noticed – it seems to be making a connect between Dante's poetry and language and the use of 'black hole' as a metaphor.
Sentence 4 talks about Robert Dicke (test-takers must immediately recognise that this sentence has to come ahead of 2, because it gives out the full name of Dicke), that he coined the term 'black hole'.
Since, 4 says 'the term' was coined, we can understand that 14 is a block, as 1 introduces the term 'black hole'. 3 needs a prior intro to Dante, which is in 2. Dante wrote the Inferno is understood from 2, which serves as the background for the explanation in 3. So, 23 is a block. 2 has to come after 4 (full name before half name).

Ans: (1423)

DILR

DIRECTIONS *for questions 1 to 4:* Answer the questions on the basis of the information given below.

Sampath was comparing the specifications of seven different laptops, L1 through L7, on five parameters – Processor, RAM, Graphics Memory, Screen Size and OS. The processor of any laptop can be i5 or i7. The RAM of any laptop can be 8GB or 16GB. The Graphics Memory of any laptop can be 6GB or 8GB. The Screen Size of any laptop can be 14" or 15". The OS of any laptop can be Windows or Linux.

Further, he calculated the Similarity Index for every pair of laptops. The Similarity Index for any pair of laptops is the number of parameters in which they have the same specifications.

The first table below provides the Similarity Index for each pair of laptops, while the second table below provides partial information about the parameters for each laptop:

Similarity Index							
	L1	L2	L3	L4	L5	L6	L7
L1	5	4	2	1	2	3	4
L2	4	5	1	0	3	4	3
L3	2	1	5	4	3	0	1
L4	1	0	4	5	2	1	2
L5	2	3	3	2	5	2	1
L6	3	4	0	1	2	5	4
L7	4	3	1	2	1	4	5

Laptop	Processor	RAM	Graphics Memory	Screen Size	OS
L1	i5			14"	Windows
L2		16GB			Windows
L3			6GB		
L4			6GB	15"	
L5		8GB		14"	
L6					
L7	i7			14"	

Q1. DIRECTIONS *for questions 1 to 4:* Select the correct alternative from the given choices.
For which of the following parameters do L2 and L6 not share the same specification?

a) **Graphics Memory**

b) **RAM**

c) **Processor**

d) **Screen Size**

Given that L2 and L4 have a similarity index of 0. This implies that L2 and L4 do not have any parameter in common. Since there are only two options for each parameter, we can find the specification of one if the other is given.
Since RAM of L2 is 16GB, RAM of L4 must be 8GB. Since the Graphics Memory of L4 is 6GB, the Graphics Memory of L2 must be 8GB. Since the Screen Size of L4 is 15", the Screen Size of L2 must be 14". Since the OS of L2 is Windows, the OS of L4 must be Linux.
The Similarity Index of L5 and L7 is 1. Hence, except for one parameter, all the others will be different for these two laptops. It is given that both the laptops have a Screen Size of 14". Hence, all the other parameters will be different.
Given that L5 has a RAM of 8GB. Hence, L7 must have a RAM of 16GB. Since L7 has i7 processor, L5 must have i5 processor.
The Similarity Index of L1 and L5 is 2. For these two laptops, the Processor and Screen Size are the same. Hence, all the others must be different. Since the RAM of L5 is 8GB, the RAM of L1 must be 16GB. Since the OS of L1 is Windows, the OS of L5 must be Linux. Since the OS of L5 is Linux, the OS of L7 must be Windows (as they must have only one parameter in common, which is Screen Size).
The Similarity Index of L4 and L5 is 2. The RAM and OS of these two laptops is the same. Since L5 has i5 processor, L4 must have i7 processor. Since L4 has 6GB Graphics Memory, L5 must have 8GB Graphics Memory. And L7 must have a 6GB Graphics Memory.
We now know all the specifications of L4. From this, we can find the processor of L2, which must be i5 (as the Similarity Index for L2 and L4 is 0).
L1 and L7 have a Similarity Index of 4. The Processor of these two laptops are different. Hence, all the others must be the same. Therefore, L1 must have Graphics Memory of 6GB (same as L7).
L3 and L6 have Similarity Index of 0. Since L3 has 6GB Graphics Memory, L6 must have 8GB Graphics Memory.
L6 and L7 have 4 parameters in common. Since L6 has 8GB Graphics Memory, this is the parameter which is different from L7 (as it has 6GB Graphics Memory). All the other parameters must be the same.
Since we know the specifications of L6, we can fill the specifications of L3.
The following table provides the specifications of the seven laptops:

Laptop	Processor	RAM	Graphics Memory	Screen Size	OS
L1	i5	16GB	6GB	14"	Windows
L2	i5	16GB	8GB	14"	Windows
L3	i5	8GB	6GB	15"	Linux
L4	i7	8GB	6GB	15"	Linux
L5	i5	8GB	8GB	14"	Linux
L6	i7	16GB	8GB	14"	Windows
L7	i7	16GB	6GB	14"	Windows

L2 and L6 differ in the Processor. Choice (C)

Q2. DIRECTIONS *for questions 1 to 4:* Select the correct alternative from the given choices.

Which of the following options denote the Processor and Graphics Memory of L5 (taken in that order)?

a) **i5, 8GB**

b) **i7, 8GB**

c) **i5, 6GB**

d) **i7, 6GB**

Given that L2 and L4 have a similarity index of 0. This implies that L2 and L4 do not have any parameter in common. Since there are only two options for each parameter, we can find the specification of one if the other is given.
Since RAM of L2 is 16GB, RAM of L4 must be 8GB. Since the Graphics Memory of L4 is 6GB, the Graphics Memory of L2 must be 8GB. Since the Screen Size of L4 is 15", the Screen Size of L2 must be 14". Since the OS of L2 is Windows, the OS of L4 must be Linux.
The Similarity Index of L5 and L7 is 1. Hence, except for one parameter, all the others will be different for these two laptops. It is given that both the laptops have a Screen Size of 14". Hence, all the other parameters will be different.
Given that L5 has a RAM of 8GB. Hence, L7 must have a RAM of 16GB. Since L7 has i7 processor, L5 must have i5 processor.
The Similarity Index of L1 and L5 is 2. For these two laptops, the Processor and Screen Size are the same. Hence, all the others must be different. Since the RAM of L5 is 8GB, the RAM of L1 must be 16GB. Since the OS of L1 is Windows, the OS of L5 must be Linux. Since the OS of L5 is Linux, the OS of L7 must be Windows (as they must have only one parameter in common, which is Screen Size).
The Similarity Index of L4 and L5 is 2. The RAM and OS of these two laptops is the same. Since L5 has i5 processor, L4 must have i7 processor. Since L4 has 6GB Graphics Memory, L5 must have 8GB Graphics Memory. And L7 must have a 6GB Graphics Memory.
We now know all the specifications of L4. From this, we can find the processor of L2, which must be i5 (as the Similarity Index for L2 and L4 is 0).
L1 and L7 have a Similarity Index of 4. The Processor of these two laptops are different. Hence, all the others must be the same. Therefore, L1 must have Graphics Memory of 6GB (same as L7).
L3 and L6 have Similarity Index of 0. Since L3 has 6GB Graphics Memory, L6 must have 8GB Graphics Memory.
L6 and L7 have 4 parameters in common. Since L6 has 8GB Graphics Memory, this is the parameter which is different from L7 (as it has 6GB Graphics Memory). All the other parameters must be the same.
Since we know the specifications of L6, we can fill the specifications of L3.
The following table provides the specifications of the seven laptops:

Laptop	Processor	RAM	Graphics Memory	Screen Size	OS
L1	i5	16GB	6GB	14"	Windows
L2	i5	16GB	8GB	14"	Windows
L3	i5	8GB	6GB	15"	Linux
L4	i7	8GB	6GB	15"	Linux
L5	i5	8GB	8GB	14"	Linux
L6	i7	16GB	8GB	14"	Windows
L7	i7	16GB	6GB	14"	Windows

L5 has i5 Processor and 8GB Graphics Memory. Choice (A)

Q3. DIRECTIONS *for questions 1 to 4:* Select the correct alternative from the given choices.
How many laptops have 6GB Graphics Memory and 8GB RAM?

a) **1**

b) **2**

c) **0**

d) **More than 2**

Given that L2 and L4 have a similarity index of 0. This implies that L2 and L4 do not have any parameter in common. Since there are only two options for each parameter, we can find the specification of one if the other is given.
Since RAM of L2 is 16GB, RAM of L4 must be 8GB. Since the Graphics Memory of L4 is 6GB, the Graphics Memory of L2 must be 8GB. Since the Screen Size of L4 is 15", the Screen Size of L2 must be 14". Since the OS of L2 is Windows, the OS of L4 must be Linux.
The Similarity Index of L5 and L7 is 1. Hence, except for one parameter, all the others will be different for these two laptops. It is given that both the laptops have a Screen Size of 14". Hence, all the other parameters will be different.
Given that L5 has a RAM of 8GB. Hence, L7 must have a RAM of 16GB. Since L7 has i7 processor, L5 must have i5 processor.
The Similarity Index of L1 and L5 is 2. For these two laptops, the Processor and Screen Size are the same. Hence, all the others must be different. Since the RAM of L5 is 8GB, the RAM of L1 must be 16GB. Since the OS of L1 is Windows, the OS of L5 must be Linux. Since the OS of L5 is Linux, the OS of L7 must be Windows (as they must have only one parameter in common, which is Screen Size).
The Similarity Index of L4 and L5 is 2. The RAM and OS of these two laptops is the same. Since L5 has i5 processor, L4 must have i7 processor. Since L4 has 6GB Graphics Memory, L5 must have 8GB Graphics Memory. And L7 must have a 6GB Graphics Memory.
We now know all the specifications of L4. From this, we can find the processor of L2, which must be i5 (as the Similarity Index for L2 and L4 is 0).
L1 and L7 have a Similarity Index of 4. The Processor of these two laptops are different. Hence, all the others must be the same. Therefore, L1 must have Graphics Memory of 6GB (same as L7).
L3 and L6 have Similarity Index of 0. Since L3 has 6GB Graphics Memory, L6 must have 8GB Graphics Memory.
L6 and L7 have 4 parameters in common. Since L6 has 8GB Graphics Memory, this is the parameter which is different from L7 (as it has 6GB Graphics Memory). All the other parameters must be the same.
Since we know the specifications of L6, we can fill the specifications of L3.
The following table provides the specifications of the seven laptops:

Laptop	Processor	RAM	Graphics Memory	Screen Size	OS
L1	i5	16GB	6GB	14"	Windows
L2	i5	16GB	8GB	14"	Windows
L3	i5	8GB	6GB	15"	Linux
L4	i7	8GB	6GB	15"	Linux
L5	i5	8GB	8GB	14"	Linux
L6	i7	16GB	8GB	14"	Windows
L7	i7	16GB	6GB	14"	Windows

Two laptops, L3 and L4, have RAM of 8GB and Graphics Memory of 6GB.

Choice (B)

Q4. DIRECTIONS *for questions 1 to 4:* Select the correct alternative from the given choices.
Which of the following statements is true?

I. All the laptops with Screen Size of 14” have Graphics Memory of 8GB.
II. All the laptops with 16GB RAM have Windows OS.
III. All the laptops with Graphics Memory of 8GB have Screen Size of 14”.

a) **Only I and II**

b) **Only II**

c) **I, II and III**

d) **Only II and III**

Given that L2 and L4 have a similarity index of 0. This implies that L2 and L4 do not have any parameter in common. Since there are only two options for each parameter, we can find the specification of one if the other is given.
Since RAM of L2 is 16GB, RAM of L4 must be 8GB. Since the Graphics Memory of L4 is 6GB, the Graphics Memory of L2 must be 8GB. Since the Screen Size of L4 is 15", the Screen Size of L2 must be 14". Since the OS of L2 is Windows, the OS of L4 must be Linux.
The Similarity Index of L5 and L7 is 1. Hence, except for one parameter, all the others will be different for these two laptops. It is given that both the laptops have a Screen Size of 14". Hence, all the other parameters will be different.
Given that L5 has a RAM of 8GB. Hence, L7 must have a RAM of 16GB. Since L7 has i7 processor, L5 must have i5 processor.
The Similarity Index of L1 and L5 is 2. For these two laptops, the Processor and Screen Size are the same. Hence, all the others must be different. Since the RAM of L5 is 8GB, the RAM of L1 must be 16GB. Since the OS of L1 is Windows, the OS of L5 must be Linux. Since the OS of L5 is Linux, the OS of L7 must be Windows (as they must have only one parameter in common, which is Screen Size).
The Similarity Index of L4 and L5 is 2. The RAM and OS of these two laptops is the same. Since L5 has i5 processor, L4 must have i7 processor. Since L4 has 6GB Graphics Memory, L5 must have 8GB Graphics Memory. And L7 must have a 6GB Graphics Memory.
We now know all the specifications of L4. From this, we can find the processor of L2, which must be i5 (as the Similarity Index for L2 and L4 is 0).
L1 and L7 have a Similarity Index of 4. The Processor of these two laptops are different. Hence, all the others must be the same. Therefore, L1 must have Graphics Memory of 6GB (same as L7).
L3 and L6 have Similarity Index of 0. Since L3 has 6GB Graphics Memory, L6 must have 8GB Graphics Memory.
L6 and L7 have 4 parameters in common. Since L6 has 8GB Graphics Memory, this is the parameter which is different from L7 (as it has 6GB Graphics Memory). All the other parameters must be the same.
Since we know the specifications of L6, we can fill the specifications of L3.
The following table provides the specifications of the seven laptops:

Laptop	Processor	RAM	Graphics Memory	Screen Size	OS
L1	i5	16GB	6GB	14"	Windows
L2	i5	16GB	8GB	14"	Windows
L3	i5	8GB	6GB	15"	Linux
L4	i7	8GB	6GB	15"	Linux
L5	i5	8GB	8GB	14"	Linux
L6	i7	16GB	8GB	14"	Windows
L7	i7	16GB	6GB	14"	Windows

Only statements II and III are true. Choice (D)

DIRECTIONS *for questions 5 to 8:* Answer the questions on the basis of the information given below.

A container, in the shape of a cube, is used for mixing paints in a factory. On each face of the container, a code, in the form of a two-digit number, is written. The paints that need mixing are injected into the container through a small hole, which is then sealed. The container is then placed in a machine which grips the top and bottom faces of the container and spins the container a few times from left to right, stopping intermittently. In the second round of mixing, the container is removed and fixed again in the machine such that the top and bottom faces are different from the previous round. The machine again spins the container, from left to right, stopping intermittently. Many such rounds of mixing happen until the paints are thoroughly mixed.

Rajesh was observing this process from the factory floor and, in each round, whenever the machine stopped spinning the container, he noted down the code written on one of the faces of the container that was visible to him. During any round, the top and bottom faces of the container are not visible to Rajesh.

The following table provides the numbers that he noted down during different rounds of mixing:

Round	Code
Round 1	23, 54, 54, 23, 81, 81
Round 2	45, 23, 23, 45, 76, 76
Round 3	45, 45, 91, 91, 81, 45
Round 4	23, 23, 45, 54, 45, 23

Q5. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
What is the code on the face which is opposite the face which has a code of 81?

a) **23**

b) **54**

c) **91**

d) **45**

From the table, the codes on the six faces are 23, 54, 76, 45, 81 and 91.
Given that in Round 1, Rajesh observed the numbers 23, 54 and 81.
In Round 2, he observed 45, 23 and 76.
In Round 1, he did not note down the number on one face, which was neither the top face nor the bottom one. This number can be 45 or 76 or 91.
Further, between Round 1 and Round 2, two numbers that appeared in Round 1 must be removed and two new numbers will be added. The numbers that are removed correspond to the faces which will be the top and bottom faces in Round 2 (since the top and bottom faces will be different in two consecutive rounds). The numbers that are added in Round 2 will correspond to the faces that were the top and bottom faces in Round 1. The other two numbers which remain unchanged will also be on opposite faces of the container.
If the number that Rajesh did not note in Round 1 is 45, then in both Round 1 and Round 2, 23 and 45 must have been visible. Hence, 23 and 45 must be opposite each other. From the information on Round 1, 54 and 81 will be opposite each other. Hence, the remaining 76 and 91 will be opposite each other.
However, in round 3, the numbers are 45, 91 and 81. The fourth number in round 3 must be 54 (as it is opposite 81) and 76 (as it is opposite 91) and 23 (as it is opposite 45).
Hence, this case is not possible.
If the fourth number in round 1 is 76, then 23 and 76 must have been visible in both Round 1 and Round 2. Hence, 23 and 76 must be opposite each other. 54 and 81 will be opposite each other and 45 and 91 will be opposite each other.
In round 3, the fourth number will be 54 as there is 81 in Round 3.
In Round 4, the fourth number will be 76 and 81 and 91. This is not possible. Hence, this case is not possible.
If the fourth number in round 1 is 91, then in Round 2, the fourth number cannot be determined.
In Round 3, the numbers are 45, 91 and 81. Only two numbers, 91 and 81, repeat in Round 1 and Round 3. Hence, these must be opposite each other. From Round 1, 23 and 54 must be opposite each other. The remaining numbers, 45 and 76 must be opposite each other.
In round 4, the fourth number must be 76. Hence, there are no inconsistencies in this case.
Hence, the pairs of codes opposite each other are **(23, 54); (45, 76); (91, 81).**

The code on the face opposite the one with 81 is 91. Choice (C)

Q6. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
Which of the following pairs of codes are on faces which are opposite each other?

a) **54, 81**

b) **45, 54**

c) **23, 91**

d) **45, 76**

From the table, the codes on the six faces are 23, 54, 76, 45, 81 and 91.
Given that in Round 1, Rajesh observed the numbers 23, 54 and 81.
In Round 2, he observed 45, 23 and 76.
In Round 1, he did not note down the number on one face, which was neither the top face nor the bottom one. This number can be 45 or 76 or 91.
Further, between Round 1 and Round 2, two numbers that appeared in Round 1 must be removed and two new numbers will be added. The numbers that are removed correspond to the faces which will be the top and bottom faces in Round 2 (since the top and bottom faces will be different in two consecutive rounds). The numbers that are added in Round 2 will correspond to the faces that were the top and bottom faces in Round 1. The other two numbers which remain unchanged will also be on opposite faces of the container.
If the number that Rajesh did not note in Round 1 is 45, then in both Round 1 and Round 2, 23 and 45 must have been visible. Hence, 23 and 45 must be opposite each other. From the information on Round 1, 54 and 81 will be opposite each other. Hence, the remaining 76 and 91 will be opposite each other.
However, in round 3, the numbers are 45, 91 and 81. The fourth number in round 3 must be 54 (as it is opposite 81) and 76 (as it is opposite 91) and 23 (as it is opposite 45).
Hence, this case is not possible.
If the fourth number in round 1 is 76, then 23 and 76 must have been visible in both Round 1 and Round 2. Hence, 23 and 76 must be opposite each other. 54 and 81 will be opposite each other and 45 and 91 will be opposite each other.
In round 3, the fourth number will be 54 as there is 81 in Round 3.
In Round 4, the fourth number will be 76 and 81 and 91. This is not possible. Hence, this case is not possible.
If the fourth number in round 1 is 91, then in Round 2, the fourth number cannot be determined.
In Round 3, the numbers are 45, 91 and 81. Only two numbers, 91 and 81, repeat in Round 1 and Round 3. Hence, these must be opposite each other. From Round 1, 23 and 54 must be opposite each other. The remaining numbers, 45 and 76 must be opposite each other.
In round 4, the fourth number must be 76. Hence, there are no inconsistencies in this case.
Hence, the pairs of codes opposite each other are **(23, 54); (45, 76); (91, 81).**

45 and 76 are on faces opposite each other. Choice (D)

Q7. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
In how many ways could the codes on the faces of the container have been written?

a) **1**

b) **2**

c) **4**

d) **8**

From the table, the codes on the six faces are 23, 54, 76, 45, 81 and 91.
Given that in Round 1, Rajesh observed the numbers 23, 54 and 81.
In Round 2, he observed 45, 23 and 76.
In Round 1, he did not note down the number on one face, which was neither the top face nor the bottom one. This number can be 45 or 76 or 91.
Further, between Round 1 and Round 2, two numbers that appeared in Round 1 must be removed and two new numbers will be added. The numbers that are removed correspond to the faces which will be the top and bottom faces in Round 2 (since the top and bottom faces will be different in two consecutive rounds). The numbers that are added in Round 2 will correspond to the faces that were the top and bottom faces in Round 1. The other two numbers which remain unchanged will also be on opposite faces of the container.
If the number that Rajesh did not note in Round 1 is 45, then in both Round 1 and Round 2, 23 and 45 must have been visible. Hence, 23 and 45 must be opposite each other. From the information on Round 1, 54 and 81 will be opposite each other. Hence, the remaining 76 and 91 will be opposite each other.
However, in round 3, the numbers are 45, 91 and 81. The fourth number in round 3 must be 54 (as it is opposite 81) and 76 (as it is opposite 91) and 23 (as it is opposite 45).
Hence, this case is not possible.
If the fourth number in round 1 is 76, then 23 and 76 must have been visible in both Round 1 and Round 2. Hence, 23 and 76 must be opposite each other. 54 and 81 will be opposite each other and 45 and 91 will be opposite each other.
In round 3, the fourth number will be 54 as there is 81 in Round 3.
In Round 4, the fourth number will be 76 and 81 and 91. This is not possible. Hence, this case is not possible.
If the fourth number in round 1 is 91, then in Round 2, the fourth number cannot be determined.
In Round 3, the numbers are 45, 91 and 81. Only two numbers, 91 and 81, repeat in Round 1 and Round 3. Hence, these must be opposite each other. From Round 1, 23 and 54 must be opposite each other. The remaining numbers, 45 and 76 must be opposite each other.
In round 4, the fourth number must be 76. Hence, there are no inconsistencies in this case.
Hence, the pairs of codes opposite each other are **(23, 54); (45, 76); (91, 81).**

Since the codes on faces opposite each other are fixed, there are only two ways in which the codes could have been written. Choice (B)

Q8. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
What is the maximum possible sum of the codes on any two faces adjacent to each other?

a) **157**

b) **167**

c) **145**

d) **None of the above**

From the table, the codes on the six faces are 23, 54, 76, 45, 81 and 91.
Given that in Round 1, Rajesh observed the numbers 23, 54 and 81.
In Round 2, he observed 45, 23 and 76.
In Round 1, he did not note down the number on one face, which was neither the top face nor the bottom one. This number can be 45 or 76 or 91.
Further, between Round 1 and Round 2, two numbers that appeared in Round 1 must be removed and two new numbers will be added. The numbers that are removed correspond to the faces which will be the top and bottom faces in Round 2 (since the top and bottom faces will be different in two consecutive rounds). The numbers that are added in Round 2 will correspond to the faces that were the top and bottom faces in Round 1. The other two numbers which remain unchanged will also be on opposite faces of the container.
If the number that Rajesh did not note in Round 1 is 45, then in both Round 1 and Round 2, 23 and 45 must have been visible. Hence, 23 and 45 must be opposite each other. From the information on Round 1, 54 and 81 will be opposite each other. Hence, the remaining 76 and 91 will be opposite each other.
However, in round 3, the numbers are 45, 91 and 81. The fourth number in round 3 must be 54 (as it is opposite 81) and 76 (as it is opposite 91) and 23 (as it is opposite 45).
Hence, this case is not possible.
If the fourth number in round 1 is 76, then 23 and 76 must have been visible in both Round 1 and Round 2. Hence, 23 and 76 must be opposite each other. 54 and 81 will be opposite each other and 45 and 91 will be opposite each other.
In round 3, the fourth number will be 54 as there is 81 in Round 3.
In Round 4, the fourth number will be 76 and 81 and 91. This is not possible. Hence, this case is not possible.
If the fourth number in round 1 is 91, then in Round 2, the fourth number cannot be determined.
In Round 3, the numbers are 45, 91 and 81. Only two numbers, 91 and 81, repeat in Round 1 and Round 3. Hence, these must be opposite each other. From Round 1, 23 and 54 must be opposite each other. The remaining numbers, 45 and 76 must be opposite each other.
In round 4, the fourth number must be 76. Hence, there are no inconsistencies in this case.
Hence, the pairs of codes opposite each other are **(23, 54); (45, 76); (91, 81).**

The maximum possible sum of codes on any two faces adjacent each other = 91 + 76 = 167. Choice (B)

DIRECTIONS *for questions 9 to 12:* Answer the questions on the basis of the information given below.

A company manufactures three models of cars, Optimus, Bumblebee and Wheeljack. In a country, the numbers of units of these three models sold in the year 2018 are in the ratio 3 : 5 : 10, respectively. Each model was sold in one or more of the three states of the country, Iacon, Tarn and Vos. The numbers of units of Bumblebee sold in these three states in the year 2018 are in the ratio 7 : 2 : 4, respectively. In Vos, the numbers of units of the three models sold (in the order specified above) are in the ratio 5 : 3 : 6, respectively.

The following table provides partial information about the number of units of each model sold in each state in the year 2018:

		State		
		Iacon	Tarn	Vos
Model	Optimus	34		
	Bumblebee			
	Wheeljack	150		

Q9. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
Which of the following statements regarding the number of units of Optimus sold is definitely true?

a) **It is the highest for Vos.**

b) **It is the lowest for Iacon.**

c) **It is the highest for Tarn.**

d) **None of the above**

Let the number of vehicles of Bumblebee sold in Vos be 60x (to ensure that we get integer multiples of x for the given ratios).
We can fill the values in the table based on the given ratios:

		State			TOTAL
		Iacon	Tarn	Vos	
Model	Optimus	34	17x – 34	100x	117x
	Bumblebee	105x	30x	60x	195x
	Wheeljack	150	270x – 150	120x	390x
TOTAL		184+105x	317x – 184	280x	702x

The number of units of Optimus sold in Vos will definitely be higher than that sold in the other two states combined. Hence, option A is correct. Choice (A)

Q10. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.

Which of the following statements is definitely false?

I. The number of units of Wheeljack sold in Iacon is greater than that sold in Vos.
II. The number of units of Wheeljack sold in Tarn is less than that sold in Vos.
III. The number of units of Wheeljack sold in Vos is less than that sold in Tarn.
IV. The number of units of Wheeljack sold in Iacon is less than that sold in Tarn.

a) **Only II and IV**

b) **Only I and II**

c) **Only III and IV**

d) **None of the above**

Let the number of vehicles of Bumblebee sold in Vos be 60x (to ensure that we get integer multiples of x for the given ratios).
We can fill the values in the table based on the given ratios:

		State			TOTAL
		Iacon	Tarn	Vos	
Model	Optimus	34	17x – 34	100x	117x
	Bumblebee	105x	30x	60x	195x
	Wheeljack	150	270x – 150	120x	390x
TOTAL		184+105x	317x – 184	280x	702x

The number of units of Optimus sold in Tarn = 17x – 34.
This value cannot be negative. Hence, x must be at least 2.
For x = 2, the number of units of Wheeljack sold in the three states will be 150, 390 and 240.
For any higher value of x, the number of units of Wheeljack sold in Tarn will be greater than that sold in any of the other two states.
Hence, statements I and II are both definitely false. Choice (B)

Q11. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
What is the minimum number of units of Bumblebee sold in the three states combined?

a) **1180**

b) **590**

c) **780**

d) **390**

Let the number of vehicles of Bumblebee sold in Vos be 60x (to ensure that we get integer multiples of x for the given ratios).
We can fill the values in the table based on the given ratios:

		State			TOTAL
		Iacon	Tarn	Vos	
Model	Optimus	34	17x – 34	100x	117x
	Bumblebee	105x	30x	60x	195x
	Wheeljack	150	270x – 150	120x	390x
TOTAL		184+105x	317x – 184	280x	702x

The number of units of Optimus sold in Tarn = 17x – 34.
This value cannot be negative. Hence, x must be at least 2.
The minimum number of units of Bumblebee sold in the three states must be 195 × 2 = 390 Choice (D)

Q12. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
If the number of units of Wheeljack sold in Tarn is at least 60% of the total number of units of Wheeljack sold, what is the minimum number of units of Optimus sold in Vos?

a) **200**

b) **400**

c) **500**

d) **600**

Let the number of vehicles of Bumblebee sold in Vos be 60x (to ensure that we get integer multiples of x for the given ratios).
We can fill the values in the table based on the given ratios:

		State			TOTAL
		Iacon	Tarn	Vos	
Model	Optimus	34	17x – 34	100x	117x
	Bumblebee	105x	30x	60x	195x
	Wheeljack	150	270x – 150	120x	390x
TOTAL		184+105x	317x – 184	280x	702x

Given that 270x – 150 is at least 60% of 390x.
Hence, $\frac{270x-150}{390x} > 0.6 \Rightarrow 36x > 150 \Rightarrow x > 4.17$
The minimum possible value of x is 5.
Hence, the minimum number of units of Optimus sold in Vos = 500 Choice (C)

DIRECTIONS *for questions 13 to 16:* Answer the questions on the basis of the information given below.

In a game show, there are *n* bulbs, each of which can be operated by the press of a button. If a bulb is initially OFF, pressing the button connected to the bulb once, will make the bulb glow Green; pressing it two times, will make the bulb glow Blue; pressing it three times, will make the bulb glow Yellow; pressing it four times, will make the bulb glow Red, while pressing it the fifth time will switch the bulb OFF. This cycle repeats itself for any number of button presses, from the sixth time onwards.

The *n* bulbs are all present in one room and none of the bulbs is visible from outside this room. The buttons connected to these *n* bulbs are all in a different room. Gaurav, a participant in the game show, was asked to operate the buttons and try to figure out the respective button connected to each bulb. Every time he enters the room in which the bulbs are present and checks the status of the bulbs, it is counted as one *visit*. The objective of the game is to minimize his number of *visits*.

Q13. DIRECTIONS *for questions 13 to 16:* Type in your answer in the input box provided below the question.
If n = 2048, what is the minimum number of *visits* required?

Each bulb has five states – OFF, Green, Blue, Yellow and Red.
Hence, with one visit, the buttons connected to five bulbs can be determined (by pressing each button a different number of times).
With two visits, it is possible to determine the buttons connected to 25 bulbs in the following manner.
Let 0 represent the button in OFF position, and 1 to 4 represent the button pressed once through four times respectively.
In the number system to the base 5, we can express from the numbers 0 to 24 using only two digits. In these 25 numbers, the first digit of each of the numbers determines the state of the 25 buttons in first visit, while the second digit of each of the numbers determines the state of the 25 buttons in the second visit.
The numbers in base 5 are given in the following table:

First Digit	Second Digit
0	0
0	1
0	2
0	3
0	4
1	0
1	1

First Digit	Second Digit
1	2
1	3
1	4
2	0
2	1
2	2
2	3

First Digit	Second Digit
2	4
3	0
3	1
3	2
3	3
3	4
4	0

First Digit	Second Digit
4	1
4	2
4	3
4	4

In the first visit, the state of the 25 buttons are denoted by the first digit in the above table. That is, first 5 buttons will be OFF, next 5 buttons will be pressed once and so on.
In the second visit, the state of the 25 buttons are denoted by the second digit in the above table. That is, first button is OFF, second button is pressed once, third button is pressed twice and so on.
Note that across these two visits, no two bulbs have the same state. Hence, each and every one of the 25 bulbs and its connected buttons can be identified using these two visits.
Hence, for any number of bulbs, b, the minimum number of trials required is a, where $5^a \geq b$.

For 2048 bulbs, the number of trials required is 5 (since $5^5 \geq 2048$). Ans: (5)

DIRECTIONS *for questions 13 to 16:* Answer the questions on the basis of the information given below.

In a game show, there are *n* bulbs, each of which can be operated by the press of a button. If a bulb is initially OFF, pressing the button connected to the bulb once, will make the bulb glow Green; pressing it two times, will make the bulb glow Blue; pressing it three times, will make the bulb glow Yellow; pressing it four times, will make the bulb glow Red, while pressing it the fifth time will switch the bulb OFF. This cycle repeats itself for any number of button presses, from the sixth time onwards.

The *n* bulbs are all present in one room and none of the bulbs is visible from outside this room. The buttons connected to these *n* bulbs are all in a different room. Gaurav, a participant in the game show, was asked to operate the buttons and try to figure out the respective button connected to each bulb. Every time he enters the room in which the bulbs are present and checks the status of the bulbs, it is counted as one *visit*. The objective of the game is to minimize his number of *visits*.

Q14. DIRECTIONS *for questions 13 to 16:* Type in your answer in the input box provided below the question.
If *n* is a multiple of 64 and Gaurav was able to determine the button connected to each bulb in 5 *visits*, what is the maximum possible value of *n*?

Each bulb has five states – OFF, Green, Blue, Yellow and Red.
Hence, with one visit, the buttons connected to five bulbs can be determined (by pressing each button a different number of times).
With two visits, it is possible to determine the buttons connected to 25 bulbs in the following manner.
Let 0 represent the button in OFF position, and 1 to 4 represent the button pressed once through four times respectively.
In the number system to the base 5, we can express from the numbers 0 to 24 using only two digits. In these 25 numbers, the first digit of each of the numbers determines the state of the 25 buttons in first visit, while the second digit of each of the numbers determines the state of the 25 buttons in the second visit.
The numbers in base 5 are given in the following table:

First Digit	Second Digit
0	0
0	1
0	2
0	3
0	4
1	0
1	1

First Digit	Second Digit
1	2
1	3
1	4
2	0
2	1
2	2
2	3

First Digit	Second Digit
2	4
3	0
3	1
3	2
3	3
3	4
4	0

First Digit	Second Digit
4	1
4	2
4	3
4	4

In the first visit, the state of the 25 buttons are denoted by the first digit in the above table. That is, first 5 buttons will be OFF, next 5 buttons will be pressed once and so on.
In the second visit, the state of the 25 buttons are denoted by the second digit in the above table. That is, first button is OFF, second button is pressed once, third button is pressed twice and so on.
Note that across these two visits, no two bulbs have the same state. Hence, each and every one of the 25 bulbs and its connected buttons can be identified using these two visits.
Hence, for any number of bulbs, b, the minimum number of trials required is a, where $5^a \geq b$.

With 5 trials, Gaurav can determine the buttons for $5^5 = 3125$ bulbs.
Since the number of bulbs is a multiple of 64, the highest multiple of 64 less than 3125 is 3072 (64 × 48). Ans: (3072)

Q15. DIRECTIONS *for questions 13 to 16:* Type in your answer in the input box provided below the question.

Due to a malfunction in the circuitry, every time a bulb is supposed to be glowing (i.e., not OFF), it does not necessarily glow in the colour that it is supposed to glow in (as per the description above), but glows in any of the four possible colours randomly. However, every fifth time the button is pressed the bulb turns OFF, just as it is supposed to. Gaurav was informed about this malfunction and was asked to figure out the respective buttons connected to each bulb.

If $n = 48$, what is the minimum number of *visits* required?

Each bulb has five states – OFF, Green, Blue, Yellow and Red.
Hence, with one visit, the buttons connected to five bulbs can be determined (by pressing each button a different number of times).
With two visits, it is possible to determine the buttons connected to 25 bulbs in the following manner.
Let 0 represent the button in OFF position, and 1 to 4 represent the button pressed once through four times respectively.
In the number system to the base 5, we can express from the numbers 0 to 24 using only two digits. In these 25 numbers, the first digit of each of the numbers determines the state of the 25 buttons in first visit, while the second digit of each of the numbers determines the state of the 25 buttons in the second visit.
The numbers in base 5 are given in the following table:

First Digit	Second Digit
0	0
0	1
0	2
0	3
0	4
1	0
1	1

First Digit	Second Digit
1	2
1	3
1	4
2	0
2	1
2	2
2	3

First Digit	Second Digit
2	4
3	0
3	1
3	2
3	3
3	4
4	0

First Digit	Second Digit
4	1
4	2
4	3
4	4

In the first visit, the state of the 25 buttons are denoted by the first digit in the above table. That is, first 5 buttons will be OFF, next 5 buttons will be pressed once and so on.
In the second visit, the state of the 25 buttons are denoted by the second digit in the above table. That is, first button is OFF, second button is pressed once, third button is pressed twice and so on.
Note that across these two visits, no two bulbs have the same state. Hence, each and every one of the 25 bulbs and its connected buttons can be identified using these two visits.
Hence, for any number of bulbs, b, the minimum number of trials required is a, where $5^a \geq b$.

If the bulbs glow in a random colour every time, then we will not be able to discern whether the button associated with the bulb is pressed once or twice or thrice or four times.
The only information we can get by pressing the button is whether the bulb has turned OFF or ON.
Hence, in this case, the buttons effectively have only two states.
If there are only two states to the button, then for any number of bulbs, b, the minimum number of trials required is a, where $2^a \geq b$.
For n = 48, a minimum of 6 trials are required. Ans: (6)

Q16. DIRECTIONS *for questions 13 to 16:* Type in your answer in the input box provided below the question.

Due to a malfunction in the circuitry, every time a bulb is supposed to be glowing (i.e., not OFF), it does not necessarily glow in the colour that it is supposed to glow in (as per the description above), and glows in any colour, which is not necessarily one of the four possible colours. However, every fifth time the button is pressed the bulb turns OFF, just as it is supposed to. Gaurav was informed about this malfunction and was asked to figure out the respective buttons connected to each bulb.

If Gaurav was able to determine the button connected to each bulb in 5 *visits*, what is the maximum possible value of *n*?

Each bulb has five states – OFF, Green, Blue, Yellow and Red.
Hence, with one visit, the buttons connected to five bulbs can be determined (by pressing each button a different number of times).
With two visits, it is possible to determine the buttons connected to 25 bulbs in the following manner.
Let 0 represent the button in OFF position, and 1 to 4 represent the button pressed once through four times respectively.
In the number system to the base 5, we can express from the numbers 0 to 24 using only two digits. In these 25 numbers, the first digit of each of the numbers determines the state of the 25 buttons in first visit, while the second digit of each of the numbers determines the state of the 25 buttons in the second visit.
The numbers in base 5 are given in the following table:

First Digit	Second Digit
0	0
0	1
0	2
0	3
0	4
1	0
1	1

First Digit	Second Digit
1	2
1	3
1	4
2	0
2	1
2	2
2	3

First Digit	Second Digit
2	4
3	0
3	1
3	2
3	3
3	4
4	0

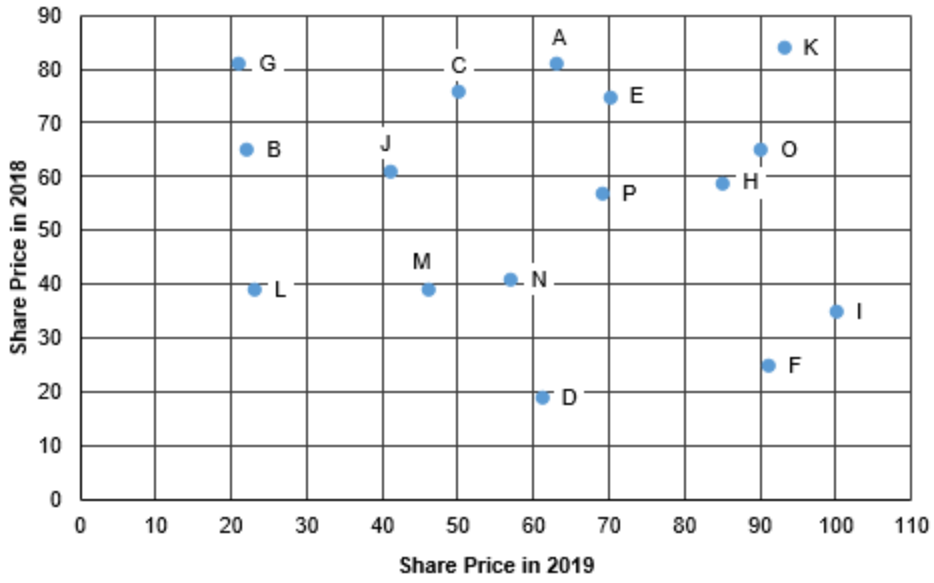
First Digit	Second Digit
4	1
4	2
4	3
4	4

In the first visit, the state of the 25 buttons are denoted by the first digit in the above table. That is, first 5 buttons will be OFF, next 5 buttons will be pressed once and so on.
In the second visit, the state of the 25 buttons are denoted by the second digit in the above table. That is, first button is OFF, second button is pressed once, third button is pressed twice and so on.
Note that across these two visits, no two bulbs have the same state. Hence, each and every one of the 25 bulbs and its connected buttons can be identified using these two visits.
Hence, for any number of bulbs, b, the minimum number of trials required is a, where $5^a \geq b$.

From the above solution, the maximum possible value of n = $2^5 = 32$ Ans: (32)

DIRECTIONS *for questions 17 to 20:* Answer the questions on the basis of the information given below.

The scatter plot below provides the price (in Rs.) of a share of each of sixteen companies, labelled A through P, at the beginning of 2018 and at the beginning of 2019. At the beginning of 2018, Hari purchased a few shares of some of these sixteen companies and, at the beginning of 2019, sold all the shares that he purchased.



Q17. DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.
If Hari purchased the shares of a certain company for Rs.1,00,000 and sold all the shares for less than Rs.40,000, the shares that he purchased could have belonged to which of the following company?

a) **B**

b) **L**

c) **F**

d) **K**

Since he purchased shares for ₹100000 and sold for less than ₹40000, the price of a share in 2019 must have become 40% or less of that in 2018.
This occurred for only two companies, G and B. From the given options, the answer is B. Choice (A)

Q18. DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.
Hari purchased a few shares of a certain company in 2018 for Rs.x and sold these shares in 2019 for Rs.y. If the difference between x and y is at most Rs.10000, what is the maximum number of shares that he purchased (approximately)?

a) **7500**

b) **2000**

c) **5000**

d) **2500**

To maximize the number of shares that he purchased, we need to minimize the difference in the share price between 2019 and 2018.
By observation, we can see that the difference in share price is the minimum for E and the difference is ₹5.
Hence, the maximum number of shares that he could have purchased = 10000/5 = 2000. Choice (B)

Q19. DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.
In 2018, Hari purchased 1000 shares of each of two companies for a total of Rs.1,00,000 and, in 2019, he sold all the shares for more than Rs.1,75,000.

What is the maximum amount that he spent on purchasing shares of any company?

a) **Rs.94,000**

b) **Rs.86,000**

c) **Rs.60,000**

d) **Rs.65,000**

Since Hari purchased exactly 1000 shares of the each of the two companies, to purchase for exactly ₹100000, the sum of the share prices of the two companies must be ₹100.
Hence, if share price of one of the companies is x, then the other must be 100 – x.
Consider the companies whose share prices are less than 50 in 2017. We can try to find corresponding shares with share price greater than 50.
For L, share price in 2018 is 39. J has a share price of 61. However, the sum of the share prices of these two companies in 2019 must be more than 175. However, the sum of the share prices is only around 64.
For M, the share price is 39. For M and J, the sum of the share prices in 2019 is around 87.
For N, the share price is 41. H has a share price of 59. The sum of the share prices of H and N in 2019 is around 142.
For D, the share price is 19. The share price of A is 81. The sum of the share prices of A and D in 2019 is around 124.
For F, the share price is 25. The share price of E is 75. The sum of the share prices of E and F in 2019 is around 161.
For I, the share price is 35. The share price of O and B is 65. The sum of share prices of I and B is around 123. The sum of the share prices of I and O is 190.
Hence, there is only one possibility for the shares that he purchased. He must have purchased I and O.
The maximum amount that he would have spent in purchasing the shares of any company = 65 × 1000 = ₹65000 Choice (D)

Q20. DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.
In 2018, Hari purchased 1000 shares of each of two companies for a total of Rs.1,00,000 and, in 2019, he sold all the shares for more than Rs.1,75,000.

What is the profit percentage that he made in purchasing and selling these shares?

a) **75%**

b) **80%**

c) **90%**

d) **110%**

From the above solution, he would have sold the shares at ₹190000. Hence, the profit percentage will be 90%. Choice (C)

DIRECTIONS *for questions 21 to 24:* Answer the questions on the basis of the information given below.

Six persons, A through F, have a certain number of books among themselves. For any group of persons among the six, the average number of books per person for that group is an integer.

It is also known that

i. the total number of books with the six persons is 2700.
ii. B has more number of books than C and the difference between the number of books with B and C is between 150 and 200.
iii. the number of books with D is the same as the sum of the number of the books with A and E.
iv. the number of books with A, F and B are in the ratio 3 : 4 : 5 and no person has more than 800 books.

Q21. DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.
What is the number of books with A?

a) **120**

b) **150**

c) **300**

d) **360**

Given that the average number of books for any group of persons is an integer.
Consider any 3 of the six numbers. The average of this group of 3 numbers must be an integer. This implies that the sum of these three numbers is a multiple of 3. If one of these three numbers is replaced with any of the other three numbers, the average of the new group must also be an integer, i.e., the sum of this new groups of three numbers is also a multiple of 3. This implies that the new number differs from the original number by a multiple of 3 (only then can the sum of both the groups be divisible by 3). Therefore, we can conclude that the difference between any two of the six numbers must also be a multiple of 3.
Considering a group of any two of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 2.
Considering a group of any four of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 4.
Considering a group of any five of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 5.
Consider the group of 6 (i.e., all the persons).

- The average of any group of 2 or 3 or 4 or 5 numbers will be an integer if all the conditions above are satisfied simultaneously. For all the conditions above to be satisfied simultaneously, the difference between any pair of numbers must be a multiple of the LCM of 2, 3, 4 and 5, i.e., 60.
- The average of entire group is an integer if the sum of the numbers is a multiple of 6.

Hence, the difference between any two numbers is a multiple of 60 and the total number of books with them must be a multiple of 6. From (i), the total number of books is 2700, which is multiple of 6.
From (iv), let the number of books with A be 3a. From (iv), the number of books with F and B must be 4a and 5a respectively.
From (ii), C must have 180 books less than B (since the difference in the number of books between any two persons is a multiple of 60).
Hence, C must have 5a – 180 books.
Let the number of books with E be e.
The number of books with D must be 3a + e.
From (i), the total number of books with the six of them is 2700.
Hence, $(3a) + (5a) + (5a - 180) + (3a + e) + (e) + (4a) = 2700 \Rightarrow 10a + e = 1440$
Since the difference in the number of books between A and F is 4a – 3a = a, a must be a multiple of 60.
Further, the difference in the number of books between E and F is 4a – e. This must be a multiple of 60. Since a (and 4a) is a multiple of 60, e must also be a multiple of 60.
The only possibility where a and e both are multiples of 60 is when e = 240 and a = 120 and when e = 840 and a = 60. However, the second case is not possible because of (iv).
Hence, e = 240 and a = 120.
The following table provides the number of books with each person:

Person	Number of books
A	360
B	600
C	420
D	600
E	240
F	480

A has 360 books. Choice (D)

Q22. DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.
What is the difference between the highest number of books with any person and the lowest number of books with any person?

a) **200**

b) **300**

c) **360**

d) **420**

Given that the average number of books for any group of persons is an integer.
Consider any 3 of the six numbers. The average of this group of 3 numbers must be an integer. This implies that the sum of these three numbers is a multiple of 3. If one of these three numbers is replaced with any of the other three numbers, the average of the new group must also be an integer, i.e., the sum of this new groups of three numbers is also a multiple of 3. This implies that the new number differs from the original number by a multiple of 3 (only then can the sum of both the groups be divisible by 3). Therefore, we can conclude that the difference between any two of the six numbers must also be a multiple of 3.
Considering a group of any two of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 2.
Considering a group of any four of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 4.
Considering a group of any five of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 5.
Consider the group of 6 (i.e., all the persons).

- The average of any group of 2 or 3 or 4 or 5 numbers will be an integer if all the conditions above are satisfied simultaneously. For all the conditions above to be satisfied simultaneously, the difference between any pair of numbers must be a multiple of the LCM of 2, 3, 4 and 5, i.e., 60.
- The average of entire group is an integer if the sum of the numbers is a multiple of 6.

Hence, the difference between any two numbers is a multiple of 60 and the total number of books with them must be a multiple of 6. From (i), the total number of books is 2700, which is multiple of 6.
From (iv), let the number of books with A be 3a. From (iv), the number of books with F and B must be 4a and 5a respectively.
From (ii), C must have 180 books less than B (since the difference in the number of books between any two persons is a multiple of 60).
Hence, C must have 5a – 180 books.
Let the number of books with E be e.
The number of books with D must be 3a + e.
From (i), the total number of books with the six of them is 2700.
Hence, $(3a) + (5a) + (5a - 180) + (3a + e) + (e) + (4a) = 2700 \Rightarrow 10a + e = 1440$
Since the difference in the number of books between A and F is 4a – 3a = a, a must be a multiple of 60.
Further, the difference in the number of books between E and F is 4a – e. This must be a multiple of 60. Since a (and 4a) is a multiple of 60, e must also be a multiple of 60.
The only possibility where a and e both are multiples of 60 is when e = 240 and a = 120 and when e = 840 and a = 60. However, the second case is not possible because of (iv).
Hence, e = 240 and a = 120.
The following table provides the number of books with each person:

Person	Number of books
A	360
B	600
C	420
D	600
E	240
F	480

The difference between the highest number of books with any person and the lowest number of books with any person = 360 Choice (C)

Q23. DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices. What is the third lowest number of books with any person?

a) **300**

b) **360**

c) **420**

d) **500**

Given that the average number of books for any group of persons is an integer.
Consider any 3 of the six numbers. The average of this group of 3 numbers must be an integer. This implies that the sum of these three numbers is a multiple of 3. If one of these three numbers is replaced with any of the other three numbers, the average of the new group must also be an integer, i.e., the sum of this new groups of three numbers is also a multiple of 3. This implies that the new number differs from the original number by a multiple of 3 (only then can the sum of both the groups be divisible by 3). Therefore, we can conclude that the difference between any two of the six numbers must also be a multiple of 3.
Considering a group of any two of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 2.
Considering a group of any four of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 4.
Considering a group of any five of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 5.
Consider the group of 6 (i.e., all the persons).

- The average of any group of 2 or 3 or 4 or 5 numbers will be an integer if all the conditions above are satisfied simultaneously. For all the conditions above to be satisfied simultaneously, the difference between any pair of numbers must be a multiple of the LCM of 2, 3, 4 and 5, i.e., 60.
- The average of entire group is an integer if the sum of the numbers is a multiple of 6.

Hence, the difference between any two numbers is a multiple of 60 and the total number of books with them must be a multiple of 6. From (i), the total number of books is 2700, which is multiple of 6.
From (iv), let the number of books with A be 3a. From (iv), the number of books with F and B must be 4a and 5a respectively.
From (ii), C must have 180 books less than B (since the difference in the number of books between any two persons is a multiple of 60).
Hence, C must have 5a – 180 books.
Let the number of books with E be e.
The number of books with D must be 3a + e.
From (i), the total number of books with the six of them is 2700.
Hence, $(3a) + (5a) + (5a - 180) + (3a + e) + (e) + (4a) = 2700 \Rightarrow 10a + e = 1440$
Since the difference in the number of books between A and F is 4a – 3a = a, a must be a multiple of 60.
Further, the difference in the number of books between E and F is 4a – e. This must be a multiple of 60. Since a (and 4a) is a multiple of 60, e must also be a multiple of 60.
The only possibility where a and e both are multiples of 60 is when e = 240 and a = 120 and when e = 840 and a = 60. However, the second case is not possible because of (iv).
Hence, e = 240 and a = 120.
The following table provides the number of books with each person:

Person	Number of books
A	360
B	600
C	420
D	600
E	240
F	480

The third lowest number of books with any person = 420 Choice (C)

Q24. DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.

What is the sum of the number of books with C and E?

a) **580**

b) **660**

c) **600**

d) **720**

Given that the average number of books for any group of persons is an integer.
Consider any 3 of the six numbers. The average of this group of 3 numbers must be an integer. This implies that the sum of these three numbers is a multiple of 3. If one of these three numbers is replaced with any of the other three numbers, the average of the new group must also be an integer, i.e., the sum of this new groups of three numbers is also a multiple of 3. This implies that the new number differs from the original number by a multiple of 3 (only then can the sum of both the groups be divisible by 3). Therefore, we can conclude that the difference between any two of the six numbers must also be a multiple of 3.
Considering a group of any two of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 2.
Considering a group of any four of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 4.
Considering a group of any five of the six numbers, we can similarly conclude that the difference between any two of the six numbers must also be a multiple of 5.
Consider the group of 6 (i.e., all the persons).

- The average of any group of 2 or 3 or 4 or 5 numbers will be an integer if all the conditions above are satisfied simultaneously. For all the conditions above to be satisfied simultaneously, the difference between any pair of numbers must be a multiple of the LCM of 2, 3, 4 and 5, i.e., 60.
- The average of entire group is an integer if the sum of the numbers is a multiple of 6.

Hence, the difference between any two numbers is a multiple of 60 and the total number of books with them must be a multiple of 6. From (i), the total number of books is 2700, which is multiple of 6.
From (iv), let the number of books with A be 3a. From (iv), the number of books with F and B must be 4a and 5a respectively.
From (ii), C must have 180 books less than B (since the difference in the number of books between any two persons is a multiple of 60).
Hence, C must have 5a – 180 books.
Let the number of books with E be e.
The number of books with D must be 3a + e.
From (i), the total number of books with the six of them is 2700.
Hence, $(3a) + (5a) + (5a - 180) + (3a + e) + (e) + (4a) = 2700 \Rightarrow 10a + e = 1440$
Since the difference in the number of books between A and F is 4a – 3a = a, a must be a multiple of 60.
Further, the difference in the number of books between E and F is 4a – e. This must be a multiple of 60. Since a (and 4a) is a multiple of 60, e must also be a multiple of 60.
The only possibility where a and e both are multiples of 60 is when e = 240 and a = 120 and when e = 840 and a = 60. However, the second case is not possible because of (iv).
Hence, e = 240 and a = 120.
The following table provides the number of books with each person:

Person	Number of books
A	360
B	600
C	420
D	600
E	240
F	480

The total number of books with C and E = 660 Choice (B)

DIRECTIONS *for questions 25 to 28:* Answer the questions on the basis of the information given below.

Uday rated 50 companies, each on a scale of 1 to 5, on four parameters, Employee Satisfaction, Customer Satisfaction, Shareholder Satisfaction and Supplier Satisfaction. The following bar graph provides the number of companies that were given each rating in each parameter:

It is known that

i. the rating of any company in Customer Satisfaction was not greater than its rating in Supplier Satisfaction.
ii. the rating of any company in Shareholder Satisfaction was not greater than its rating in Employee Satisfaction.

Q25. DIRECTIONS *for questions 25 to 28:* Type in your answer in the input box provided below the question.
What is the maximum number of companies which have the same rating in both Shareholder Satisfaction and Employee Satisfaction?

Let ES, CS, SHS and SUS represent the four parameters, Employee Satisfaction, Customer Satisfaction, Shareholder Satisfaction and Supplier Satisfaction, respectively.

The number of companies with rank 5 in SHS is 5. Of the 10 companies that have rank 5 in ES, 5 companies must have rank 5 in SHS.
The number of companies with rank 4 in SHS is 10. The number of companies with rank 4 in ES is 5. Hence, of the 10 companies with rank 4 in SHS, five will have rank 5 in ES and five will have rank 4 in ES.
The number of companies with rank 3 in SHS is 10. The number of companies with rank 3 in ES is 15. Hence, all the ten companies with rank 3 in SHS will have rank 3 in ES as well.
The number of companies with rank 2 in SHS is 20. The number of companies with rank 2 in ES is 15. Hence, fifteen companies with rank 2 in SHS will have rank 2 in ES and the other five companies with rank 2 in SHS will have rank 3 in ES.
The number of companies with rank 1 in SHS is 5 and the number of companies with rank 1 in ES is 5. Hence, these 5 companies will have the same rank, i.e., 1 in SHS and ES.
The number of companies with rank 5 in both parameters = 5
The number of companies with rank 4 in both parameters = 5
The number of companies with rank 3 in both parameters = 10
The number of companies with rank 2 in both parameters = 15
The number of companies with rank 1 in both parameters = 5
Note that there is only possibility for the number of companies with the same rank, which is 5 + 5 + 10 + 15 + 5 = 40. Ans: (40)

Q26. DIRECTIONS *for questions 25 to 28:* Type in your answer in the input box provided below the question.
What is the maximum number of companies which are rated 2 in Customer Satisfaction, 2 in Supplier Satisfaction, 3 in Employee Satisfaction and 2 in Shareholder Satisfaction?

Let ES, CS, SHS and SUS represent the four parameters, Employee Satisfaction, Customer Satisfaction, Shareholder Satisfaction and Supplier Satisfaction, respectively.

From the graph, we can see that there are 10 companies which have rank 5 in CS. All these 10 companies must also have rank of 5 in SUS. There are a total of 15 companies with rank 5 in SUS and 10 of these companies must have rank 5 in CS.
There are 5 companies with rank 4 in CS and there are 10 companies with rank 4 in SUS. 5 companies which have rank 4 or 5 in SUS can be the five companies with rank 4 in CS. Hence, the 5 companies with rank 4 in CS can have rank 4 or 5 in SUS.
There are 15 companies with rank 3 in CS and 5 companies with rank 3 in SUS. All these 5 companies with rank 3 in SUS must have rank 3 in CS as well. The remaining 10 companies with rank 3 in CS can have rank 4 or 5 in SS.
There are 10 companies with rank 2 in CS and 15 companies with rank 2 in SUS. Hence, the 10 companies with rank 2 in CS must have rank 2 in SUS.
Therefore, the number of companies which are ranked 2 in both CS and SUS is 10.
From the previous solution, the number of companies which are ranked 2 in SHS and 3 in ES is 5.
Since there is no information on the link between these two pairs of ranks, we can take the maximum number of companies which satisfy all the four ranks to be 5.

Ans: (5)

Q27. DIRECTIONS *for questions 25 to 28:* Type in your answer in the input box provided below the question.
What is the maximum number of companies which have the same rating in all the four parameters?

Let ES, CS, SHS and SUS represent the four parameters, Employee Satisfaction, Customer Satisfaction, Shareholder Satisfaction and Supplier Satisfaction, respectively.

The number of companies with rank 5 in both CS and SUS = 10
The number of companies with rank 5 in both ES and SHS = 5
The maximum number of companies with rank 5 in all parameters = 5
The maximum number of companies with rank 4 in both CS and SUS = 5
The number of companies with rank 4 in both ES and SHS = 5
The maximum number of companies with rank 4 in all parameters = 5
The number of companies with rank 3 in both CS and SUS = 5
The number of companies with rank 3 in both ES and SHS = 10
The maximum number of companies with rank 3 in all parameters = 5
The number of companies with rank 2 in both CS and SUS = 10
The number of companies with rank 2 in both ES and SHS = 15
The maximum number of companies with rank 2 in all parameters = 10
The number of companies with rank 1 in both CS and SUS = 5
The number of companies with rank 1 in both ES and SHS = 5
The maximum number of companies with rank 1 in all parameters = 5
The maximum number of companies with same rank in all parameters = 5 + 5 + 5 + 10 + 5 = 30

Ans: (30)

Q28. DIRECTIONS *for questions 25 to 28:* Type in your answer in the input box provided below the question.
What is the maximum number of companies which have distinct ratings in all the four parameters?

Let ES, CS, SHS and SUS represent the four parameters, Employee Satisfaction, Customer Satisfaction, Shareholder Satisfaction and Supplier Satisfaction, respectively.

The number of companies with rank 5 in CS and any other rank in SUS = 0
The maximum number of companies with rank 4 in CS and any other rank in SUS = 5 (these 5 companies can have rank 5 in SUS)
The number of companies with rank 3 in CS and any other rank in SUS = 10 (these 10 companies can have rank 4 in SUS)
The number of companies with rank 2 in CS and any other rank in SUS = 0
The number of companies with rank 1 in CS and any other rank in SUS = 5 (these five companies will have rank 2 in SUS)
Hence, for these two parameters, there are 5 companies with rank 4 in CS and rank 5 in SUS; 10 companies with rank 3 in CS and rank 4 in SUS; 5 companies with rank 1 in CS and rank 2 in SUS.
The number of companies with rank 5 in SHS and any other rank in ES = 0
The number of companies with rank 4 in SHS and any other rank in ES = 5 (these 5 companies will have rank 5 in ES)
The number of companies with rank 3 in SHS and any other rank in ES = 0
The number of companies with rank 2 in SHS and any other rank in ES = 5 (these 5 companies will have rank 3 in ES)
The number of companies with rank 1 in SHS and any other rank in ES = 0
Hence, for these two parameters, there are five companies with rank 4 in SHS and rank 5 in ES; five companies with rank 2 in SHS and rank 3 in ES.
Hence, there can be five companies with rank 4 in SHS, rank 5 in ES, rank 1 in CS and rank 2 in SUS and another five companies with rank 2 in SHS, rank 3 in ES, rank 4 in CS and ranks 5 in SUS.
There can be a maximum of 10 companies with four distinct ranks. Ans: (10)

DIRECTIONS *for questions 29 to 32:* Answer the questions on the basis of the information given below.

Each of six persons, Amit, Karan, Jai, Lokesh, Pavan and Ratan, are standing in a queue, one behind the other, all facing the same direction. Each person has with him a different number of chocolates among 10, 14, 18, 19, 23 and 29.

It is also known that

i. for any pair of persons adjacent to each other, the difference between the number of chocolates with the two of them is greater than four.

ii. Karan, who is standing behind Amit, has four chocolates more than the number of chocolates with the person standing at the end of the queue.
iii. not more than four persons are standing in front of the person with the least number of chocolates.
iv. Jai is standing immediately behind Lokesh.
v. Pavan, who has five chocolates more than Lokesh, is standing three places away from Amit.

Q29. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices. Who has the highest number of chocolates?

a) **Jai**

b) **Pavan**

c) **Ratan**

d) **Amit**

From (ii), Karan has 4 chocolates more than the person at the end of the queue.
Hence, Karan can have 14 or 18 or 23 chocolates, while the person at the end of the queue can have 10 or 14 or 19 chocolates.
From (iii), the person with the least number of chocolates is not at the end of the queue. Hence, the person at the end of the queue cannot have 10 chocolates and Karan cannot have 14 chocolates.
From (v), Pavan has 5 chocolates more than Lokesh. Hence, Pavan can have 19 or 23 chocolates, while Lokesh can have 14 or 18 chocolates. If Pavan and Lokesh have 23 and 18 chocolates respectively, then there will not be any possibilities for the number of chocolates with Karan.
Hence, Pavan must have 19 chocolates and Lokesh must have 14 chocolates.
Since Pavan has 19 chocolates, Karan must have 23 chocolates. The person standing at the end of the queue must, therefore, have 19 chocolates and this person must be Pavan.
From (v), Amit must be in the third place (since he is three places away from Pavan).
Karan must be behind Amit. Hence, Karan can be in the fourth or fifth place. If Karan is in the fifth place, then Pavan will be immediately behind Karan. But this violates condition (i), as Kiran and Pavan have 23 and 19 chocolates respectively. Since Pavan has 19 chocolates, Lokesh has 14 chocolates.
Hence, Karan must be in the fourth place.
From (iv), Jai is immediately behind Lokesh. Hence, Jai must be in second place and Lokesh must be in first place. Ratan must be in fifth place.
Lalit has 14 chocolates. Jai cannot have 10 or 18 chocolates (from (i)). Since Karan and Pavan have 23 and 19 chocolates respectively, Jai must have 29 chocolates.
Amit and Ratan can have 10 and 18 chocolates in any order. Ratan is standing immediately in front of Pavan, who has 19 chocolates. From (i), Ratan cannot have 18 chocolates. Hence, Ratan must have 10 chocolates, while Amit has 18 chocolates.
The following table provides the position of each person in the queue and the number of chocolates with each of them:

Position	Person	Number of Chocolates
1	Lokesh	14
2	Jai	29
3	Amit	18
4	Karan	23
5	Ratan	10
6	Pavan	19

Jai has the highest number of chocolates. Choice (A)

Q30. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.
How many chocolates does the person standing at the beginning of the queue have?

a) **29**

b) **19**

c) **14**

d) **23**

From (ii), Karan has 4 chocolates more than the person at the end of the queue.
Hence, Karan can have 14 or 18 or 23 chocolates, while the person at the end of the queue can have 10 or 14 or 19 chocolates.
From (iii), the person with the least number of chocolates is not at the end of the queue. Hence, the person at the end of the queue cannot have 10 chocolates and Karan cannot have 14 chocolates.
From (v), Pavan has 5 chocolates more than Lokesh. Hence, Pavan can have 19 or 23 chocolates, while Lokesh can have 14 or 18 chocolates. If Pavan and Lokesh have 23 and 18 chocolates respectively, then there will not be any possibilities for the number of chocolates with Karan.
Hence, Pavan must have 19 chocolates and Lokesh must have 14 chocolates.
Since Pavan has 19 chocolates, Karan must have 23 chocolates. The person standing at the end of the queue must, therefore, have 19 chocolates and this person must be Pavan.
From (v), Amit must be in the third place (since he is three places away from Pavan).
Karan must be behind Amit. Hence, Karan can be in the fourth or fifth place. If Karan is in the fifth place, then Pavan will be immediately behind Karan. But this violates condition (i), as Kiran and Pavan have 23 and 19 chocolates respectively. Since Pavan has 19 chocolates, Lokesh has 14 chocolates.
Hence, Karan must be in the fourth place.
From (iv), Jai is immediately behind Lokesh. Hence, Jai must be in second place and Lokesh must be in first place. Ratan must be in fifth place.
Lalit has 14 chocolates. Jai cannot have 10 or 18 chocolates (from (i)). Since Karan and Pavan have 23 and 19 chocolates respectively, Jai must have 29 chocolates.
Amit and Ratan can have 10 and 18 chocolates in any order. Ratan is standing immediately in front of Pavan, who has 19 chocolates. From (i), Ratan cannot have 18 chocolates. Hence, Ratan must have 10 chocolates, while Amit has 18 chocolates.
The following table provides the position of each person in the queue and the number of chocolates with each of them:

Position	Person	Number of Chocolates
1	Lokesh	14
2	Jai	29
3	Amit	18
4	Karan	23
5	Ratan	10
6	Pavan	19

The person standing at the beginning of the queue, Lalit, has 14 chocolates.

Choice (C)

Q31. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.
What is the total number of chocolates with the last three persons in the queue?

a) **60**

b) **62**

c) **52**

d) **55**

From (ii), Karan has 4 chocolates more than the person at the end of the queue.
Hence, Karan can have 14 or 18 or 23 chocolates, while the person at the end of the queue can have 10 or 14 or 19 chocolates.
From (iii), the person with the least number of chocolates is not at the end of the queue. Hence, the person at the end of the queue cannot have 10 chocolates and Karan cannot have 14 chocolates.
From (v), Pavan has 5 chocolates more than Lokesh. Hence, Pavan can have 19 or 23 chocolates, while Lokesh can have 14 or 18 chocolates. If Pavan and Lokesh have 23 and 18 chocolates respectively, then there will not be any possibilities for the number of chocolates with Karan.
Hence, Pavan must have 19 chocolates and Lokesh must have 14 chocolates.
Since Pavan has 19 chocolates, Karan must have 23 chocolates. The person standing at the end of the queue must, therefore, have 19 chocolates and this person must be Pavan.
From (v), Amit must be in the third place (since he is three places away from Pavan).
Karan must be behind Amit. Hence, Karan can be in the fourth or fifth place. If Karan is in the fifth place, then Pavan will be immediately behind Karan. But this violates condition (i), as Kiran and Pavan have 23 and 19 chocolates respectively. Since Pavan has 19 chocolates, Lokesh has 14 chocolates.
Hence, Karan must be in the fourth place.
From (iv), Jai is immediately behind Lokesh. Hence, Jai must be in second place and Lokesh must be in first place. Ratan must be in fifth place.
Lalit has 14 chocolates. Jai cannot have 10 or 18 chocolates (from (i)). Since Karan and Pavan have 23 and 19 chocolates respectively, Jai must have 29 chocolates.
Amit and Ratan can have 10 and 18 chocolates in any order. Ratan is standing immediately in front of Pavan, who has 19 chocolates. From (i), Ratan cannot have 18 chocolates. Hence, Ratan must have 10 chocolates, while Amit has 18 chocolates.
The following table provides the position of each person in the queue and the number of chocolates with each of them:

Position	Person	Number of Chocolates
1	Lokesh	14
2	Jai	29
3	Amit	18
4	Karan	23
5	Ratan	10
6	Pavan	19

The total number of chocolates with the last three persons in the queue = 23 + 10 + 19 = 52 Choice (C)

Q32. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.
For how many persons is the number of chocolates with them greater than that with any person standing adjacent to them?

a) **0**

b) **1**

c) **2**

d) **3**

From (ii), Karan has 4 chocolates more than the person at the end of the queue.
Hence, Karan can have 14 or 18 or 23 chocolates, while the person at the end of the queue can have 10 or 14 or 19 chocolates.
From (iii), the person with the least number of chocolates is not at the end of the queue. Hence, the person at the end of the queue cannot have 10 chocolates and Karan cannot have 14 chocolates.
From (v), Pavan has 5 chocolates more than Lokesh. Hence, Pavan can have 19 or 23 chocolates, while Lokesh can have 14 or 18 chocolates. If Pavan and Lokesh have 23 and 18 chocolates respectively, then there will not be any possibilities for the number of chocolates with Karan.
Hence, Pavan must have 19 chocolates and Lokesh must have 14 chocolates.
Since Pavan has 19 chocolates, Karan must have 23 chocolates. The person standing at the end of the queue must, therefore, have 19 chocolates and this person must be Pavan.
From (v), Amit must be in the third place (since he is three places away from Pavan).
Karan must be behind Amit. Hence, Karan can be in the fourth or fifth place. If Karan is in the fifth place, then Pavan will be immediately behind Karan. But this violates condition (i), as Kiran and Pavan have 23 and 19 chocolates respectively. Since Pavan has 19 chocolates, Lokesh has 14 chocolates.
Hence, Karan must be in the fourth place.
From (iv), Jai is immediately behind Lokesh. Hence, Jai must be in second place and Lokesh must be in first place. Ratan must be in fifth place.
Lalit has 14 chocolates. Jai cannot have 10 or 18 chocolates (from (i)). Since Karan and Pavan have 23 and 19 chocolates respectively, Jai must have 29 chocolates.
Amit and Ratan can have 10 and 18 chocolates in any order. Ratan is standing immediately in front of Pavan, who has 19 chocolates. From (i), Ratan cannot have 18 chocolates. Hence, Ratan must have 10 chocolates, while Amit has 18 chocolates.
The following table provides the position of each person in the queue and the number of chocolates with each of them:

Position	Person	Number of Chocolates
1	Lokesh	14
2	Jai	29
3	Amit	18
4	Karan	23
5	Ratan	10
6	Pavan	19

For three persons (Jai, Karan and Pavan), the number of chocolates with them greater than that with any person standing adjacent to them. Choice (D)

QA

Q1. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.
Let $a = (\log_2 x)^2 - 12 \log_2 x + 48$, where x is a real number. The number of distinct roots of $x^a = 16^{16}$ is

a) **0.**

b) **1.**

c) **2.**

d) **3.**

$a = \log_x 16^{16} = \log_x \left(2^4\right)^{16} = 64\log_x 2$

$\Rightarrow 64 \log_x 2 = (\log_2 x)^2 - 12\log_2 x + 48$

$\Rightarrow (\log_2 x)^3 - 12(\log_2 x)^2 + 48\log_2 x - 64 = 0$

$(\because \log_x 2 = \frac{1}{\log_2 x})$

$(\log_2 x - 4)^3 = 0$

$\log_2 x = 4$

$\therefore$ x has a unique value. Choice (B)

Q2. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.
If the highest power of 225 in $n!$ is 10, find the number of values that n can assume.

a) **0**

b) **3**

c) **5**

d) **10**

We know, $225 = 3^2 \times 5^2$
$\Rightarrow$ The power of 3 or 5 has to be 20 or 21 for the highest power of 225 in n! to be 21.
Since, the power of 3 in a factorial is always greater than that of 5, the power of 5 in n! is 20 or 21.
$\Rightarrow$ The number of numbers which have power of 5 as 20 in their factorials is 5 (85 to 89, checking using successive division, i.e., 17 + 3 + 0 = 20).
The number of number which have power of 5 as 21 in their factorials 5(90 to 94, i.e., 18 + 3 + 0 = 21).
$\therefore$ The required answer is 5 + 5 = 10 Choice (D)

Q3. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.
Three numbers in geometric progression are such that if 64 is decreased from the largest, then the three numbers thus obtained would be in arithmetic progression. Further if the middle number of the new set of numbers is reduced by 8, the numbers thus obtained would be in geometric progression. Find the middle term of the original sequence.

a) **5**

b) **20**

c) $\frac{52}{9}$

d) **Cannot be determined**

Let the numbers be a/r, a and ar
$2a = a/r + ar - 64$ ..... (1)
also, $(a-8)^2 = (a/r)(ar - 64)$
$\Rightarrow a^2 - (a-8)^2 = 64a/r \Rightarrow a - 4 = 4a/r$
$\Rightarrow r = 4a/(a-4)$ ..... (2)
Substituting in (1),
We get $a = 20$; $r = 5$ or $a = 52/9$ and $r = 13$ (Also the original sequence is 4,20,100 or 4/9, 52/9, 676/9.
Hence, the middle term cannot be uniquely determined. Choice (D)

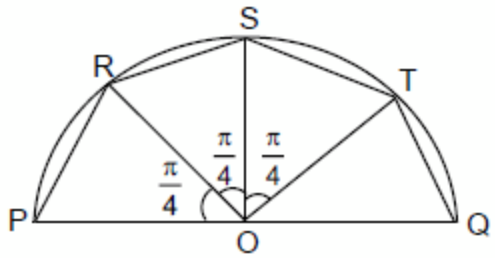
Q4. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.
A semicircle, whose centre is O, has a radius of 7 cm. P and Q are the end points of its diameter. Now, if three points, R, S and T are selected on it such that PR = RS = ST = TQ, find the area of the pentagon POTSR (in sq.cm)

a) $\frac{147\sqrt{2}}{4}$

b) $\frac{147\sqrt{2}}{6}$

c) $\frac{294\sqrt{2}}{4}$

d) $\frac{147\sqrt{2}}{2}$



PR = RS = ST = TQ.
Also OP = OS = OT = OQ = 7 cm
∴ It follows that any two of the triangles POR, ROS, SOT and TOQ are congruent ----- ----- (1)

$\therefore \angle POR = \angle ROS = \angle SOT = \angle TOQ = \frac{180°}{4} = 45°$

Required area = Area of ΔPOR + Area of ΔROS + Area of ΔSOT = 3(Area of ΔPOR), from (1)

$= 3(\frac{1}{2} .OP. OR. \sin\angle POR) = \frac{3}{2} (7)^2 \sin 45°$

$= \frac{147}{2\sqrt{2}}$ sq.cm $= \frac{147\sqrt{2}}{4}$ sq.cm. Choice (A)

Q5. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.
Ten years ago, Amar's age was one-third of Balu's age and half of Chiru's age. If ten years from now, Amar's age will be half of Balu's age and two-thirds of Chiru's age, how old is Chiru now?

a) **30 years**

b) **40 years**

c) **50 years**

d) **60 years**

Let a, b and c, be the ages of Amar, Balu, and Chiru respectively.

$$a - 10 = \frac{1}{2}(c - 10) \Rightarrow a = \frac{c}{2} + 5$$

$$a + 10 = \frac{2}{3}(c + 10) \Rightarrow a = \frac{2c}{3} - \frac{10}{3}$$

$$\therefore \frac{c}{2} + 5 = \frac{2c}{3} - \frac{10}{3} \Rightarrow c = 50$$

Choice (C)

Q6. DIRECTIONS *for question 6:* Type in your answer in the input box provided below the question.
Neha takes a loan at 20% p.a. with interest being compounded annually. The loan is to be repaid in ten equal annual instalments of Rs.7,200 each. After paying the eighth instalment (at the end of the eighth year), the rate of interest was reduced to 10% for the ninth and tenth years. Now, if Neha wants to repay the remaining loan (along with the interest) in a single payment at the end of the ninth year, what is the amount (in Rs.) that she must pay?

According to the original repayment schedule, Neha has to pay ₹7,200 at the end of the 9^{th} year and ₹7,200 at the end of the 10^{th} year. The worth of these instalments at the end of the 8^{th} year is (7200/1.2) or ₹6,000 and (7200/1.44) or ₹5,000 respectively. Thus the outstanding debt at the end of 8 years is ₹11,000. The rate of interest is changed to 10% p.a. Therefore she has to pay ₹(11,000) (1.1) or ₹12,100 at the end of the 9^{th} year as full and final settlement of the loan.

Ans: (12100)

Q7. DIRECTIONS *for question 7:* Select the correct alternative from the given choices.
If an eight-digit number with distinct digits has exactly three odd digits and is divisible by all the non-zero digits in it, then which of the following cannot be a digit of the number?

a) **3**

b) **7**

c) **1**

d) **5**

As the eight-digit number has only three odd digits, its other five digits are even. ∴ The other five digits must be 0, 2, 4, 6 and 8. Let the odd digits be a, b and c respectively. We have to leave out 2 of the 5 odd digits. This can be done in 10 ways. Thus we have only 10 ways of choosing the three odd digits. It can easily be observed that, if 9 is included then the sum of the digits cannot be a multiple of 9, and similarly if 3 is included then the sum of the digits cannot be a multiple of 3(since 9 has already been excluded). We can see that only the digits 8, 7, 6, 5, 4, 2, 1, 0 satisfy the given conditions.

∴ None of the digits can be 3 or 9. Among the options only 3 appears.

Choice (A)

Q8. DIRECTIONS *for question 8:* Type in your answer in the input box provided below the question.
Three men, John, Jack, and Joe, run around a circular track, starting at the same time and at the same point, with constant speeds of 8 kmph, 10 kmph, and 15 kmph respectively. John and Jack run in the same direction, whereas Joe runs in the opposite direction. If John and Jack meet each other for the first time after 15 minutes, how long (in minutes) will it take for all three of them to meet for the first time?

Given that John and Jack meet for the first time after 15 minutes, i.e., $\frac{1}{4}$hr. Let L be the length of the track.

$\therefore \frac{L}{(10-8)} = \frac{1}{4} \Rightarrow L = 0.5$ km

For the three of them to meet for the first time, time taken = LCM of $\left(\frac{L}{a-b}, \frac{L}{b-c}\right)$ where, a, b, and c are their speeds. Since one of them is running in the opposite direction, the sign of the speed will change.

$\text{LCM}\left(\frac{0.5}{10-8}, \frac{0.5}{8+15}\right) = \text{LCM}\left(\frac{1}{4}, \frac{1}{46}\right) = \frac{1}{2}$ hour = 30 minutes

Ans: (30)

Q9. DIRECTIONS *for question 9:* Select the correct alternative from the given choices.
For three distinct positive real numbers a, b and c, let

$f(a, b, c) = \max[\min(a, b), \min(b, c), \min(c, a)]$

$g(a, b, c) = \min[\min(a, b), \min(b, c), \min(c, a)]$

$h(a, b, c) = \max[\max(a, b), \max(b, c), \max(c, a)]$

p (a, b, c) = min [max (a, b), max (b, c), max (c, a)]

q (a, b, c) = max (a, b, c) and

r (a, b, c) = min (a, b, c)

Which of the following expressions is necessarily less than 1?

a) $\frac{q(a,b,c)}{r(a,b,c)}$

b) $\frac{[q(a,b,c) - g(a,b,c)]}{p(a,b,c)}$

c) $\frac{p(a,b,c)}{h(a,b,c)}$

d) $\frac{[g(a,b,c) + p(a,b,c)]}{q(a,b,c)}$

Without loss of generality, assume that $a < b < c$
Then, $f(a, b, c)$ = b
$g(a, b, c) = a$
$h(a, b, c) = c$
$p(a, b, c) = b$
$q(a, b, c) = c$ and $r(a, b, c) = a$
Now, let us test for the validity of the options of each question.

Choice (A): $\frac{q}{r} = \frac{c}{a} > 1$

Choice (B): $\frac{q-g}{p} = \frac{c-a}{b} \geq 1$

Choice (C): $\frac{p}{h} = \frac{b}{c} < 1$

Choice (D): $\frac{g+p}{q} = \frac{a+b}{c} \geq 1$

Hence, choice (C) is the right option. Choice (C)

Q10. DIRECTIONS *for question 10:* Type in your answer in the input box provided in the question.

If $(14 - a)^{1/3} + (14 + a)^{1/3} = 4$, then the product of the roots of the equation is

It is given that,

$(14-a)^{1/3} + (14+a)^{1/3} = 4$

Cubing both sides, we get

$(14 - a) + (14 + a) + 3(4)(14^2 - a^2)^{1/3} = 64$

$12(196 - a^2)^{1/3} = 64 - 28$

$\therefore (196 - a^2)^{1/3} = 3.$

Cubing both sides, we get $196 - a^2 = 27$

$\Rightarrow a^2 = 169$

$\therefore a = \pm\sqrt{169}$

Product of the roots of the equation on will be $(13)(-13) = -169$.

Alternative Solution:

By inspection, (14 + a) and (14 – a) must be perfect cubes.
By simple trial and error a = ±13 satisfies.
Hence, product of roots = (13)(–13) = –169. Ans: (–169)

Q11. DIRECTIONS *for questions 11 and 12:* Select the correct alternative from the given choices.

A, B and C are three points on a circle with centre O, such that ∠OAC = ∠ABC. If AB = $24\sqrt{2}$ cm and AC = 24 cm, find the length of BC.

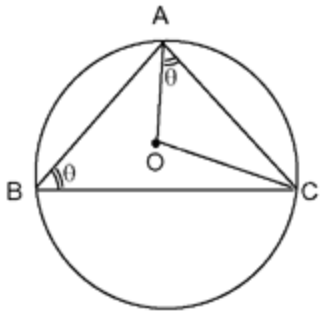
a) $12\sqrt{2}$ cm

b) $12\sqrt{3}$ cm

c) $2\sqrt{2}$ cm

d) **24 cm**

Consider the following figure, where $\angle OAC = \angle ABC = \theta$ (say)



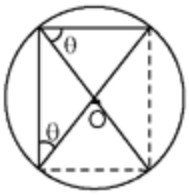
If we join OC, $\angle OCA = \angle OAC = \theta$
Also, angle subtended by AC at centre (i.e., $\angle AOC$) will be twice that subtended by AC on the rest of the circle (i.e., $\angle ABC$).
Hence, $\angle AOC = 2\theta$
Now in ΔAOC, $\theta + \theta + 2\theta = 180° \Rightarrow \theta = 45°$

$\Rightarrow \angle AOC = 90°$ and $AO = OC = \frac{AC}{\sqrt{2}} = \frac{24}{\sqrt{2}} = 12\sqrt{2}$

$\Rightarrow$ Radius of circle = $12\sqrt{2}$ cm (and diameter = $24\sqrt{2}$ cm)

But it is given that AB = $24\sqrt{2}$ cm. Hence AB must itself be the diameter. Hence $\angle BCA = 90°$ and therefore O, in fact lies on AB and ΔABC is a 90°, 45°, 45° triangle.
$\Rightarrow$ BC = AC = 24 cm.

Alternative solution:



Let AO be extended to meet the circle say at Y.
And let $\angle CAY = \theta$
Since AY is the diameter $\angle ABY = 90°$
Clearly $\angle CBY = \theta$ ($\because \angle CAY = \theta$ and $\angle CAY$ and $\angle CBY$ are angles in the same segment)
$\therefore \angle ABY = 90° = \theta + \theta = 2\theta$
$\Rightarrow \theta = 45°$.
As AC = 24, and $\angle ACY = 90°$, $\angle CYA = 45°$, AY = $24\sqrt{2}$
As AB is given as $24\sqrt{2}$, it is possible only if B coincides with Y, in which case CB = CY = 24 Choice (D)

Q12. DIRECTIONS *for questions 11 and 12:* Select the correct alternative from the given choices.
The number of positive integers n, satisfying $n^3 - 16n - 4n^2 + 64 \leq 0$ is

a) **2.**

b) **0.**

c) **1.**

d) **More than 2.**

$n^3 - 4n^2 - 16n + 64 \le 0$
$n^2 (n-4) - 16 (n-4) \le 0$
$(n^2 - 16) (n-4) \le 0$
$(n+4) (n-4)^2 \le 0$
For all values of n, $(n-4)^2 \ge 0$
Since n is positive $n + 4$ can never be less than zero.
Hence $n = 4$ is the only positive integer value of n that is possible. Choice (C)

Q13. DIRECTIONS *for question 13:* Type in your answer in the input box provided below the question.
Let y be a five-digit number with exactly four digits being same. If y is also a multiple of 3, how many such numbers are possible?

Let us represent the digit which is repeated 4 times by a and the 5th digit by b. The possible solutions are

Case (i):
when $a = 0$, b can be 3 or 6 or 9. The numbers are 30000, 60000 and 90000.
when $a = 1$, b can be 2 or 5 or 8. The number of possible values will be given by $\frac{5!}{4!} \times {}^3C_1$ i.e., 15.
[${}^3C_1$ is for selecting one from the three digits 2, 5 or 8 and that number can be arranged in $\frac{5!}{4!} = 5$ ways, as the fifth digit 'b' can occupy any of the five places.

Note that if the fifth digit is zero, then it can occupy only four of the five places. For example, when $a = 3$, b can be 0 or 6 or 9. Now with 6 or 9 we will have 5 ways but with 0 there will be 4 ways [since 0 cannot be in the ten thousands place]. Total 14 number are possible.
Hence, whenever 'a' is not a multiple of 3, we will get 15 ways. But when 'a' is a multiple of 3, then we will get only 14 ways. Hence we will have 15 ways for each case when a = 1, 2, 4, 5, 7 and 8. Also, we will have 14 ways for each case when a = 3, 6 and 9.
Therefore total number of possible values for y
$= 3 + 3(14) + 6(15) = 135$ Ans: (135)

Q14. DIRECTIONS *for questions 14 to 18:* Select the correct alternative from the given choices.

If the reciprocal of the sum of the reciprocals of the roots of a quadratic equation $ax^2 + bx + c = 0$ equals the reciprocal of the square of the sum of its roots, then which of the following conclusions holds true?

a) ***a*, *b* and *c* are in arithmetic progression.**

b) ***b*, *a* and – *c* are in arithmetic progression.**

c) ***b*, *a* and – *c* are in geometric progression.**

d) ***a*, *c*, –*b* are in geometric progression.**

The given equation is $ax^2 + bx + c = 0$.
Let the roots be α and β. As the roots have reciprocals, $c \neq 0$.
The sum of the reciprocals is $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta}$.
This expression would have a reciprocal, provided $\alpha + \beta \neq 0$, (i.e. $b \neq 0$) and in that case it would be given by $\frac{\alpha\beta}{\alpha+\beta}$.
The square of the sum of the roots of the equation is $(\alpha + \beta)^2$.

$$\therefore \frac{\alpha\beta}{\alpha + \beta} = \frac{1}{(\alpha + \beta)^2} \Rightarrow (\alpha + \beta)\,\alpha\beta = 1 \Rightarrow -bc = a^2$$

i.e. b, a and $-c$ are in geometric progression. Choice (C)

Q15. DIRECTIONS *for questions 14 to 18:* Select the correct alternative from the given choices.
P and Q can complete a job in 30 days and 20 days respectively. If P started the work first and 15 days later, Q joined, in how many days will they complete the remaining work?

a) **6 days**

b) **12 days**

c) **18 days**

d) **21 days**

P alone finished $\frac{15}{30} = \frac{1}{2}$ of the work.

Part of job completed by P and Q together in a day

$= \frac{1}{20} + \frac{1}{30} = \frac{1}{12}$, i.e., they will take 12 days to complete the work.

Since P alone finished half of the work already, P and Q will take another $\frac{1}{2} \times 12 = 6$ days to finish the remaining work. Choice (A)

Q16. DIRECTIONS *for questions 14 to 18:* Select the correct alternative from the given choices.
If the equations of the two tangents drawn to a circle C from a point P are $4x + 3y - 7 = 0$ and $3x - 4y + 1 = 0$, then the centre of the circle C will definitely lie on the pair of straight lines represented by

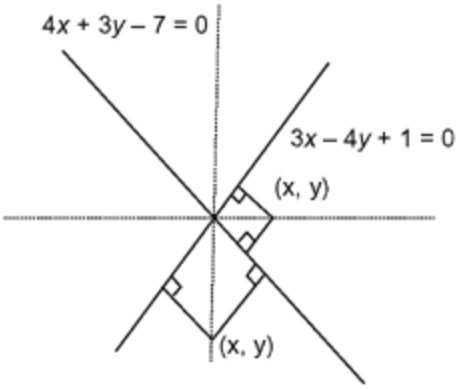
a) **$(x + 6y - 7)(6x + y - 7) = 0$.**

b) **$(x + 7y - 8)(7x - y - 6) = 0$.**

c) **$(x - 6y + 5)(6x + y - 7) = 0$.**

d) **$(x - 7y + 6)(7x + y - 8) = 0$.**

The length of the perpendicular drawn from the centre of the circle to the tangents will equal to that of the radius of the circle.



Let (x, y) be the centre of the circle

$$\Rightarrow \frac{|4x+3y-7|}{\sqrt{4^2+3^2}} = \frac{|3x-4y+1|}{\sqrt{3^2+4^2}}$$

$\Rightarrow 4x + 3y - 7 = \pm(3x - 4y + 1)$

$\Rightarrow 4x + 3y - 7 - (3x - 4y + 1) = 0$

or

$4x + 3y - 7 + (3x - 4y + 1) = 0$

$\Rightarrow x + 7y - 8 = 0$ or $7x - y - 6 = 0$

i.e., The centre of the circle lies on either $x + 7y - 8 = 0$ or $7x - y - 6 = 0$

$\therefore$ The centre of the circle will definitely satisfy

$(x + 7y - 8)(7x - y - 6) = 0$

Alternative Solution:

The centre of the circle must lie on one of the angle bisectors of the angles formed by the given two lines. The slopes of the given lines are $\frac{-4}{3}$ and $\frac{3}{4}$, i.e., they are perpendicular to each other. Hence one of the angle bisectors will be at an angle (say α) of exactly 45° more than the angle, A, made by the line with slope $\left(\frac{3}{4}\right)$,

i.e., $\tan A = \left(\frac{3}{4}\right)$

$$\therefore \tan\alpha = \tan(A + 45°) = \frac{\tan A + 1}{1 - \tan A} = \frac{\frac{3}{4} + 1}{1 - \frac{3}{4}} = 7$$

Hence, slope of the other bisector = $\frac{-1}{7}$

Checking the options (for the slopes of the two lines), only option (B) is possible.

Choice (B)

Q17. DIRECTIONS *for questions 14 to 18:* Select the correct alternative from the given choices.

If M = 30! $\left(\frac{1}{30!}+\frac{1}{29!}+\frac{1}{28!2!}+\frac{1}{27!3!}+\ldots.+\frac{1}{3!27!}+\frac{1}{2!28!}+\frac{1}{1!29!}+\frac{1}{30!}\right)$, find the quotient when M − 1 is divided by 1023.

a) $2^{20} - 1$

b) $2^{20} - 2^{10} + 1$

c) $2^{20} + 1$

d) $2^{20} + 2^{10} + 1$

$$M = \frac{30!}{30!0!}+\frac{30!}{29!1!}+\frac{30!}{28!2!}+\ldots..\frac{30!}{0!30!}$$

These terms can be observed to be nothing but the binomial co-efficients in the expansion of $(1 + x)^{30}$, where x can be assumed as 1, which will lead to the conclusion that

$^{30}C_0 + {}^{30}C_1 + {}^{30}C_2 + \ldots.. + {}^{30}C_{30} = 2^{30}$

$(\because {}^{n}C_0 + {}^{n}C_1 + {}^{n}C_2 + \ldots... + {}^{n}C_n = 2^n)$

$$\frac{2^{30}-1}{1023} = \frac{\left(2^{10}\right)^3 - 1}{2^{10}-1} = \left(2^{10}\right)^2 + 2^{10} + 1 = 2^{20} + 2^{10} + 1$$

Choice (D)

Q18. DIRECTIONS *for questions 14 to 18:* Select the correct alternative from the given choices.

An alloy, P, is formed by mixing copper and nickel in the ratio of 2 : 3, by weight, while another alloy, Q, is formed by mixing nickel and zinc in the ratio of 4 : 5, by weight. If a third alloy, R, is formed by mixing P and Q, such that the ratio of copper and zinc in R is 5 : 9, by weight, then what fraction, by weight, of the alloy R is nickel?

a) $\frac{21}{47}$

b) $\frac{20}{41}$

c) $\frac{21}{41}$

d) **None of the above**

Let x kg of P and y kg of Q yield (x + y) kg of R, which has copper and zinc in ratio 5 : 9

$\therefore \left[\frac{2}{(2+3)} \times x\right] : \left[\frac{5}{(5+4)} \times y\right]$ = 5 : 9 (because copper comes only from x kg of P and zinc, only from y kg of Q)

$\Rightarrow x : y = \frac{125}{162}$. So, mixing 125 kg of P and 162 kg of Q, yields $\left[125 \times \left(\frac{3}{2+3}\right) + 162 \times \left(\frac{4}{4+5}\right)\right]$ kg, i.e., 147 kg of nickel.

Hence, fraction of nickel in R = $\frac{(147)}{(125+162)} = \frac{147}{287} = \frac{21}{41}$. Choice (C)

Q19. DIRECTIONS *for question 19:* Type in your answer in the input box provided below the question.

A frog in a well, 300 feet deep, climbs the well in the following manner. On the first day, it climbs one feet. On the second day, it climbs two feet and on the third day it climbs three feet and so on. But every night, it slips down half of the distance that it climbed during the corresponding day. On which day will the frog climb out of the well?

On the first day, the effective height climbed
= 1 – 1/2 = 1/2 foot
On the second day, the effective height climbed
= 2 – 2/2 = 1 foot
Similarly, on the n^{th} day, the effective height climbed
= $n – n/2 = n/2$
Let the frog will be out of the well on the nth day.

$\therefore \frac{1}{2} + 1 + \ldots\ldots + \frac{(n-1)}{2} + n \geq 300$

[∵ The frog will be out of the well on the *n*th day, so it is not in the well on the nth night]

$\Rightarrow \frac{1}{2} \Sigma(n-1) + n \geq 300 \Rightarrow \frac{1}{2} \frac{(n-1)(n-1+1)}{2} + n \geq 300$

$\Rightarrow (n-1)(n) + 4n \geq 1200 \Rightarrow n(n+3) \geq 1200$

The least positive integer which satisfies the above equation is 34. Ans: (34)

Q20. DIRECTIONS *for questions 20 and 21:* Select the correct alternative from the given choices.

A positive number N is divided into two unequal parts such that the difference of the cubes of the two parts is 133 times their difference. If the product of the two parts is 36, then what is the value of N?

a) **12**

b) **13**

c) **15**

d) **20**

Let N = A + B (say A > B)
It is given that $A^3 - B^3 = 133 (A - B)$
$\Rightarrow (A - B)(A^2 + B^2 + AB) = 133 (A - B)$
$\Rightarrow A^2 + B^2 + AB = 133$ ----- (1)
Again we know that AB = 36
Adding AB to both sides of equation (1), we get
$A^2 + B^2 + AB + AB = 133 + AB$
$A^2 + B^2 + 2AB = 133 + 36$
$(A + B)^2 = 169$
Therefore $A + B = \sqrt{169} = 13$. Choice (B)

Q21. DIRECTIONS *for questions 20 and 21:* Select the correct alternative from the given choices.

A permutation is an ordered arrangement of two or more objects. The interchange of any two adjacent objects in a permutation is called a *transposition*. Thus, for three objects *a*, *b* and *c*, the permutation *acb* can be obtained from the permutation *abc* using one *transposition*.

How many *transpositions* are needed to completely reverse the permutation *abcdef*, to obtain the permutation *fedcba*?

a) **15**

b) **21**

c) **6**

d) **18**

To obtain the required permutation we proceed as follows

Permutation	Number of transpositions
abcdef	
bcdefa	5
cdefba	4
defcba	3
efdcba	2
fedcba	1

∴ The total number of transpositions needed is 15. Choice (A)

Q22. DIRECTIONS *for questions 22 and 23:* Type in your answer in the input box provided below the question.

If $xy^2z^3 = 2^{12}\ 3^2$, where x, y and z are positive real numbers, then find the minimum value of $3x + 2y + z$.

We are given that the product $xy^2\ z^3$ is constant and we need the minimum value of $3x + 2y + z$.
We try to express the constant as the product of several factors whose sum is $3x + 2y + z$.

We can think of xy^2z^3 as $9(3x)\ (y)\ (y)\left(\frac{z}{3}\right)\left(\frac{z}{3}\right)\left(\frac{z}{3}\right)$

The sum of these 6 factors (omitting the numerical coefficient of 9) is $3x + 2y + z$. This sum is minimum when all the factors are equal, i.e., when $3x = y = \frac{z}{3}$

As $9\ (3x)\ (y)\ (y)\left(\frac{z}{3}\right)\left(\frac{z}{3}\right)\left(\frac{z}{3}\right) = 2^{12}\ 3^2$

i.e., $(3x)\ (y)\ (y)\left(\frac{z}{3}\right)\left(\frac{z}{3}\right)\left(\frac{z}{3}\right) = (4)^6$

The sum is minimum where

$3x = y = \frac{z}{3} = 4$ i.e., $x = \frac{4}{3}$, $y = 4$, $z = 12$

This minimum sum is $3\left(\frac{4}{3}\right) + 2\ (4) + 12 = 24$ Ans: (24)

Q23. DIRECTIONS *for questions 22 and 23:* Type in your answer in the input box provided below the question.

Two friends, Turbo and Black Shadow, simultaneously left two places A and B respectively. Turbo left from A, for B, and Black Shadow left from B, for A. However, every time that either of them

arrives at his destination, he immediately turns back to reach his starting point and then keeps on travelling in that manner between A and B. If the distance between A and B is 7 km and the speeds of Turbo and Black Shadow are 70 kmph and 20 kmph respectively, how many times do they meet in the first seven hours after they start?

Each time Turbo travels a one-way trip, i.e., from A to B or B to A, he and Black Shadow will meet exactly once, unless they meet at A or B (in which case, they will meet only once for two one-way trips by Turbo).

Each one-way trip by Turbo takes $\frac{7}{70} \times 60 = 6$ minutes. Each one-way trip by Back Shadow takes $\frac{7}{20} \times 60$

= 21 minutes.

Now, let both of them meet (say) at A. Then an even multiple of 6 = an odd multiple of 21, which is not possible.

Now, let them meet at (say) B. Then, an odd multiple of 6 = an even multiple of 21, which is possible. Now, by some observation, we can figure out that they meet at B for the first time when Turbo travels from A to B four times and from B to A three times and Black Shadow travels B to A and then from A to B, once.

But they would not meet when Turbo travels from B to A, after which they would meet another six times by the time Black Shadow reaches B for the second time, at which instance they are back in their initial positions again.

So Turbo and Black Shadow meet thirteen times in $\frac{(14)(7)}{(70)} = \frac{7}{5}$ hours.

$\therefore$ In seven hours, they would meet $13 \times \frac{7}{\left(\frac{7}{5}\right)} = 65$ times. Ans: (65)

Q24. DIRECTIONS *for question 24:* Select the correct alternative from the given choices.

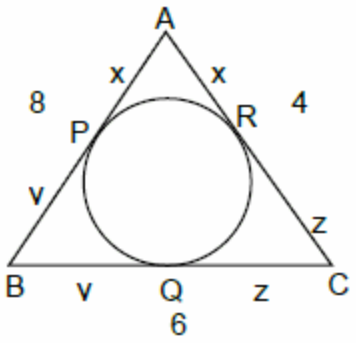
The sides AB, BC and CA of a triangle ABC are 8, 6 and 4 respectively and the incircle of triangle ABC touches the sides AB, BC and CA at P, Q and R respectively. What is the ratio of the lengths of AP and CR?

a) **1 : 3**

b) **3 : 1**

c) **2 : 3**

d) **3 : 2**



$AB + BC + CA = 2(x + y + z)$

$x + y + z = \frac{8+6+4}{2} = 9$

$\therefore x = (x + y + z) - (y + z) = 9 - 6 = 3$

$z = 9 - 8 = 1$

$x : z = 3 : 1$ Choice (B)

Q25. DIRECTIONS *for question 25:* Type in your answer in the input box provided below the question.

If x, y, z are positive integers, such that $xy + x + y = 215$, $yz + y + z = 161$ and $zx + z + x = 107$, then $(y - z))/((x - z) =$

Q26. DIRECTIONS *for question 26:* Select the correct alternative from the given choices.

A circle of radius $\frac{\pi}{2}$ units, centered at the origin, is divided by the curve $y = \tan x$ into two parts, one below the other. The area (in sq.units) of the lower parts is

a) $\frac{\pi^3}{8}$.

b) $\frac{\pi^3}{4}$.

c) $\frac{\pi^2}{8}$.

d) $\frac{\pi^2}{4}$.

Given,
$xy + x + y = 215$ .....(1)
$yz + y + z = 161$ .....(2)
$zx + z + x = 107$ .....(3)
where, x, y, z are positive integers.
From (1)
$xy + x + y + 1 = 216$
$\Rightarrow x(y + 1) + (y + 1) = 216$
$\Rightarrow (x + 1)(y + 1) = 216$ .....(4)
Similarly,
$(y + 1)(z + 1) = 162$ .....(5)
and $(z + 1)(x + 1) = 108$ .....(6)
(4) (6) ÷ (5) gives

$$\frac{[(x+1)(y+1)][(z+1)(x+1)]}{[(y+1)(z+1)]} = \frac{216\ (108)}{162}$$

$$= \frac{12(18)(12)(9)}{18(9)}$$

$(x+1)^2 = 12^2 \Rightarrow x + 1 = 12 \Rightarrow x = 11$
Similarly, $(y + 1)^2 = 18^2 \Rightarrow y + 1 = 18 \Rightarrow y = 17$
And $(z+1)^2 = 9^2 \Rightarrow z + 1 = 9$
i.e., $(x, y, z) = (11, 17, 8)$

$$\frac{y-z}{x-z} = \frac{17-8}{11-8} = \frac{9}{3} = 3.$$

Ans: (3)

Q26. DIRECTIONS *for question 26:* Select the correct alternative from the given choices.

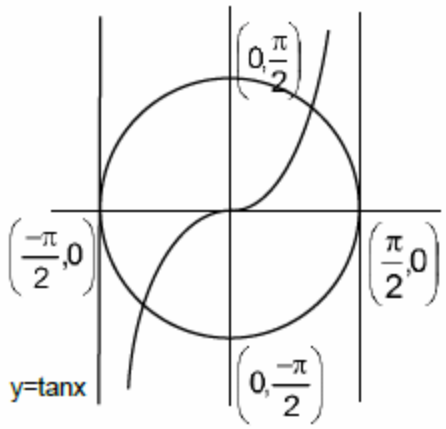
A circle of radius $\frac{\pi}{2}$ units, centered at the origin, is divided by the curve $y = \tan x$ into two parts, one below the other. The area (in sq.units) of the lower parts is

a) $\frac{\pi^3}{8}$.

b) $\frac{\pi^3}{4}$.

c) $\frac{\pi^2}{8}$.

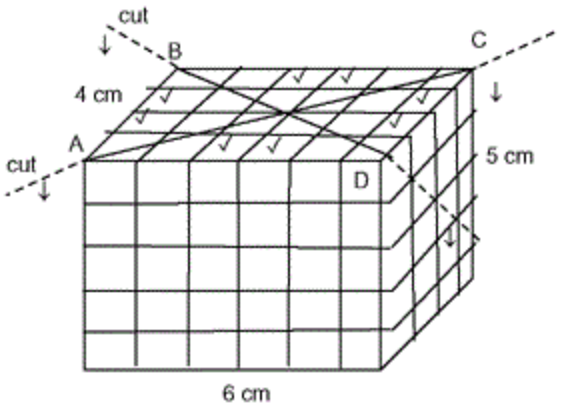
d) $\frac{\pi^2}{4}$.



We see that y = tan x in the range $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ will divide the area of the circle into two equal halves (symmetrically).
Therefore the area of each part will be

$\frac{1}{2}$ [Area of the circle] = $\frac{1}{2}\pi\left(\frac{\pi}{2}\right)^2 = \frac{\pi^3}{8}$ Choice (A)

Q27. DIRECTIONS *for question 27:* Type in your answer in the input box provided below the question.
A cuboid of dimensions 4 cm × 5 cm × 6 cm is constructed from identical cubes, each of side 1 cm. The cuboid is then placed on a table, resting on one of its 6 cm × 4 cm face. Now, two vertical cuts are made (down the height), one cut along each of the two diagonals of the top face. What is the total number of unit cubes which are not affected by the cuts?



The above figure clearly shows the required arrangement. The cuts are made along AC and BD, the two diagonals of the top face ABCD. The top layer of unit cubes, will have exactly eight cubes (indicated with a '√' mark) which are unaffected by the cuts. There will be five such layers in the cuboid. Hence 8 (5) or 40 unit cubes are unaffected by the cuts. Ans: (40)

Q28. DIRECTIONS *for questions 28 to 34:* Select the correct alternative from the given choices.
Rakesh purchased a pen and a book for Rs.53. The next day, he returned the book and got a full refund, with which he purchased 6 pencils and also got back a change of Rs.21. If the price of a pen is twice that of a pencil, then the number of pens that he can purchase with the change that he got is at most

a) **0**

b) **1**

c) **2**

d) **3**

Let the cost of the pen be p, and the cost of the book be b. Given $p + b = 53$.
Let the price of each pencil be n. Given that, $b = 6n + 21$
Also, $p = 2n \Rightarrow b = 3p + 21 \Rightarrow p = 8$.
Hence, he could have purchased 2 pens with ₹21. Choice (C)

Q29. DIRECTIONS *for questions 28 to 34:* Select the correct alternative from the given choices.
Two points A and B are taken on one of the perpendicular sides of a right angled triangle MNO, right angled at O, such that OA = 4 cm and OB = 10 cm. A circle is then drawn such that it passes

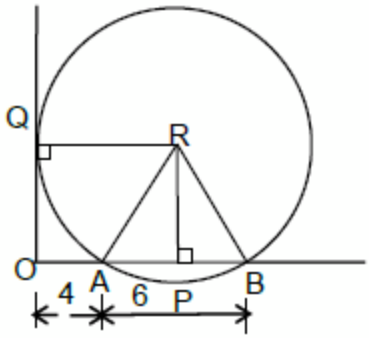
through the points A and B and touches the other perpendicular side of the triangle. What is the radius of the circle?

a) **10 cm**

b) **7 cm**

c) **6 cm**

d) **5 cm**



$OP = 4 + \frac{6}{2} = 7$

$RQ = r = OP = 7$

$\therefore$ Radius = 7

Choice (B)

Q30. DIRECTIONS *for questions 28 to 34:* Select the correct alternative from the given choices.
Among four men, P, Q, R and S, P takes thrice as much time as Q to complete a piece of work. Q takes thrice as much time as R, while R takes thrice as much time as S to complete the same work. One group of three of the four men can complete the work in 13 days, while another group of three can do so in 31 days. Which is the group that takes 13 days?

a) **P, Q, S**

b) **Q, R, S**

c) **P, R, S**

d) **P, Q, R**

From the given information Q is thrice as efficient as P. R is thrice as efficient as Q. S is thrice as efficient as R. If the work done by P in a day is x units, the work done in a day by Q, R and S would be 3x, 9x and 27x units respectively. It can be seen that, P, Q and R working together can do 13x units in a day while P, Q and S working together can do 31x units in a day. Hence the ratio of times taken to complete the work by the former and latter groups is 31 : 13, P, Q and S take 13 days. Choice (A)

Q31. DIRECTIONS *for questions 28 to 34:* Select the correct alternative from the given choices.
There are some baskets labelled 1, 2, 3, 4 …… and so on upto 2*n*, where $n > 6$, such that, for $k = 1$, 2, 3, 4, ….. 2*n*, there are exactly *k* baskets labelled *k*.

Now, consider the following two cases for the number of apples a_i in the basket labelled *i*.

Case I : $a_i = i + 1$, if *i* is odd.
$= i + 2$, if *i* is even.
Case II : $a_i = i + 2$, if *i* is odd.
$= i + 1$, if *i* is even.

If the total number of baskets is N, then find the difference between the total number of apples in the N baskets in Case I and Case II.

a) **1**

b) $\frac{\sqrt{8N+1}-1}{4}$

c) $\frac{N(N-1)}{6}$

d) $\frac{N-4}{8}$

In presence of so many notations, it is advisable to take small numbers and observe the pattern that emerges.
Since the label of the baskets goes on till 2n, let us assume values of n to begin with.
Say n = 1 ⇒ The baskets are labelled 1, 2, 2 (since there are two baskets with label 2).
In this case, N = 3 (since there are three baskets in total)
and the total number of apples as per case I = 2 + 4 + 4 = 10
and the total number of apples as per case II = 3 + 3 + 3 = 9
∴ the difference when N = 3 is 1.
Hence, substituting N = 3 in the choices, choice (D) can be eliminated.
Similarly, when n = 2, the baskets are 1, 2, 2, 3, 3, 3, 4, 4, 4, 4.
∴ A total of 10 baskets are present.
∴ N = 10
Baskets with odd-numbered labels have one apple more in case II when compared with case I. In case of even-numbered baskets, it is vice-versa.
∴ Difference between total number of apples in case I and case II is the difference between the number of odd and even-numbered baskets.
For instance, difference between number of apples in basket 1 under case I and case II is +1.
For label 2, difference is –1.
For label 3, difference is +1.
.
.
.
and so on.
∴ For even-numbered basket, difference is –1 and for odd-numbered basket, difference is +1.
∴ Difference in total number of apples under case I and case II, for n = 2, is $|(1 + 3) – (2 + 4)| = 2$, i.e., when N = 10.
Now substituting N = 10 in the answer choices, choices (A) and (C) can be eliminated.
Hence, the correct answer must be choice (B).

Alternative Solution:

After the pattern in the difference is found as 'n', we get
$N = 1 + 2 + 3 + \ldots\ldots + (2n)$

$$= \frac{2n(2n+1)}{2}$$

$$\Rightarrow 2n^2 + n - N = 0$$

$$\Rightarrow n = \frac{-1+\sqrt{1+8N}}{4}$$

Choice (B)

Q32. DIRECTIONS *for questions 28 to 34:* Select the correct alternative from the given choices.
What is the sum of the series 3 + 33 + 333 + ……. to m terms?

a) $\frac{8\times 10^{m}+10-9m}{27}$

b) $\frac{8\times 10^{m+1}+27-9m}{27}$

c) $\frac{8\times10^{m-1}-27-9m}{27}$

d) $\frac{10^{m+1}-10-9m}{27}$

3 + 33 + 333 + ... to m terms
3/9 (9 + 99 + 999 + ... to m terms
= 3/9 [(10 – 1) + (100 – 1) + (1000 – 1) + ... to m terms]
= 3/9 [(10 + 100 + 1000 + ... to m terms) – m]

$$=\frac{3}{9}\left(\frac{10(10^m-1)}{10-1}-m\right)$$

$$=\frac{3}{9}\left(\frac{10^{m+1}-10-9m}{9}\right)=1/27(10^{m+1}-10-9m)$$ Choice (D)

Q33. DIRECTIONS *for questions 28 to 34:* Select the correct alternative from the given choices.

If $N=\frac{2}{1}\times\frac{4}{3}\times.....\times\frac{400}{399}$, then N must lie between

a) **50 and 60.**

b) **20 and 30.**

c) **30 and 40.**

d) **40 and 50.**

We first consider the lower limit of N.

We know that $\frac{2}{1} > \frac{3}{2}, \frac{4}{3} > \frac{5}{4}, \ldots \frac{398}{397} > \frac{399}{398}$ and $\frac{400}{399} > 1$

Let $N_1 = \left(\frac{3}{2}\right)\left(\frac{5}{4}\right)\ldots\left(\frac{399}{398}\right)$ (1)

Now, $N_1 N = 400$. Also $N > N_1$

$\therefore N^2 > N_1 N \Rightarrow N^2 > 400$

$\therefore N > 20.$

We now consider the upper limit of N.

$N^2 = \left(\frac{2}{1}\right)^2\left(\frac{4}{3}\right)^2\left(\frac{6}{5}\right)^2 \ldots\left(\frac{400}{399}\right)^2$

Let $N_2 = \left(\frac{2}{1}\right)^2\left(\frac{3}{2}\times\frac{4}{3}\right)\left(\frac{5}{4}\times\frac{6}{5}\right)\ldots\left(\frac{399}{398}\times\frac{400}{399}\right)$

$N^2 < N_2$. Also $N_2 = (2)\,(400) \Rightarrow N^2 < (2)\,(400)$

$\therefore N < 20\sqrt{2}$, which is approximately 28.2

Hence, N lies between 20 and 30. Choice (B)

Q34. DIRECTIONS *for questions 28 to 34:* Select the correct alternative from the given choices.
The strength of Delhi Public School (D.P.S) is double that of Mumbai Public School (M.P.S). The ratio of the number of boys in class X to the total strength of class X of D.P.S. is 3 : 5 and the same for M.P.S. is 3 : 4. The girls of class X form 2% of the total school strength, both in D.P.S as well as M.P.S. If all the students of class X of both the schools are grouped together, what will be the ratio of girls to boys in the group formed?

a) **1 : 3**

b) **1 : 2**

c) **3 : 1**

d) **Data insufficient**

Let the strength of girls in Class X of MPS be 'G'
$\therefore$ Strength of MPS = 50G
(Since class X girls form 2% of the strength of MPS)
Strength of DPS = 2×50 G = 100 G
Strength of girls in Class X of DPS = 2 G.

Ratio of Boys to girls in Class X of DPS = $\frac{3}{(5-3)}$ = 3 : 2

$\therefore$ Number of boys in Class X of DPS = 3G

Ratio boys to girls in MPS in class X = $\frac{3}{4-1}$ = 3 : 1

$\therefore$ Number of boys in MPS = 3G
$\therefore$ When class X of both the schools in clubbed into a group, the number of boys in the group = 6G and the number of girls in the group = 3G
$\therefore$ Ratio of girls to boys = 3G : 6G = 1 : 2 Choice (B)